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Luke Heath Milsom,[1] Vladimír Pažitka,[2] Isabelle Roland[3] and Dariusz Wójcik[4]

Abstract

We examine how cross-border syndication ties reduce information frictions and positively impact exports of equity underwriting services. Using a panel data set from 2000–15, we develop a measure of information flows based on 'core syndication ties' where the lead underwriter is in either the importing or exporting country. We find that new core syndication ties have a significant and positive effect on exports. This finding is supported by evidence from 'peripheral syndication ties', which are associated with smaller information flows, and an instrumental variable approach which focuses on plausibly exogenous supply-side shocks. Furthermore, the effect of new core syndication ties is stronger when information frictions between trading partners are more severe and for more information-sensitive transactions like IPOs.

Key words: Gravity, international trade, international finance, equity securities underwriting, cross-border bank linkages, financial geography.

JEL classification: F14, F23, F36, F65, G15, G24.

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1 Introduction

International bank linkages are a key feature of global financial market integration. In equity underwriting services, cross-border underwriting syndicates are a driving force for integration. Syndicates are groups of underwriters organized for the purpose of bringing a single issue of equity securities to the market and dissolved thereafter (Pichler and Wilhelm, 2001). Typically, a lead underwriter[1] manages the relationship with the issuer and is primarily responsible for due diligence. The other syndicate members sell securities to investors within their networks and may contribute equity analyst coverage of the issuer (Ljungqvist et al., 2009). Underwriters involved in a syndicate collectively have a higher potential for information collection and dissemination than any individual syndicate member. Ties formed through international underwriting syndicates therefore facilitate information flows and mitigate information frictions between issuers and investors located in different countries. We argue that, through this channel, syndication ties promote trade in equity underwriting services, and provide supporting evidence using theory-consistent gravity equations.

We build a measure of newly formed "core syndication ties" that proxies for information flows in either direction between the trading partners. To do so, we exploit the structure of underwriting syndicates. The lead underwriter is primarily responsible for conducting due diligence on the issuer and uses other syndicate members to produce and disseminate information about the issuer and investor demand for the offering. Therefore, information flows between the trading partners are strongest when the underwriter in the importing (issuing) or exporting country is the lead underwriter. We denote syndication ties where the underwriter in either the importing or exporting country is the lead underwriter as "core syndication ties". While information is still expected to flow between the trading partners when the underwriters in both countries are non-lead underwriters, the information content of new syndication ties should be lower. We denote syndication ties where the underwriters in both countries are non-lead underwriters as "peripheral syndication ties". Separating newly formed syndication ties into two categories based on the strength of the information flows they generate enables us to provide evidence for the information channel. For each category of syndication ties, the stock of ties in year t is measured using the count of unique bank dyads that are connected through co-membership of underwriting syndicates for each pair of countries up to year t. The question we ask is whether newly formed ties increase the flow of underwriting services between trading partners. Therefore, our explanatory variables measure *changes* in syndication ties over time. More specifically, they measure the number of newly connected bank dyads for each pair of countries in each year.

Our data set addresses the scarcity of disaggregated data on trade in financial services. We construct a country-pair panel data set using transaction-level data on fees earned by banks on equity underwriting services. Specifically, we compile a comprehensive data set of trade flows by aggregating transaction-level data on revenue flows associated with the underwriting of new (primary and secondary) issues of equity securities from the Dealogic Equity Capital Market (ECM) database. Our

[1] The lead underwriter is often referred to as bookrunner.

data set covers 91,511 transactions from 7,326 underwriters serving 46,408 equity issuers across 122 countries of origin and 145 countries of destination for the period 2000-2015. In line with best practice in the presence of many zero trade flows, the gravity equations are estimated with Poisson pseudo maximum likelihood (PPML). The causal interpretation of our baseline results is potentially threatened by unobserved common factors that drive both syndication ties and exports of equity underwriting services. To address the presence of common factors, we saturate our regression models with fixed effects, namely importer-time, exporter-time, and country-pair fixed effects.

We begin our empirical analysis by testing whether new core syndication ties formed between exporting country j and importing (issuing) country k between times $t-1$ and t affect exports from j to k at time t. We find that the effect is statistically and economically significant. Specifically, a 1% increase in new core syndication ties increases exports by 0.243%. In addition, we show that the effect displays some persistence. Core syndication ties formed between $t-2$ and $t-1$ also have a significant effect on exports of equity underwriting services. The fact that lagged changes in syndication ties are positively correlated with flows of equity underwriting services is suggestive of causality. The causal interpretation of our baseline result, however, is potentially threatened by reverse causality. Identification is endangered by the fact that underwriters from export markets might establish new linkages in import markets in anticipation of an increase in exports due to demand shocks in the importing country. We address the potential for reverse causality with a "placebo test" and an instrumental variable (IV) approach.

Our first test is akin to a placebo test. We test whether new peripheral syndication ties (formed by non-lead underwriters in countries k and j) affect exports from j to k less strongly than new core syndication ties. As explained earlier, we expect new syndication ties between non-lead underwriters to be associated with smaller information flows, so we should find a smaller effect on exports. Indeed, information acquisition is mainly conducted by lead underwriters. This analysis serves as a placebo test: if our benchmark result was purely driven by spurious correlation between new syndication ties and exports of equity underwriting services, it would be as likely to show up in the coefficient on the most informative (core) and the least informative (peripheral) syndication ties. In addition, the test provides the first piece of evidence in support of our hypothesis that underwriting syndicates promote exports through information production. We find that the effect of a 1% increase in new core syndication ties on exports is roughly seven times larger than the effect of newly formed peripheral ties.

The result of this test places limits on the extent to which reverse causality might be driving our findings. To further rule out endogeneity concerns, we develop an instrumental variable (IV) approach. We identify supply-side shocks to new core syndication ties between exporting country j and importing country k by measuring shifts in country j's underwriters' interest in country k as an export destination unrelated to changes in demand-side prospects in country k. In particular, we instrument newly formed core ties between j and k with newly formed core ties between j and i. The subscript i denotes a country that is comparable to country k as an export market for country j's underwriters.

The idea is that newly formed core ties between j and i measure country i's attractiveness to country j's underwriters, which is plausibly exogenous to demand-side shocks to exports from j to k. Our relevance assumption is that positive shocks to the attractiveness of country i (newly formed core ties between j and i) constitute negative shocks to the attractiveness of country k. Our exogeneity assumption is that newly formed core syndication ties between j and i only affect exports from j to k through their impact on newly formed core ties between j and k. Our baseline results are validated. We find that a 1% increase in new core syndication ties increases exports by 0.221% (compared to 0.243% when new core ties are not instrumented).

Having established solid evidence for our baseline result, we then proceed to study the mechanism in more detail. The literature on gravity in international finance provides evidence on the role of information frictions in cross-border transactions in financial assets (e.g. Portes et al., 2001; Portes and Rey, 2005). The main information frictions affecting trade in equity underwriting services relate to the barriers that investors face in accessing and interpreting price relevant information, particularly soft information, about foreign issuers. Higher information barriers between the issuer's country (importer) and the underwriter's country (exporter) lead to a higher cost of capital because investors demand a higher risk premium as compensation for information asymmetry. Given the negative relationship between bilateral flows in equity underwriting services and the cost of capital faced by individual issuers, information frictions are expected to reduce trade. Information frictions can, however, be mitigated by financial and reputational intermediaries, including securities underwriters' networks. We review the relevant literature in Sections 2.1 and 2.4.

We provide evidence that underwriting syndicates promote exports through information production. The first piece of evidence is the placebo test described above. In addition to alleviating concerns about spurious correlation between exports of equity underwriting services and new syndication ties, our placebo test shows that changes in syndication ties that generate large information flows between the trading partners (core ties) matter more for exports than ties that generate smaller information flows (peripheral ties). We further establish the plausibility of the information mechanism using two approaches that show that newly formed core syndication ties have a stronger effect on exports of equity underwriting services when information frictions between the trading partners are more severe. In our first approach, we first use OECD membership as a crude proxy for contract enforcement. We find that the effect of new core syndication linkages on exports is larger when the exporter is an OECD member but the importer is not. Second, we find that the effect of new core syndication ties on exports is larger when the destination country is riskier. The risk proxies include the importing country's International Country Risk Guide index, sovereign credit rating (as measured by Moody's), and Resolving Insolvency score from the World Bank Doing Business survey (overall score and recovery rate score). For the second approach, we demonstrate that the effect of new core syndication ties on exports is larger for more information-sensitive transactions. Specifically, we show that the effect is larger for initial public offerings (IPOs) than for other transactions (follow-on offerings and convertible debt) - the former being more information sensitive.

The remainder of the paper proceeds as follows. Section 2 briefly describes the related literature and highlights our novel contributions. Section 3 describes the empirical gravity model, its application to trade in equity underwriting services, and its empirical implementation. Section 4 describes our data. In Section 5 we present and discuss our results. Section 6 concludes.

2 Related literature and novel contributions

2.1 Gravity in international finance

First, our paper is related to the literature on gravity in international finance. The interest in gravity was sparked by the finding that gravity equations explain international transactions in financial assets at least as well as trade transactions for goods (Portes et al., 2001; Portes and Rey, 2005). Since then a large number of papers have estimated gravity equations for cross-border equity, bond and bank holdings.[2] In contrast with this literature, we focus on financial services provided by banks in the context of the issuance of equity securities rather than on the security holdings themselves. Focusing on services rather than asset holdings offers the advantage that we escape the criticism of Okawa and van Wincoop (2012) that applies to most of the literature on gravity in international finance. Most contributions are in violation of the theory of gravity because they include explanatory variables without theoretical foundation. According to the theory of optimal portfolio choice, the demand for an asset depends not only on its expected return, but also on the latter's covariance with other assets. As a consequence, researchers often include correlations (mainly across asset returns) as explanatory variables in their gravity equations.[3] However, this is not consistent with gravity theory. Indeed, one of the key assumptions that must be satisfied to generate a gravity specification for asset holdings is that asset demand depends on a relative price. This assumption is problematic because it is not in line with the theory of optimal portfolio choice. Our paper is not subject to this caveat.

The literature on gravity in international finance provides evidence on the role of information frictions in cross-border transactions in financial assets (e.g. Portes et al., 2001; Portes and Rey, 2005). According to Portes and Rey (2005), informational frictions are the main factor shaping the geographical distribution of international equity transactions. The role of information barriers in cross-border asset holdings and transactions is reflected in a similar finding in the literature on overseas listings. In-

[2]Papers that examine cross-border bank holdings using the BIS *Locational Banking Statistics* include among others Papaioannou (2009), Brei and von Peter (2018), Daude and Fratzscher (2008), and Houston, Lin and Ma (2012). Papers that examine equity holdings using the IMF *Coordinated Portfolio Investment Survey* (CPIS) include among others Lane and Milesi-Ferretti (2008), Daude and Fratzscher (2008), Lane and Milesi-Ferretti (2005), Veronique and Benassy-Quere (2006), Faruqee et al. (2004), Coeurdacier and Martin (2009), Coeurdacier and Guibaud (2011), and Berkel (2007). The literature that relies on other data sets is dominated by papers focusing primarily on a single country, with most attention paid to the United States; e.g. Portes et al. (2001), Ahearne et al. (2004), Forbes (2010), and Chiţu et al. (2014).

[3]See among others Lane and Milesi-Ferretti (2008), Forbes (2010), Faruqee et al. (2004), Coeurdacier and Guibaud (2011), Berkel (2007), Portes and Rey (2005), and Chan et al. (2005).

deed, the results of Sarkissian and Schill (2004) on proximity and familiarity preference in the choice of listing venues indicate that asymmetric information plays an important role in issuers' choice of overseas listing venues. The main information frictions affecting trade in equity underwriting services relate to the barriers that investors face in accessing and interpreting price relevant information, particularly soft information, about foreign issuers. Higher information barriers between the issuer's country (importer) and the underwriter's country (exporter) lead to a higher cost of capital because investors demand a higher risk premium as compensation for information asymmetry. Given the negative relationship between bilateral flows in equity underwriting services and the cost of capital faced by individual issuers, information frictions are expected to reduce trade. Information frictions can, however, be mitigated by financial and reputational intermediaries, including venture capitalists, equity research analysts, accountants, auditors, law firms and securities underwriters among others (see e.g. Dunbar, 2000; Pollock et al., 2004; Ljungqvist et al., 2009; Jeon and Ligon, 2011). We focus on the role of securities underwriters' networks.

2.2 Gravity in services trade

Second, our paper is related to the literature on gravity in services (see e.g. Kimura and Lee, 2006; Anderson et al., 2018). The paucity of comparable cross-country, time series data on services means that the empirical literature is still sparse. Data sets on trade in services are compiled on the basis of balance of payments data provided by national statistics offices. There are many challenges to overcome in order to develop a global database of coherent bilateral trade in services statistics. These challenges include missing data, trade asymmetries (where the reported exports of country j to country k do not align with the reported imports of country k from country j), and differences in reporting standards and statistical methodologies. These challenges are particularly acute when trying to compile a database at a disaggregated level to look at certain categories of services in isolation. Due to severe data limitations, gravity estimates for services are still often based on total trade with the rest of the world or are limited to a small number of (mostly high-income) countries[4]. Contributions that focus specifically on trade in financial services are even scarcer (see e.g. Nordås and Rouzet, 2017; Brei and von Peter, 2018). Brei and von Peter (2018) use the BIS Locational Banking Statistics to estimate theory-consistent gravity equations for international banking. The authors argue that if information frictions matter, lending should be greater when banks have better access to information on foreign markets. They condition the amount of credit extended from a country to another on whether banks from the country of origin have branches or subsidiaries operating in the country of destination. The presence of affiliates abroad enters with a large positive coefficient.

Our paper contributes to this literature in several ways. We construct an entirely novel panel data set which presents numerous advantages over data sets that are based on balance of payments statistics. First, our data set has a comprehensive global coverage (zero observations are true zeros with a very

[4]Contributions include Kimura and Lee (2006), Francois and Wignaraja (2008), Ceglowski (2006), Head et al. (2009), Aichele et al. (2014), and Anderson et al. (2018).

high probability) and does not require any manipulations designed to harmonize the data across countries, to mirror exports and imports, and to predict missing trade flows among countries. In particular, using "synthetic" observations obtained through mirroring and prediction techniques might be problematic in regressions that study the determinants of bilateral trade because there is a danger that a similar gravity model was used to fill in the missing cells in the trade matrix. In addition, the amount of modeling contained in the data will vary across country groups. The data set might be heavy on modeling for emerging markets for example, particularly when applying sectoral disaggregation.

Second, our data set enables us to zoom in to a very specific type of financial service. Francois and Hoekman (2010) highlight that it "makes little sense to speak of 'the service sector'." Indeed, services differ significantly in terms of their roles in the economy, their market structures, and the relative importance of the various channels through which firms can access foreign markets. In this paper, we heed their advice and zoom in on equity securities underwriting. In 2015, $5.25 trillion of services were exported globally, out of which $457.81 billion, approximately 8.7%, were exports of financial services (UNCTADSTAT, 2021). Exports of equity underwriting services were $7.80 billion in 2015 (Dealogic ECM database), approximately 1.7% of all exports of financial services in the same year. Although trade in equity underwriting services is still a relatively small percentage of world GDP, it plays a crucial role in enabling firms to access global capital markets.

Third, our raw data is at the transaction level, which enables us to construct measures of cross-border connections specific to syndication activity in the equity underwriting industry. This allows us to contribute to the research agenda on *modes of supply* in services trade (see e.g. Francois and Hoekman, 2010). Providers of financial services in one country can compete with providers in other countries through four principal modes of supply (see e.g. Sampson and Snape, 1985; Webster and Hardwick, 2005). In the case of financial services, the most significant modes of supply are cross-border exporting of financial services and the establishment of a commercial presence in the importing country. We study another mode of supply which is specific to the underwriting of equity securities, namely co-membership of underwriting syndicates. The literature on modes of supply is sparse because of a dearth of data on sales of services by foreign affiliates of multinational enterprises (Francois and Hoekman, 2010).

2.3 Cross-border bank linkages and trade in goods

There is a growing body of literature on the relationship between finance and trade in goods.[5] Recent papers highlight the role of international bank linkages in promoting trade in goods through various channels. Claessens and Van Horen (2021) examine the link between the presence of foreign banks in the exporting country and international exports of goods. They find that exports are larger when a foreign bank from the importing country is present in the exporting country. The channel is that the presence of foreign banks reduces financial frictions faced by exporting firms. Caballero et al. (2018)

[5]See surveys by Manova and Foley (2015) and Contessi and de Nicola (2012).

also study the link between international trade in goods and bank linkages, but measure linkages differently. Bank linkages are measured as the number of bank pairs in the exporting and importing countries that are connected through syndicated lending to each other. Their results indicate that not only do bank linkages increase exports of goods, they do so by reducing export risk.

Our paper is related to these contributions in that we study the role of international bank linkages in trade. However, our contribution is different in many ways. First, unlike Claessens and Van Horen (2021) and Caballero et al. (2018), we study trade in financial services as opposed to trade in goods. Contributions on financial services are scarce, especially at a disaggregated level such as the equity underwriting services industry. We argue that international bank linkages matter for trade in financial services, too, through channels that might be different than the channels that matter for trade in goods. Second, our measures of international bank linkages are tailored to the equity underwriting industry due to the fact that we zoom in on the latter. Specifically, we focus on newly formed syndication ties because cross-border underwriting syndicates are a specific feature (or mode of supply) in the industry we study. We exploit the hierarchical structure of equity underwriting syndicates to build a proxy for information flows between the trading partners. The measures of bank linkages in Claessens and Van Horen (2021) and Caballero et al. (2018) are entirely different. The measure of bank linkages in Claessens and Van Horen (2021) is based on the physical presence of foreign banks in the exporting country. The measure of Caballero et al. (2018) is much closer in spirit to our measure in the sense that it is a proxy for information flows that does not rely on physical presence abroad. Caballero et al. (2018) proxy information flows using data on linkages formed by bank loans extended by banks in the exporting country to banks in the importing country. Our measure of newly formed syndication ties is also a proxy for information flows but its construction is dictated by the idiosyncrasies of the syndication process (see Section 4.3). Finally, the mechanism we examine is specific to the equity underwriting industry. We propose that syndicates alleviate information frictions between underwriters in the exporting country and issuers in the importing country. We provide more information on this channel in the next section.

2.4 The role of syndicates in alleviating information frictions

An offering can be underwritten by a single underwriter or a group of underwriters, a so-called underwriting syndicate. Syndicates are groups of underwriters organized for the purpose of bringing a single issue of equity securities to the market and dissolved thereafter (Pichler and Wilhelm, 2001). There is, however, a great deal of persistence in the membership of underwriting syndicates. Therefore, recently observed syndication ties are informative about the structure of relational ties and information flows within syndication networks (Pollock et al., 2004). The purpose of underwriting syndicates goes far beyond risk sharing among underwriters. In fact, information production has been argued to be their key purpose, particularly since equity underwriters started becoming publicly listed, thereby alleviating concerns around financial capacity and the need for risk sharing for smaller privately-owned investment banks (Corwin and Schultz, 2005).

Information exchange between issuers and investors is hindered by information asymmetry, which leads to investors discounting issuers' equity valuations. Reputable financial intermediaries can reduce information asymmetry by performing credible due diligence on issuers and feeding information on investor demand back to issuers (Pichler and Wilhelm, 2001). Underwriters generally face internal limitations when performing these functions, including a limited pool of investors in their respective business networks and limited internal expertise in equity valuation. Equity underwriting syndicates can alleviate information asymmetry more effectively than any individual underwriter by pooling their investor and client networks as well as their internal valuation expertise (Corwin and Schultz, 2005; Chuluun, 2015).

Typically, a lead underwriter, often referred to as bookrunner, manages the relationship with the issuer and holds primary responsibility for carrying out due diligence on the latter. Other syndicate members, including co-managers and underwriters, are primarily tasked with selling securities to investors within their networks and gathering information on investor interest in the offering (Pollock et al., 2004). However, they may also contribute to due diligence and the pricing of the offering, particularly if they conduct equity analyst research on the issuer (Ljungqvist et al., 2009). This means that underwriting syndicates are able to facilitate access to information on investor demand across a much broader group of investors than any individual underwriter (Shipilov, 2006; Jeon and Ligon, 2011; Vithanage et al., 2016) and at the same time perform superior due diligence by having collectively a higher capacity for information production (Corwin and Schultz, 2005; Ljungqvist et al., 2009; Chuluun, 2015). This consequently allows underwriting syndicates to further reduce information asymmetry between issuers and investors, which is particularly valuable in conditions of high information asymmetry such as IPOs and international offerings involving issuers and investors located in different countries. The literature therefore clearly indicates that syndication ties can proxy for information flows (Pichler and Wilhelm, 2001; Corwin and Schultz, 2005; Chuluun, 2015).

Accordingly, we use newly formed syndication ties to construct proxies for information flows across country dyads. In doing so, we take full advantage of the information embedded in the structure of underwriting syndicates. Lead underwriters act as the epicentre of every underwriting syndicate and the primary point of contact for issuers. Consequently, it is safe to assume that any key information flows between issuers and investors facilitated by an underwriting syndicate will be routed through lead underwriters (Pollock et al., 2004). For example, all the underwriters involved in a syndicate market the offering and collect information about investor demand across their respective networks of investors. This information is then passed on to the lead underwriter to inform deal pricing (Corwin and Schultz, 2005). Another specific example of information flows relates to the contribution of individual co-managers to due diligence on the issuer. Lead underwriters routinely invite other banks to join a syndicate as co-managers because the latter provide analyst coverage of the issuer and can therefore contribute their specialist expertise to due diligence and deal pricing (Ljungqvist et al., 2009). Any information contributed by individual co-managers is compiled by the lead underwriter,

who holds the ultimate responsibility for due diligence, prepares the IPO prospectus summarising its findings, and communicates this to investors. Therefore, the intensity of information flows facilitated by underwriting syndicates arguably depends on whether a particular syndication tie involves a lead underwriter (core ties) or whether it connects two non-lead underwriters (peripheral ties). While core syndication ties carry prime information content, peripheral ties correspond to lesser information flows.

Our paper contributes to the body of evidence on the information acquisition role of underwriting syndicates using a novel framework in the field (gravity) by showing that various proxies for information frictions are associated with lower exports and that such frictions are reduced through syndication linkages between countries.

3 Empirical methodology

One of the most attractive features of the gravity model of trade is that it can be theoretically derived from a large class of models and be estimated separately for each industry. For example, Arkolakis et al. (2012) show that a large number of micro foundations generate isomorphic gravity equations. As described in Section 2.2, the gravity framework works very well with services data. Theoretically, Okawa and van Wincoop (2012) highlight that two key assumptions are needed to generate a gravity specification. First, total production and expenditure must be separable from the bilateral allocation of trade across countries. Second, demand must depend on a relative price, such as the price of services from a particular country relative to an overall price index. Both conditions are reasonably met for financial services trade, including trade in equity underwriting services. Trade in equity underwriting services is, however, an atypical market compared to those that are traditionally explained by gravity frameworks. Indeed, the market is relatively concentrated, implying that frameworks which emphasize perfect competition are less empirically justifiable. The market for underwriting services is however global in nature and therefore unlikely to exhibit oligopolistic tendencies[6]. Therefore, we base our application of the gravity framework on the monopolistic competition model developed in Krugman (1980), allowing for imperfect competition and potentially high entry costs as in Melitz (2003). Finally, note that the gravity framework has been used to study international banking, an industry which is also highly concentrated and global in nature (see e.g., Nordås and Rouzet, 2017; Brei and von Peter, 2018).

A traditional gravity equation that explains flows of equity underwriting services between exporting country j and importing country k at time t, X_{jkt}, is given by:

$$X_{jkt} = \exp\{\pi_{jt} + p_{kt} + Z_{jk}\Gamma\} + \varepsilon_{jkt} \tag{1}$$

[6]See e.g. Papaioannou and Karagozoglu (2017) for details on market structure, concentration and competition in the underwriting industry.

where π_{jt} are exporter-time fixed effects, p_{kt} are importer-time fixed effects, and Z_{jk} is a vector of time-invariant bilateral trade costs. ε_{jkt} is an error term. The exporter-time and importer-time fixed effects account for the unobserved multilateral resistance terms in theoretical gravity equations. These multilateral resistance terms capture j's outward resistance or ease of market access, and k's inward resistance or ease of market access, respectively. Baldwin and Taglioni (2006) show the importance of sufficiently accounting for these terms in order to achieve consistent estimation of the parameters in a gravity model. The country-year fixed effects also control for any country-specific time-varying market conditions that might have an impact on issuance activity. This is important since our sample period includes data posterior to the global financial crisis. The post-crisis period saw important changes in regulation, with potential repercussions for secondary market liquidity[7].

The traditional proxies for bilateral trade costs are the logarithm of physical distance between the trading partners ($\ln(\text{Distance}_{jk})$), a dummy variable equal to one when the trading partners share a language ($\text{Shared language}_{jk}$), a dummy variable equal to one when the trading partners share a geographical border ($\text{Shared border}_{jk}$), and a dummy variable equal to one when the trading partners share a colonial history ($\text{Shared colonial history}_{jk}$). These variables are well suited to capture the familiarity and proximity preference in overseas listings.[8] The literature indicates that firms that list overseas have a strong tendency to choose foreign markets that are similar to their respective domestic markets. Using a cross-section of the entire universe of overseas listings across world markets, Sarkissian and Schill (2004) find that geographic, economic, cultural, and industrial proximity play a dominant role in the choice of overseas listing venue. In other words, the choice of overseas listing venues reflects the same bias toward more proximate or familiar markets as the one found in the literature that examines investors' asset holdings.[9] As a consequence, foreign listings are more common across markets for which diversification gains are relatively low, contrary to the idea that firms maximize international portfolio diversification gains when listing overseas.[10] The preference for proximate or familiar markets is echoed by the home bias in the provision of investment banking services, although at the same time, the industry is highly internationalized and cross-border deals are very common (Wójcik, 2011). Wójcik et al. (2018) document that a fairly steady fraction of approximately 45% of global investment banking revenue was associated with cross-border deals during 2000-2015. This is comparable to the figures documented in this study. On a revenue weighted basis, 42.8% of our measured trade flows are cross-border, while the remainder are domestic.[11] It is noteworthy that the home bias varies significantly across countries. For example, approximately 75-80% of fees are from

[7] See Rischen and Theissen (2021) for evidence on the euro area bond market.

[8] See Karolyi (2006) for a review of the overseas listings literature.

[9] See e.g. French and Poterba (1991), Tesar and Werner (1995), Coval and Moskowitz (1999, 2001), Huberman (2001), Grinblatt and Keloharju (2001), Portes and Rey (2005), Van Nieuwerburgh and Veldkamp (2009).

[10] This reflects a similar finding for asset holdings: Investors neglect fundamental principles of portfolio diversification by favoring proximate assets and markets (Sarkissian and Schill, 2004). Portes and Rey (2005) provide evidence of this in a gravity framework. Once they control for informational frictions, the authors find weak support for a diversification motive in cross-border equity flows.

[11] Domestic (cross-border) flows are defined as those where the underwriter and client (issuer) are headquartered in the same country (different countries).

cross-border flows for EMEA, 20-35% for Asia-Pacific and 20-30% for the Americas (Wójcik et al., 2018). The traditional trade costs variables included in gravity models lend themselves perfectly to capture this bias toward more proximate or familiar markets. These variables are described in Section 4.2.

Equation (1) is estimated with PPML. Trade data, especially when disaggregated by sector, suffers from the many-zeros problem. Many countries have no trade with many other countries in many time periods. Therefore, the full trade matrix is a sparse matrix containing many zero entries. This is a serious problem when using the traditional log-linearized version of the gravity equation estimated with OLS. Indeed, zeros are dropped as if they were missing values, despite the fact that they contain useful information about trade patterns. First-generation solutions to this problem, such as adding a small positive number to each zero, are arbitrary and lead to biased results (Head and Mayer, 2014). Therefore, we follow Santos Silva and Tenreyro (2006) and estimate our gravity equation using PPML[12], which allows us to retain the zeros. This method has been shown to have excellent properties, even when the proportion of zeros is very high. In addition, log-linearized models are biased (and inconsistent) in the presence of sufficient heteroskedasticity (as is the norm with trade data)[13]. Using PPML also enables us to overcome this problem as described in Santos Silva and Tenreyro (2006). For reference, we also provide results estimated with OLS.

While Equation (1) serves to illustrate that gravity is a valid framework for equity underwriting services, it is not our preferred specification. Our benchmark specification saturates the model with fixed effects by adding country-pair fixed effects and controls for changes in syndication ties. Our baseline empirical gravity equation is given by:

$$X_{jkt} = \exp\left\{\beta s_{jkt}^{\text{core}} + \pi_{jt} + p_{kt} + \rho_{jk}\right\} + \varepsilon_{jkt} \tag{2}$$

where π_{jt} are exporter-time fixed effects, p_{kt} are importer-time fixed effects, ρ_{jk} are country-pair fixed effects, and ε_{jkt} is an error term. The country-pair fixed effects capture all time-invariant trade costs between the trading partners and therefore absorb the traditional proxies for time-invariant bilateral trade costs. The variable of interest, s_{jkt}^{core}, measures the change in cross-border core syndication ties between the importing and exporting countries between times $t-1$ and t. To obtain this measure, we first compute the cumulative sum of unique linkages formed by all syndicate relationships between countries j and k where the lead underwriter is located in either j or k (S_{jkt}^{core}). We then take the log transformation of the one-period change in the aggregate number of core ties, which is the natural

[12]PPML is a weighted non-linear least squares estimator where the weights are constructed under the assumption that $\mathbb{E}[y|x] \propto \mathbb{V}[y|x]$. This captures the well-known property of trade data that higher means are associated with higher variances. This assumption leads to equal weighting and Poisson distributed errors. In general, the following set of FOCs are solved to find $\hat{\beta}_{PPML}$: $\sum_i \left(y_i - \exp\left(x_i \hat{\beta}_{PPML}\right)\right) x_i = 0$.

[13]This is due to the simple fact that Jensen's inequality implies $\ln(\mathbb{E}[y]) \neq \mathbb{E}[\ln(y)]$.

logarithm of the number of new connections formed between countries j and k between $t-1$ and t:

$$s_{jkt}^{\text{core}} = ln(1 + (S_{jkt}^{\text{core}} - S_{jkt-1}^{\text{core}})) \tag{3}$$

We motivate this measure as a proxy for information flows based on how syndicates are structured. In an underwriting syndicate, the lead underwriter holds primary responsibility for performing due diligence and shares information with the other syndicate members (non-lead underwriters). Therefore, information flows between the trading partners are strongest when the underwriter in the importing (issuing) or exporting country is the lead underwriter. β is the coefficient of interest, which we expect to be positive. In line with best practice for trade matrices with many zero entries, Equation (2) is estimated with PPML. For reference, we also provide results estimated with OLS.

While Equation (2) examines the contemporaneous relationship between newly formed core syndication ties and flows of underwriting services, we also estimate the same equation with several lags of the syndication variable to explore the persistence of the effects. A positive correlation between flows of underwriting services and past changes in the intensity of syndication ties is suggestive of causality. The causal interpretation of our baseline result, however, is potentially threatened by reverse causality. Indeed, underwriters from export markets might establish new linkages in import markets in anticipation of an increase in exports. We address the potential for reverse causality with a "placebo test" and an instrumental variable (IV) approach.

First, we perform an analysis akin to a placebo test. We test whether new syndication linkages formed by non-lead underwriters in the exporting and importing countries ($s_{jkt}^{\text{peripheral}}$) affect exports less strongly than new core syndication ties. As explained earlier, we expect new syndication ties between non-lead underwriters to be associated with a lower information content, so we should find a smaller effect on exports. Indeed, information acquisition is mainly conducted by lead underwriters. This analysis serves as a placebo test: if our benchmark result was purely driven by spurious correlation between syndication ties and exports of equity underwriting services, it would be equally likely to show up in the coefficient on the most informative and the least informative syndication ties. In addition, the test provides the first piece of evidence in support of our hypothesis that underwriting syndicates promote exports by mitigating information frictions. The empirical model is as follows:

$$X_{jkt} = \exp\left\{\beta_1 s_{jkt}^{\text{core}} + \beta_2 s_{jkt}^{\text{peripheral}} + \pi_{jt} + p_{kt} + \rho_{jk}\right\} + \varepsilon_{jkt} \tag{4}$$

All previously described variables are as before. $s_{jkt}^{\text{peripheral}}$ is defined in a similar manner to s_{jkt}^{core} in Equation (3) but using the stock of pheripheral linkages, $S_{jkt}^{\text{peripheral}}$, i.e. syndication linkages formed by non-lead underwriters in the exporting and importing countries. While we expect β_1 and β_2 to be positive, we expect β_2 to be smaller in magnitude or insignificant. In line with best practice for trade matrices with many zero entries, Equation (4) is estimated with PPML.

To further rule out reverse causality, we develop an instrumental variable (IV) approach. We aim to isolate the causal effect of syndicates on exports through information production (supply-side effects). Identification is endangered by the fact that underwriters from export markets might establish new linkages in import markets in anticipation of an increase in exports due to demand shocks in country k (demand-side effects). We identify supply-side shocks to new core syndication ties between exporting country j and importing country k by measuring shifts in country j's underwriters' interest in country k as an export destination unrelated to changes in demand-side prospects in country k. This IV approach follows the spirit of Calomiris et al. (2021). In particular, we instrument newly formed core ties between j and k with newly formed core ties between j and i. The subscript i denotes the importing country with the cumulative import value from j over the period 2000-2015 closest to that of country k. In other words, country i is comparable to country k as an export market for country j's underwriters. The idea is that newly formed core ties between j and i measure country i's attractiveness to country j's underwriters, which is plausibly exogenous to demand-side shocks to exports from j to k. Our relevance assumption is that positive shocks to the attractiveness of country i (newly formed core ties between j and i) constitute negative shocks to the attractiveness of country k. Our exogeneity assumption is that newly formed core syndication ties between j and i only affect exports from j to k through their impact on newly formed core ties between j and k. However, it is possible that syndication linkages between j and i may not be exogenous to exports from j to k if these exports are expected to be redirected to i. While we cannot rule out this possibility, it does suggest a channel by which syndicates matter for exports. The first stage is given by Equation (5).

$$s_{jkt}^{\text{core}} = \exp\left\{\beta s_{jit}^{\text{core}} + \pi_{jt} + p_{kt} + \rho_{jk}\right\} + \varepsilon_{jkt} \tag{5}$$

Due to the non-linear nature of our modeling procedure, we take a control function approach, whereby the estimated residuals from the first stage, $\hat{\varepsilon}_{jkt}$, are introduced as a control variable in the second stage to overcome endogeneity concerns. The second stage is given by Equation (6).

$$X_{jkt} = \exp\left\{\beta s_{jkt}^{\text{core}} + \gamma\hat{\varepsilon}_{jkt} + \pi_{jt} + p_{kt} + \rho_{jk}\right\} + \nu_{jkt} \tag{6}$$

Our final piece of analysis is to provide further evidence for the mechanism. If syndicates promote exports by mitigating information frictions as described in Section 2.4, the effect of new syndication ties will vary with the severity of information frictions between country j and country k. The main information frictions affecting trade in equity underwriting services relate to the barriers that investors face in accessing and interpreting price relevant information, particularly soft information, about foreign issuers. This problem is more acute when the issuing country is perceived as riskier. We first separate countries into OECD members and non-OECD members as a rough measure of contract enforcement and estimate Equation (2) for the four possible country-pair types. We then extend our analysis by adding a proxy for the riskiness of the importing (issuing) country, which we interact with

our measure of syndication linkages. The estimating equations are:

$$X_{jkt} = \exp\left\{\beta_1 s_{jkt}^{\text{core}} + \beta_2 s_{jkt}^{\text{core}} \times \text{Risk}_{kt} + \pi_{jt} + p_{kt} + \rho_{jk}\right\} + \varepsilon_{jkt} \tag{7}$$

As before, π_{jt} are exporter-time fixed effects, p_{kt} are importer-time fixed effects, ρ_{jk} are country-pair fixed effects, and s_{jkt}^{core} is defined in Equation (3). Risk_{kt} is a proxy for risk associated with the importing (issuing) country.[14] The information acquisition role of syndicates grows in importance when the importing country becomes riskier. Therefore, we expect the coefficient β_2 to be significantly positive when a higher value of Risk_{kt} indicates higher risk. The risk proxies we use are the destination country's score on the International Country Risk Guide index (ICRG index_{kt}), the destination country's sovereign credit rating as measured by Moody's ($\text{Credit rating}_{kt}$), the destination country's Resolving Insolvency score from the World Bank Doing Business surveys ($\text{Insolvency score}_{kt}$), and the destination country's Resolving Insolvency Recovery Rate score from the World Bank Doing Business surveys ($\text{Recovery score}_{kt}$). We expect that the effect of new core syndication linkages on exports is larger when the destination country scores worse on the ICRG index, has a worse sovereign credit rating, and performs worse in terms of resolving insolvencies. The proxies for risk are described in Section 4.4. Equation (7) is estimated with PPML.

Finally, we build on the insight that exports of underwriting services emanating from initial public offerings (IPOs) are likely to be more information sensitive than exports emanating from other transactions (follow-on offerings and convertible debt). Indeed, information asymmetries between issuers and investors are the largest in the case of IPOs, since the latter refer to the process of offering equity securities to the public in a new stock issuance for the first time. Follow-on offerings and convertible debt issuance refer to the issuance of equity securities or convertible debt following a company's IPO - at which stage market participants already have much more information on the issuer. Thus, we expect the effect of new core syndication ties to be higher for IPOs. We, therefore, estimate Equation (2) separately for exports of services related to IPOs and other transactions, expecting the coefficient β to be higher for the former. Such a strategy of splitting the sample according to the information sensitivity of transactions has been applied for example in Brei and von Peter (2018) when looking at international banking. The authors distinguish between interbank lending and credit extended to non-banks (corporates and non-bank financial institutions), the latter being more information sensitive.

4 Data sources and descriptive statistics

4.1 Exports of equity underwriting services

Our source of data on trade flows is Dealogic's Equity Capital Market (ECM) database. Our dependent variable is a measure of exports of equity underwriting services based on revenues earned by

[14] Note that there is no stand-alone Risk_{kt} control variable because it is absorbed by the importer-year FE.

banks from underwriting equity securities for their clients (issuers). Revenues are reported in current USD (nominal). Our data set covers 91,511 issues of equity securities offerings during the 2000-2015 period. These can be divided into 23,136 initial public offerings (IPOs), 58,454 follow-on offerings, and 9,921 convertible debt securities. We identify the key parties for each transaction – the underwriter(s) and the issuer. Every offering has as many revenue flows as there are underwriters involved. The 91,511 offerings in our data set constitute 306,512 revenue flows among underwriters and their clients. 57.3% of the offerings in our data set are underwritten by a single underwriter. The remaining transactions are underwritten by underwriting syndicates. When more than one underwriter is involved in an offering, revenue is apportioned by Dealogic's proprietary apportioning model among syndicate members. This is done based on their role in the syndicate (bookrunner, lead manager, co-manager, underwriter) and their level of participation in the deal, given by the fraction of newly issued securities allocated to them for selling to primary market investors.

In order to aggregate these individual revenue flows to a country-dyadic level, we need to identify the country of the underwriter(s) (exporting country/countries) and the country of the issuer (importing country) for each transaction. We adopt two conventions. First, the country of both the underwriter and the issuer is assigned based on their respective headquarters of operations, i.e. where their de-facto head office is located, rather than where each company is registered for tax or legal purposes. In other words, we are interested in de facto headquarters, where transactions are conducted, rather than de jure headquarters.[15] Second, if the underwriter directly involved in a transaction is a subsidiary company, the exporting country is determined by the nationality of its parent company - in line with international trade statistics conventions (MSITS, 2010). Assigning the trade to the parent company also allows us to study commercial presence in the importing country as a mode of supply. We link the 91,511 offerings in our data set to 46,408 clients and 7,326 underwriter subsidiaries, controlled by 4,287 parent companies. Dealogic's ECM database contains information on the country of headquarters of operations for all the 46,408 issuers in our data set. The ECM database, however, does not include data on the location of underwriters. To fill this gap, we hand-collect data on addresses of headquarters of operations of underwriters' parent companies from corporate websites and databases, including Bureau van Dijk Orbis, Nexis UK and Bloomberg. We were able to collect data on countries of HQ of operations for 4,176 parent companies (97.4% of the total).

Data on revenue earned from underwriting equity securities in Dealogic's ECM database is either directly reported by underwriters or is estimated by Dealogic. Revenue data is directly disclosed for 45.1% of transactions by the underwriters involved in them, and undisclosed for the remaining 54.9% of transactions. However, Dealogic's ECM database offers proprietary estimates of revenue earned for 47.7% of transactions. We therefore have a combination of disclosed and estimated fees available for 92.8% of transactions. Using estimates is preferable to omitting transactions for which hard data on revenue earned is not available. While the use of estimates for a fraction of transac-

[15] This is to avoid any biases caused by companies registered or formally headquartered outside of the countries of their operations. For example, it is very popular for Chinese companies to register in the British Virgin Islands.

tions may be a source of random measurement error, the exclusion of transactions for which hard data is not available is likely to bias our results against countries that do not require underwriters to disclose revenue earned from equity underwriting for individual deals.[16] Finally, 7.2% of transactions do not have disclosed or estimated revenue data available, and are therefore omitted from our sample. The missing geographical and revenue data means that we cannot observe 7,710 out of the 306,512 revenue flows (2.52%) in our data set. In terms of the pattern of missing data, we were less likely to find geographical data for very small and no longer operating underwriters with no traceable online footprint. We would however not expect this to affect specific countries disproportionately.

After aggregating individual revenue flows into country-dyadic flows, we merge the latter with the CEPII distance data set. The country of origin is the country of the underwriter (exporting country), and the country of destination is the country of the issuer (importing country). Our country-dyadic flows derived from Dealogic data cover 122 countries of origin and 145 countries of destination. We replace any unmatched observations in the trade matrix with zeros. This is justified by the comprehensive nature of Dealogic's Equity Capital Markets database, which allows us to treat unobserved trade flows as true zeros with a very high level of confidence. Naturally, it cannot be ruled out that some of the zero trade flows in our data set may be the consequence of missing data, but we estimate that the proportion of "false zeros" is likely to be very small. All the missing data combined represent 7,710 revenue flows among underwriters and clients, which we are either unable to pinpoint geographically or for which we do not have data on revenue earned. We would expect that the vast majority of these missing revenue flows will be associated with country-dyads that have non-zero trade flows and only a small fraction of the 7,710 missing revenue flows is likely to fall on country-dyads for which we report zero trade flows. Therefore, the fraction of "false zeros" resulting from the missing data is likely to be very small. Even in the worst case scenario where all the missing revenue flows would fall exclusively on country-dyads for which we report zero trade flows, they would only create a small fraction of "false zeros" because the 7,710 missing revenue flows represent only 2.8% of all zero trade flows (271,205 trade flows in total). In other words, a maximum of 2.8% of our zero trade flows would be misreported as zeros instead of small non-zero trade flows. This means that our zero trade flows can be most accurately interpreted as a mix of mostly true zeros and some censored observations (at most 2.8% of the true zeros) that are very close to zero. For this reason we maintain that our zero trade flows are informative and should not be treated as missing data, but rather as true zeros. We

[16]To get a sense of the quality of Dealogic's revenue estimates, we contacted Dealogic and inquired about their estimation method. We learned that Dealogic employs a designated data analytics team, which focuses on modelling fees earned from investment banking transactions, including equity underwriting. Dealogic develops pricing models similar to those used by investment banks to price these transactions in the first place. The parameters of these models are not estimated from data on other transactions, but they are instead derived from regular expert interviews with industry practitioners responsible for pricing investment banking deals. We also inquired about the accuracy of such estimates and were advised that Dealogic's interviews with industry practitioners indicate that their estimates are within a 5% margin of error. Further reassurance on the reliability of the estimates comes from the fact that Dealogic serves as a platform for investment banks to collate their data on capital market transactions into a single data set that they rely on for market share calculations, ranking tables, and industry reports.

drop country pairs that do not display any variation in revenue flows (i.e. exports are always zero), as they are not informative for the estimation of the gravity equations. We obtain a sample of 132 countries that have at least one non-zero revenue flow during the 2000-2015 period (see list of countries in Appendix). This leaves us with a very sparse matrix of trade flows. The proportion of zero trade flows in our country-pair panel regressions is typically around 50% (see tables in Section 5 for exact numbers). However, the PPML estimation method is capable of handling such sparse trade matrices (Santos Silva and Tenreyro, 2006).

Our data set has several advantages over data sources used in the existing literature. Unlike data sets on financial services trade that rely on balance of payments statistics, our data does not require any harmonization, such as mirroring. It is recorded by a single data vendor, Dealogic, in a consistent manner across countries for every offering of equity securities. In contrast to other related research, which relies on the IMF's Coordinated Portfolio Investment Survey (CPIS) data, our dependent variable is built using revenue earned from the provision of financial services, rather than financial holdings. As explained above, this enables us to estimate a gravity equation that is consistent with a variety of models of international trade. Unlike CPIS data, the data used here does not omit transactions from any countries and the data collection process is globally consistent. In contrast, CPIS excludes some important countries, including China, and relies on surveys with varying levels of coverage of institutional investors across participating countries. As a result, the resultant dyadic observations of cross-border financial holdings captured by CPIS data are not necessarily measured consistently across countries and there are many missing values. By contrast, due to the comprehensive and consistent nature of the Dealogic ECM database, the zero trade flows in our data set can be interpreted as "real zeros" with a very high degree of confidence. Unlike missing values, they carry useful information about the structure of trade among countries.

4.2 Traditional proxies for bilateral trade costs

The traditional trade costs variables included in gravity models (distance, shared language, shared colonial history, and shared border) lend themselves perfectly to capture the bias toward more proximate or familiar markets (Sarkissian and Schill, 2004). We source these variables from the Centre d'Études Prospectives et d'Informations Internationales (CEPII) GeoDist distance data set (Mayer and Zignago, 2011). We begin with a bilateral population weighted distance variable. To account for the physical contiguity of countries, we include an indicator variable that equals one if countries share a political border and zero otherwise (*Shared border*). We also control for whether the trading partners share a language (*Shared language*) and whether they have a common colonial history (*Shared colonial history*). There are several variables available in the CEPII distance data set that capture the colonial history of countries. We opt for a non-directional specification. Specifically, *Shared colonial history* is equal to one for countries that were in a colonial relationship at any point in history, and is equal to zero otherwise. We do this to reflect the stylized fact that former colonies are not necessarily only importers, but can also be major exporters of financial services, the US being the most prominent

example.

4.3 Cross-border syndication ties

We measure cross-border syndication ties using deal-level data on offerings of equity securities from Dealogic's Equity Capital Market database between 2000 and 2015. The data set contains 91,511 equity securities offerings, out of which 39,075 (42.7%) are syndicated deals involving more than one underwriter. We follow a methodology similar to that of Caballero et al. (2018) for lending linkages to construct two novel measures of cross-border syndication ties. Caballero et al. (2018) construct a global network of banks, in which relationships are formed when banks extend syndicated loans to each other. They take into account the direction of the linkages, but not the amount lent, because they are interested in these lending flows only as a proxy for information flows. Specifically, they calculate the number of unique pairs of banks linked through syndicated loans extended by banks in the exporting country j to banks in the importing country k between the beginning of their sample period (1990) and year t. The authors then take a logarithmic transformation of the first difference in the number of unique pairs of banks.

In a similar fashion, we construct a global equity underwriter network, in which relationships are formed when underwriters are part of the same equity underwriting syndicate. We rely on equity offerings underwritten between 2000 and year t to construct a global underwriter network for year t. We assign each underwriter to a country using the headquarters of operations of the underwriter's parent, consistent with our geographical assignment of trade flows. We define the stock of syndication ties between countries j and k (S_{jkt}) as the number of unique pairs of equity securities underwriters connected through co-membership in underwriting syndicates between the year 2000 and year t. This is a count measure because we are interested in syndication ties as a proxy for information flows. Following Caballero et al. (2018), we then transform the aggregate number of syndication ties S_{jkt} by taking the natural logarithm of its first difference. This is because the question we ask is whether newly formed ties increase the flow of underwriting services between trading partners. In contrast to Caballero et al. (2018), who construct a directed measure of bank linkages from lenders to borrowers, our syndication ties are undirected and therefore $S_{jkt} = S_{kjt}$. Whereas information naturally flows from borrower (importer) to lender (exporter) in syndicated lending, there is no natural direction in which information flows in underwriting syndicates. Instead, information can flow in any direction among syndicate members.

That being said, the intensity of information flows among different types of syndicate members is unlikely to be constant. We exploit the structure of underwriting syndicates to identify the syndication relationships which are likely to generate the highest information flows. In an underwriting syndicate, the lead underwriter (bookrunner or lead manager) holds primary responsibility for performing due diligence and manages the relationship with the issuer on behalf of non-lead underwriters (co-managers or underwriters). Concurrently, non-lead underwriters, who are primarily tasked with

selling equity securities, can feed back information from institutional investors to lead underwriters to inform the pricing of equity offerings. Information flows within underwriting syndicates are therefore expected to be strongest for underwriter-dyads that involve a lead underwriter. By extension, such linkages are expected to contribute more to overcoming information barriers among exporters and importers than those among non-lead underwriters. We denote syndication ties involving a lead underwriter as "core syndication ties". While information is still expected to flow between the trading partners when the underwriters in both countries are non-lead underwriters, the information content of these syndication ties should be lower. We denote syndication ties where the underwriters in both countries are non-lead underwriters as "peripheral syndication ties". Separating syndication ties into two categories based on the strength of the information flows they generate enables us to provide evidence for the information channel. Core syndication ties, S_{jkt}^{core}, are measured as the sum of unique pairs of underwriters for country-dyad jk connected through syndicate relationships where at least one of these underwriters is the lead underwriter. Peripheral syndication ties, $S_{jkt}^{\text{peripheral}}$, are measured by computing the sum of unique pairs of underwriters for country-dyad jk connected through syndicate relationships where both of the underwriters are in non-lead positions. For both core and peripheral ties, our explanatory variable is the natural logarithm of the number of new connections formed between countries j and k between $t-1$ and t:

$$s_{jkt}^{\text{h}} = ln(1 + (S_{jkt}^{\text{h}} - S_{jkt-1}^{\text{h}})) \text{ where } h=\{\text{core, peripheral}\} \tag{8}$$

We also perform robustness tests using lags of s_{jkt}^{h}. This allows us to relax assumptions about the timeframe at which newly formed syndication ties influence exports in equity underwriting services.

4.4 Proxies for issuing country risk

4.4.1 ICRG Political Risk index

We use the International Country Risk Guide (ICRG) Political Risk index to proxy for country-specific risk. The ICRG index has been widely employed in the literature to proxy for contract enforcement and creditworthiness (see e.g., Berkowitz et al., 2006; Antràs and Foley, 201; Caballero et al., 2018). The index is published by the PRS Group and consists of 12 underlying sub-indices covering the following areas: (1) bureaucracy quality, (2) corruption, (3) democratic accountability, (4) external conflict, (5) ethnic tensions, (6) government stability, (7) internal conflict, (8) investment profile, (9) law and order, (10) military in politics, (11) religious tensions, (12) socioeconomic conditions. Each of these components is reported on a 1-100 scale, where 100 indicates the lowest risk, and 0 indicates the highest risk. A political risk rating of 0.0% to 49.9% indicates a very high risk; 50.0% to 59.9% high risk; 60.0% to 69.9% moderate risk; 70.0% to 79.9% low risk; and 80.0% or more very low risk (PRS Group, 2022). Since we do not have a prior on which of the 12 components of the ICRG index would be the best proxy for the quality of contract enforcement in a given country, we follow Caballero et al. (2018) and use the first principle component as our explanatory variable for measuring the risk of the destination (importing) country. The first principal component explains 49% of the variance and has

an eigenvalue of 5.9. The next component only explains an additional 11% and has an eigenvalue of 1.3. The first principal component loads positively on all the index components with loadings ranging from 0.17 on government stability, to 0.29 on investment profile and 0.34 on military in politics.

4.4.2 Moodys' sovereign credit ratings

Sovereign credit ratings have also been widely used in the literature to proxy for contract enforcement and creditworthiness (see e.g., Caballero et al., 2018). We use the destination country's sovereign credit rating as measured by Moody's as another proxy for country risk.[17] Moody's credit ratings scale ranges from Aaa (highest rating) to C (lowest rating) and comprises 21 notches. We have transformed Moody's ratings into numerical categories, where a lower number indicates a higher credit rating and vice versa (from Aaa=1 to C=21). Ratings are divided into two categories, namely investment grade and speculative grade. Investment grade includes ratings Aaa - Baa3 and speculative grade includes ratings Ba1 - C. 96.1% of cross-border trade flows in equity underwriting services in our sample are with issuers headquartered in countries with an investment grade sovereign credit rating, while less than 4% of cross-border equity underwriting services are delivered to issuers in speculative grade countries. Credit ratings are not available for every year and country in our sample due to the coverage of countries being either initiated or suspended during our sample period. Overall, data on Moody's sovereign credit ratings is available for 86.5% of observations in the data set used for analysis (country-dyads that have at least one non-zero trade flow in the 2000-2015 period).

4.4.3 World Bank Doing Business - Resolving Insolvency

We use the destination country's scores on Resolving Insolvency from the World Bank Doing Business surveys for 2005-2015 (World Bank, 2022).[18] The surveys collect data on the time, cost and outcome of insolvency proceedings involving domestic entities as well as the strength of the legal framework surrounding insolvency. The data are obtained from questionnaire responses by local insolvency practitioners and corroborated through a study of laws and regulations as well as public information on insolvency systems (World Bank, 2022). The surveys contain two measures that assess how well different countries resolve insolvency, namely the strength of insolvency framework index and the recovery rate. In addition, the data set contains an overall resolving insolvency score, which is an equally weighted average of the underlying scores on strength of insolvency framework and recovery rate. The strength of insolvency framework index is based on underlying scores on the commencement of proceedings, management of debtors' assets, reorganization proceedings and creditor participation. The recovery rate is defined as cents on the dollar recovered by secured creditors through reorganization, liquidation or debt enforcement (foreclosure or receivership) proceedings. In our analysis, we use the overall score on resolving insolvency as well as the sub-score for the recovery rate. The scores are measured on a scale from 0 to 100, where 0 represents the lowest and 100 represents the best perfor-

[17] We collected sovereign credit ratings from Moody's website. This data is available free of charge upon subscription and it covers 132 countries for the period 2000-2015.

[18] The World Bank Doing Business surveys are only available from 2005 onwards.

mance. The values of these scores inform how a country's performance compares to other countries. A positive change in these scores across time for a particular country suggests that it is closing the gap with the best performing country over time.[19]

4.5 Miscellaneous variables

4.5.1 Instrumental variable

As explained in Section 3, we instrument newly formed core ties between j and k with newly formed core ties between j and i, where i denotes an importing country with exports from j similar to those of country k. For every exporter - importer pair jk, we select an alternative importer i such that the value of exports from j to k is as closely as possible matched by the value of exports from j to i. Specifically, we use cumulative trade flows for 2000-2015 to choose the most similar alternative importer country i for each exporter-importer pair jk. Newly formed core syndication ties between j and i are then computed as described in Section 4.3.

4.5.2 Financial integration

We use two proxies for measuring financial integration. The first proxy is a measure of the stock of lending ties between the trading partners as in Caballero et al. (2018), constructed using data on interbank syndicated loans (Lending ties$_{jkt}$). The second proxy is a measure of the equity asset holdings of the exporting country (underwriter) in the importing country (issuer) as a percentage of the total overseas equity asset holdings of the exporting country (Equity holdings$_{jkt}$). This proxy is constructed using data from the IMF Coordinated Portfolio Investment Survey (CPIS).

To construct our *Lending ties* variable, we first obtain data on all (146,022) syndicated loans available in the Dealogic Loans Analytics database between January 1, 2000 and December 31, 2015. We then restrict the 'borrower type' to 'private sector bank' and 'public sector bank', leaving us with 8,019 syndicated loans. These loans are primarily underwritten as term loans (39.6% of loan tranches), fixed or floating certificates of deposit (19.9%), credit facilities (18.9%) and revolving credit (8.1%). Unfortunately, Dealogic does not offer a comparable categorisation for 'lender type'. This may result in some of the lenders not necessarily being banks. This is however unlikely to have a material impact on our results, given that despite this caveat, this measure remains a viable proxy for financial integration. Our data set of inter-bank syndicated loans covers 2,750 lenders from 110 countries and 1,647 borrowers from 135 countries. In order to identify lending ties among individual lenders and borrowers, we reshape the data set of syndicated loans such that each lender-borrower interaction is listed in a separate row, leading to a data set of 63,304 bank lending ties. We use data on the nationality of borrowers and lenders provided by Dealogic to link them to countries. We then construct a cumulative global bank network (GBN) for each year between 2000 and 2015 using all lending ties

[19]For example, a score of 75 in Doing Business 2019 means that an economy was 25 percentage points away from the best regulatory performance constructed across all economies and across time. A score of 80 in Doing Business 2020 would indicate that the economy was improving (World Bank, 2022).

between year 2000 and year t. Our proxy for financial integration is the number of bank pairs in countries j and k which are directly connected in the cumulative GBN in year t (AL_{jkt}). Note that the direction of connection matters, given that AL_{jkt} is the number of banks in country j lending to banks in country k. Thus $AL_{jkt} \neq AL_{kjt}$.

We construct our *Equity holdings* variable using data on international equity securities holdings sourced from the Coordinated Portfolio Investment Survey (CPIS) released by the IMF (2022). CPIS reports data on foreign portfolio asset holdings, divided into equity, long-term debt and short-term debt, by residence of the issuer. We use the data on equity holdings, which covers 83 source countries and 214 destination countries. For the available country pairs, we obtain equity holdings held by investors from exporting country j (underwriter) in importing country k (issuer). We then calculate the percentage of the total overseas equity asset holdings of the exporting country invested in each destination country for every year between 2001 and 2015.[20] For example, the 2001 CPIS reports US foreign equity holdings for 114 destination countries. For 14 of these destination countries, it reports zero equity holdings by US investors. For those countries with non-zero US holdings, the percentage of US foreign equity holdings ranges from 0.000063% for Gambia to 21.993651% for the United Kingdom. In contrast, the 2015 CPIS reports foreign equity investments of US investors across as many as 209 countries, 116 of which have non-zero equity holdings ranging between 0.000015% for Burkina Faso and 13.876336% for the Cayman Islands. It is worth noting that CPIS data is subject to several limitations. Its coverage of countries is incomplete given that it requires voluntary participation on the part of the source countries which report their foreign investments. The number of countries covered has expanded over the years, increasing from 67 in 2001 to 81 in 2015. In addition to its limited coverage, CPIS data on foreign equity holdings is subject to additional limitations including under-reporting of assets due to incomplete institutional coverage of the survey, third-party holdings and problems in collection methods (Lane and Milesi-Ferretti, 2008). Despite these limitations, CPIS data on equity holdings offers a viable measure of financial integration at the country-pair level.

4.5.3 Ownership ties

Equity securities underwriters operate networks of subsidiaries across multiple countries. In some cases, an underwriter is a parent of a bank located in the issuer's country. If the issuer has a pre-existing lending relationship with the subsidiary, it may seem natural for a parent to underwrite the issuer's equity offering. To control for this ownership mechanism, we build a proxy for parent-subsidiary networks (Ownership ties$_{jkt}$) using data on the parent-subsidiary ties among underwriters in Dealogic's ECM database. We establish 26,965 parent-subsidiary ties by identifying unique dyads of underwriter parents and subsidiaries involved in the underwriting of equity issues in 2000-2015. We complement these ties with data on the country of headquarters of operations for 6,469 subsidiaries

[20] CPIS data is not currently available for the year 2000.

(88.3%), which we hand-collected from corporate websites, Bureau van Dijk Orbis, Nexis UK and Bloomberg. We discard ties for which we do not have data on the country of headquarters of operations of the subsidiaries, leaving us with 25,229 ties (93.6% of initial total). The Dealogic ECM database, however, continuously updates the parent-subsidiary ties with the most recent ownership data available. This means that while the records on underwriter subsidiaries for each transaction are historically accurate, the corresponding parent companies are overwritten with the current, rather than historical, ownership of said subsidiaries. To allow our connectivity measure to vary over time, we correct for any changes in these subsidiary-parent ties between 2000 and 2015 using records of mergers and acquisitions from Dealogic's M&As database and from Nexis UK. Specifically, we corrected the records of parent companies linked to subsidiaries on an annual basis for 2,256 ties (8.9% of the total). This leads to a data set of time-varying parent-subsidiary ties recorded annually, which features 25,229 ownership ties among 6,469 underwriter subsidiaries controlled by 3,741 parent companies for the 2000-2015 period.

Using this corrected data, we construct a count measure for each country-dyad, which is equal to the number of underwriters that have subsidiaries in both countries. We therefore obtain an undirected measure of underwriter overlaps measured at the level of country-dyads.[21] Our data set contains 800 country-dyads (3.2% of all dyads)[22] that are connected by underwriter overlaps in at least one year of the sample period. The number of overlapping underwriters ranges from 1 to 30 and is time-varying. Finally, we normalize the count variable by dividing it by the sum of ownership ties for each exporter-year (i.e. the number of ties between the exporting country and the rest of the world). We refer to this variable as *ownership ties*.

5 Effect of syndication ties on exports

5.1 Baseline results

Table 1 below reports the results from the estimation of Equations (1) and (2).[23] Column (1) is Equation (1) estimated with PPML, column (2) is Equation (2) estimated with PPML. Column (3) is Equation (1) estimated with OLS, and column (4) is Equation (2) estimated with OLS. The Table reports the number of exporting and importing countries, as well as the proportion of zero trade flows in the sample for the PPML estimations. By construction, OLS drops the zero trade flows and in that

[21] For example, if say JPMorgan (parent) has subsidiaries in both the US and the UK, that counts as one ownership tie, regardless of how many subsidiaries JPMorgan has in each country. If for example JPMorgan, Morgan Stanley and Goldman Sachs have some subsidiaries in the US and the UK, regardless of their number, this would be three ownership ties between the US and the UK. Every parent company counts only once at most.

[22] Given that our specification of ownership ties is undirected, we only count each country-dyad once here.

[23] The coefficients are interpreted as follows. For dummy variables, changing the dummy from zero to one changes predicted exports by $(exp(\beta) - 1) \times 100\%$, where β is the regression coefficient. For variables expressed as natural logarithms, the coefficient β is an elasticity. In other words, a 1% increase in the explanatory variable is associated with a β% change in exports.

sense only takes into account the intensive margin of trade.

Table 1: The contemporaneous effect of core syndication ties

	(1)	(2)	(3)	(4)
$\ln(\textbf{Distance}_{jk})$	-0.540***		-0.506***	
	(0.122)		(0.108)	
$\textbf{Shared language}_{jk}$	0.262		0.433*	
	(0.394)		(0.241)	
$\textbf{Shared border}_{jk}$	0.118		0.778**	
	(0.452)		(0.352)	
$\textbf{Shared colonial history}_{jk}$	1.691***		1.165***	
	(0.265)		(0.134)	
$s_{jkt}^{\textbf{core}}$		0.243***		0.379***
		(0.0315)		(0.0273)
Constant	18.82***	19.12***	14.88***	14.62***
	(0.396)	(0.122)	(0.179)	(0.0269)
Observations	76,766	14,997	6,875	6,039
Exporter-year FE (jt)	Yes	Yes	Yes	Yes
Importer-year FE (kt)	Yes	Yes	Yes	Yes
Pair FE (jk)	No	Yes	No	Yes
Number of exporters	96	67	63	47
Number of importers	108	97	92	72
Prop. of zero trade flows	0.902	0.539	0	0
R^2	0.935	0.986	0.536	0.837

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Standard errors clustered on origin and destination countries.
For PPML regressions the pseudo R^2 is reported, for OLS regressions the adjusted R^2 is reported.

Column (1) reports the PPML estimates from Equation (1). Regarding distance, we find that it is highly significant, but the distance elasticity is modest. A coefficient of -0.540 implies that a 10% increase in bilateral distance translates into a 5.4% decrease in exports of equity underwriting services. It is not surprising to find a small distance elasticity given the non-physical nature of trade in financial services. This is in sharp contrast to the literature on trade in goods where the distance elasticity varies between -0.9 and -1.1 (Head and Mayer, 2014). Our estimates are quantitatively in line with those of Portes and Rey (2005) for equities. Nevertheless, it might appear puzzling that physical distance still matters at all. The consensus in the literature on gravity in international finance is that

distance reflects information frictions. For example, Brei and von Peter (2018) find that the role of distance remains substantial for banking where transport cost is immaterial, pointing to the role of information frictions as a common driver. A shared language does not exhibit any significance. This is in contrast to the fact that language has been found to be an important determinant in services trade (see e.g., Ceglowski, 2006; Kimura and Lee, 2006; Walsh, 2008). A shared border is also insignificant. This result is in contrast to the literature on trade in goods where a shared border is usually highly significant, with an average coefficient of 0.7 (Head and Mayer, 2014). It is not surprising, however, since transportation costs associated with the provision of equity underwriting services are very small and many international financial centers are located in countries that do not share a physical border with each other. Finally, a shared colonial past has a significantly positive impact. A coefficient of 1.691 indicates that being a previous colonial partner increases exports by 442.5%. This coefficient is higher than magnitudes previously found in the goods trade literature (0.75) (Head and Mayer, 2014). The apparent importance of a shared colonial history is intuitive. Countries that have been in a colonial relationship are more likely to share common institutional and legal frameworks, which are paramount for trade in financial services. For reference, column (3) reports the OLS estimates from Equation (1). OLS drops all the zero trade flows, so effectively only looks at the intensive margin of trade. The distance elasticity is almost unaffected, but the effect of a shared colonial past decreases to 220.6%. A shared language now attracts significance at the 10% level and a shared border at the 5% level. Given the importance of zero trade flows in the sample, and the information that these flows carry, we use PPML as our baseline.

Column (2) reports the PPML estimates from Equation (2) with the change in core syndication linkages as the variable of interest. The traditional time-invariant bilateral gravity variables are absorbed by the country-pair fixed effects. Newly formed core syndication ties have a significantly positive impact on exports of equity underwriting services. Specifically, a 1% increase in new core syndication ties increases exports by 0.243%. In other words, doubling the change in the intensity of core ties is associated with a 24.3% increase in exports. For reference, column (4) reports the OLS estimates for the same equation. The effect of doubling the change in the intensity of core ties increases to 37.9%. This suggests that using OLS (and dropping the zero trade flows) would lead to an overestimation of the effect of syndication ties. We therefore use PPML as our baseline.

In Appendix Table A1, we perform a couple of robustness checks for the results in column (2). First, we control for the degree of financial integration between the trading partners. Second, we argue that ownership ties do not drive our results. There are cases where the underwriter is a parent of a bank located in the issuer country. If the issuer is already banking with the subsidiary, it would be natural for the parent to underwrite the issue. Despite its apparent plausibility, we argue that this mechanism is very unlikely to explain our results. In addition, we explicitly control for parent-subsidiary ownership ties and show that our results still hold.

5.2 Exploring persistence

We have so far uncovered a positive contemporaneous correlation between changes in syndication ties between two countries and flows of equity underwriting services between those two countries. In this section, we examine whether the effect of syndication ties is persistent, i.e whether lagged changes in syndication ties are positively correlated with flows of equity underwriting services. Persistence would be suggestive of supply-driven causality. This is because increases in syndication ties are equivalent to increased inflows of equity capital (whether from domestic or foreign investors) which put upward pressure on stock prices, reduces the cost of equity capital, and therefore encourages destination countries' firms to issue equity, a decision that occurs with a lag. A finding of persistence should alleviate concerns of reverse causation. However, it would only be indicative of supply-driven forces because serial correlation in demand shocks could produce a relation between changes in syndication ties (lagged inflows) and current issuances (current equity underwriting services). In the next sections, we will provide more evidence of a supply-driven mechanism by conducting a placebo test, and providing evidence to support that syndication ties mitigate information frictions.

We estimate Equation (2) with several lags of newly formed core syndication ties. The results of PPML estimations are in Table 2. We only report the results for the first two lags as the coefficients on the second and further lags are insignificant. Newly formed core syndication ties display a significantly positive correlation with exports of equity underwriting services at the first lag. In other words, core ties formed between $t-2$ and $t-1$ affect trade at time t. The contemporaneous effect is the largest. A coefficient of 0.0830 on the first lag in column (2) implies that a 1% increase in new core syndication ties increases exports by 0.0830%. In other words, doubling the change in the intensity of core ties between $t-2$ and $t-1$ is associated with a 8.3% increase in exports. In addition, the coefficient on ties formed between $t-1$ and t is only slightly affected by the inclusion of the first lag. The effect on exports of doubling the change in the intensity of core ties between $t-1$ and t decreases from 24.3% to 23% when the first lag is included.

Table 2: The lagged effect of cross-border syndication ties

	(1)	(2)	(3)
$s_{jkt}^{\mathbf{core}}$	0.243***	0.230***	0.234***
	(0.0315)	(0.0326)	(0.0344)
$s_{jkt-1}^{\mathbf{core}}$		0.0830***	0.0848***
		(0.0208)	(0.0210)
$s_{jkt-2}^{\mathbf{core}}$			0.0339
			(0.0227)
Constant	19.12***	18.85***	18.72***
	(0.122)	(0.168)	(0.222)
Observations	14,997	14,150	13,156
Exporter-year FE (jt)	Yes	Yes	Yes
Importer-year FE (kt)	Yes	Yes	Yes
Pair FE (jk)	Yes	Yes	Yes
Number of exporters	67	67	67
Number of importers	97	97	96
Prop. of zero trade flows	0.539	0.533	0.526
Pseudo R^2	0.986	0.986	0.986

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered on origin and destination countries.

5.3 Addressing reverse causality

The main concern with our identification strategy is reverse causality. Reverse causality could drive the results if underwriters operating in export markets anticipate an increase in exports and therefore choose to form syndication ties with underwriters in import markets. Changes in syndication ties could be entirely demand-driven. Demand-side factors are any changes in the importing (issuing) country that affect investment opportunities, such as changes in productivity, technology, or local economic conditions. This is a particular concern since syndicates are groups of underwriters organized for the purpose of bringing an issue of equity securities to the market (which generates the exports) and dissolved thereafter. In other words, our measure of syndication linkages has a direct connection to trade activity.

We test for reverse causality by regressing new core ties (s_{jkt}^{core}) on the logarithm of contemporaneous and lagged exports ($ln(X_{jit})$ and $ln(X_{jit-1})$). The estimation is performed with OLS and a full set of fixed effects.[24] We find that the effect of contemporaneous exports on new core syndication ties is significantly positive while that of lagged exports is insignificant. However, the effect of exports is

[24]The table of results is available upon request.

small in magnitude. A 1% increase in exports increases the change in the intensity of core ties by 0.08%. This means that the elasticity of new core syndication ties with respect to exports is roughly three times smaller than the elasticity of exports with respect to core syndication ties formed between $t-1$ and t. Nevertheless, this indicates that reverse causality is a priori a valid concern. Therefore, to provide empirical evidence that reverse causality cannot explain all our results, we conduct two additional tests. First, we conduct a kind of placebo test which relies on the intensity of information production associated with different syndication ties. Second, we use the IV strategy described earlier.

5.3.1 Information content of syndication ties

We test whether new syndication linkages formed by non-lead underwriters in the exporting and importing countries ($s_{jkt}^{\text{peripheral}}$) affect exports less strongly than syndication ties where the underwriter in either the importing or exporting country is the lead underwriter (s_{jkt}^{core}). We expect new syndication ties between non-lead underwriters to be associated with a lower information content because information acquisition is mainly conducted by lead underwriters. Hence, we should find a smaller effect on exports. This analysis serves as a placebo test: if our benchmark result was purely driven by spurious correlation between syndication ties and exports of equity underwriting services, it would be as likely to show up in the coefficient on the most informative and the least informative syndication ties. In addition, the test provides the first piece of evidence in support of our hypothesis that underwriting syndicates promote exports through information production.

Table 3 presents the PPML results. Column (1) is our baseline from column (2) in Table 1. Column (2) is the estimation of Equation (2) with $s_{jkt}^{\text{peripheral}}$ as the explanatory variable instead of s_{jkt}^{core}. Finally, column (3) presents the results from the estimation of Equation (4) with both explanatory variables. The results are in line with our hypothesis and the channel we propose. In column (2), a 1% increase in new peripheral syndication ties increases exports by 0.0778%. In other words, doubling the change in the intensity of peripheral ties is associated with a 7.8% increase in exports. This effect is roughly three times smaller than that of new core syndication ties in column (1). When controlling for both syndication measures in column (3), the effect of doubling the change in the intensity of core ties is stable (at 23.2%), whereas that of peripheral ties falls dramatically to 3.3%. In this case, the effect of a 1% increase in new core syndication ties on exports is roughly seven times larger than the effect of new peripheral ties.

Table 3: Placebo test

	(1)	(2)	(3)
$s_{jkt}^{\textbf{core}}$	0.243***		0.232***
	(0.0315)		(0.0327)
$s_{jkt}^{\textbf{peripheral}}$		0.0778***	0.0330**
		(0.0164)	(0.0160)
Constant	19.12***	19.74***	19.03***
	(0.122)	(0.0665)	(0.126)
Observations	14,997	14,997	14,997
Exporter-year FE (jt)	Yes	Yes	Yes
Importer-year FE (kt)	Yes	Yes	Yes
Pair FE (jk)	Yes	Yes	Yes
Number of exporters	67	67	67
Number of importers	97	97	97
Prop. of zero trade flows	0.539	0.539	0.539
Pseudo R^2	0.986	0.985	0.986

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered on origin and destination countries.

5.3.2 Instrumental variables estimation

The results of our instrumental variables estimation are presented in Table 4. Column (1) reports the results of the first-stage estimation (Equation (5)), while column (2) shows the second-stage estimation (Equation (6)). The first stage is strong with an F-statistic of 13.54. The coefficient on s_{jit}^{core} is negative and significant at the 1% level - indicating that new core syndication ties between j and i are negatively correlated with those between j and k. The second-stage results provide further support for our baseline finding. We find that a 1% increase in new core syndication ties increases exports by 0.221%. In other words, doubling the change in the intensity of core ties is associated with a 22.1% increase in exports. While we cannot fully rule out endogeneity concerns, our tests taken together place limits on the extent to which reverse causality might be driving our results.

Table 4: IV estimation

	First stage	Second stage
$s_{jit}^{\mathbf{core}}$	-0.0696***	
	(0.0189)	
$s_{jkt}^{\mathbf{core}}$		0.221***
		(0.0656)
Response residual		0.0500
		(0.0642)
Constant	0.0615***	18.00***
	(0.0155)	(0.156)
Observations	14,068	9,029
Exporter-year FE (jt)	Yes	Yes
Importer-year FE (kt)	Yes	Yes
Pair FE (jk)	Yes	Yes
Number of exporters	72	52
Number of importers	72	66
Prop. of zero trade flows	0.642	0.446
Pseudo R^2	0.341	0.965

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered on origin and destination countries.

5.4 Assessing the information mechanism

In this section, we test whether the mechanism through which syndication linkages affect exports is related to information frictions. Using two different approaches, we find evidence supporting this hypothesis. First, we demonstrate that the effect of syndication linkages is larger in magnitude when the issuing country is riskier. To do so, we first separate countries into OECD and non-OECD as a rough measure of contract enforcement and estimate Equation (2) for the four possible country-pair types. We then estimate Equation (7) using several proxies for destination country risk described in Section 4.4. Second, we show that the effect of syndication linkages is larger for exports that relate to initial public offerings (IPOs) as opposed to other transactions (follow-on offerings and convertible debt) - the former being more information sensitive.

5.4.1 Do syndication ties matter more when the issuing country is riskier?

First, we follow the simple approach of splitting importers and exporters into groups by OECD membership, where the latter serves as a proxy for contract enforcement or more generally rule of law (Hall and Jones, 1999; Rodrik et al., 2004). While this is a crude proxy for destination country

risk, OECD membership has the advantage of being completely predetermined and unaffected by subsequent changes in syndication ties or trade. It is therefore often used as a proxy for contract enforcement (e.g. Caballero et al., 2018). The results are presented in Table 5. We find that new core syndication ties are more important when the exporter is an OECD member and the importer is not (column (2)) than when both countries are OECD members (column (1)). The effect of doubling the change in the intensity of core ties is 5.6 percentage points larger when the destination country is not an OECD member. The results of column (3) have to be taken with extreme caution because the standard error is very wide due to the low number of observations. Indeed, there are very few transactions where the exporting country is not an OECD member, but the destination country is. Column (4), where neither country is an OECD member, also suffers from a lower number of observations but the coefficient is significant, but lower than in columns (1) and (2). These results are intuitive. Underwriters put their reputation and money at stake when they underwrite equity offerings. This means that we would expect the *difference* in contract enforcement, or more generally risk, between the exporting and importing countries to affect the value of syndication ties in mitigating this risk. Crucially, syndication ties are most needed when the importing country is riskier than the exporting country, but not necessarily vice versa or when both countries have a similar risk profile.

Table 5: OECD membership

	(1)	**(2)**	**(3)**	**(4)**
OECD membership	Both	Only origin	Only destination	Neither
$s_{jkt}^{\textbf{core}}$	0.228***	0.284***	0.258	0.165***
	(0.0290)	(0.0615)	(0.246)	(0.0415)
Constant	19.46***	17.48***	15.87***	19.10***
	(0.121)	(0.105)	(0.260)	(0.160)
Observations	6,020	4,114	909	1,929
Exporter-year FE (jt)	Yes	Yes	Yes	Yes
Importer-year FE (kt)	Yes	Yes	Yes	Yes
Pair FE (jk)	Yes	Yes	Yes	Yes
Number of exporters	29	24	18	31
Number of importers	32	59	20	38
Prop. of zero trade flows	0.44	0.511	0.592	0.484
Pseudo R^2	0.989	0.958	0.947	0.995

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered on origin and destination countries.

Second, we estimate Equation (7) using several proxies for destination country risk described in Section 4.4. The results are in Table 6. The results of column (1) suggest that a 1% increase in new core syndication ties increases exports by 14.2% more when the destination country is at the 25th percentile of the ICGR index distribution as opposed to the 75th percentile. Since a higher value of the index

indicates lower destination country risk, this means that new core syndication ties matter more when the destination country is riskier.[25] The results of column (2) suggest that a 1% increase in new core syndication ties increases exports by 18.3% more when the destination country is at the 75th percentile of the Moody's credit rating distribution as opposed to the 25th percentile. Since a higher value of the rating indicates higher destination country risk, this means that new core syndication ties matter more when the destination country is riskier. The results of column (3) suggest that a 1% increase in new core syndication ties increases exports by 24.6% more when the destination country is at the 25th percentile of the distribution of scores on Resolving Insolvency as opposed to the 75th percentile. Since a higher value of the score indicates lower destination country risk, this means that new core syndication ties matter more when the destination country is riskier. Finally, the results of column (4) suggest that a 1% increase in new core syndication ties increases exports by 14.2% more when the destination country is at the 25th percentile of the distribution of scores on the recovery rate as opposed to the 75th percentile. Since a higher value of the score indicates lower destination country risk, this means that new core syndication ties matter more when the destination country is riskier.

[25]The differential impact of the explanatory variable s_{jkt}^{core} on exports for a country with Risk_{kt} at the 25th percentile of the distribution (Risk_{kt}^{25}) and a country with Risk_{kt} at the 75th percentile of the distribution (Risk_{kt}^{75}) is given by $exp(\beta_1)\left(exp(\beta_2 \times \text{Risk}_{kt}^{25}) – exp(\beta_2 \times \text{Risk}_{kt}^{75})\right) \times 100\%$, where β_1 is the coefficient on s_{jkt}^{core} and β_2 is the coefficient on $s_{jkt}^{\text{core}} \times \text{Risk}_{kt}$.

Table 6: Syndication ties and destination country risk

	(1)	(2)	(3)	(4)
$s_{jkt}^{\mathbf{core}}$	0.331***	0.204***	0.634***	0.440***
	(0.0549)	(0.0396)	(0.118)	(0.0932)
$s_{jkt}^{\mathbf{core}} \times$ **ICRG index**$_{kt}$	-0.0354**			
	(0.0157)			
$s_{jkt}^{\mathbf{core}} \times$ **Credit rating**$_{kt}$		0.0148**		
		(0.00582)		
$s_{jkt}^{\mathbf{core}} \times$ **Insolvency score**$_{kt}$			-0.00529***	
			(0.00156)	
$s_{jkt}^{\mathbf{core}} \times$ **Recovery score**$_{kt}$				-0.00246**
				(0.00112)
Constant	19.15***	19.23***	18.38***	18.33***
	(0.120)	(0.135)	(0.124)	(0.118)
Observations	14,572	13,687	9,545	9,545
Exporter-year FE (jt)	Yes	Yes	Yes	Yes
Importer-year FE (kt)	Yes	Yes	Yes	Yes
Pair FE (jk)	Yes	Yes	Yes	Yes
Number of exporters	67	66	64	64
Number of importers	88	84	93	93
Prop. of zero trade flows	0.539	0.538	0.508	0.508
Pseudo R^2	0.986	0.987	0.975	0.975

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered on origin and destination countries.

5.4.2 Do syndication ties matter more for more information sensitive services?

Finally, we show that the effect of new core ties is larger for exports that relate to IPOs rather than other issuance activities (follow-on offerings and convertible debt) - the former being more information sensitive. We estimate Equation (2) for four samples, namely all transactions, IPOs, follow-on offerings (FOs) and convertible debt, and FOs only. The results are in Table 7. Column (1) is our baseline for all types of transactions from column (2) in Table 1. The coefficient in column (2) suggests that doubling the change in the intensity of core ties is associated with a 28% increase in exports of equity underwriting services related to IPOs. This effect is 3.7pp larger than the effect for all transactions in column (1), 6.5pp larger than the effect for FOs and convertible debt together (column (3)), and 5pp larger than the effect for FOs only (column (4)).

Table 7: IPOs versus FOs and convertible debt issuance

	(1) All	(2) IPOs	(3) FOs and convertibles	(4) FOs
$s_{jkt}^{\mathbf{core}}$	0.243***	0.280***	0.215***	0.230***
	(0.0315)	(0.0373)	(0.0294)	(0.0333)
Constant	19.12***	18.10***	18.87***	18.60***
	(0.122)	(0.150)	(0.112)	(0.124)
Observations	14,997	9,824	11,678	11,185
Exporter-year FE (jt)	Yes	Yes	Yes	Yes
Importer-year FE (kt)	Yes	Yes	Yes	Yes
Pair FE (jk)	Yes	Yes	Yes	Yes
Number of exporters	67	58	54	54
Number of importers	97	87	83	82
Prop. of zero trade flows	0.539	0.419	0.458	0.443
Pseudo R^2	0.986	0.981	0.981	0.979

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered on origin and destination countries.

All the above results are consistent with the mechanism we propose: syndication linkages contribute to trade growth by mitigating risk through information acquisition. While they do not prove that the effect of syndication ties on trade is causal, one would be hard pressed to find an alternative story that would be consistent with all the evidence presented.

6 Conclusions

We shed light on the relationship between cross-border syndication ties and trade in equity underwriting services using theory-consistent gravity equations. The interest in gravity in international finance is not new, but theory-consistent gravity estimations for trade in financial services are extremely rare. This scarcity is undoubtedly related to the limitations of current data on financial services. Our first contribution is therefore to construct a novel panel data set on revenue earned on domestic and cross-border equity securities underwriting transactions using the Dealogic Equity Capital Market database. Our data set covers 91,511 deals across 122 countries of origin and 145 countries of destination for the period 2000-2015. We argue that our data set has several advantages over other data sets based on balance of payments statistics. Most importantly, having access to transaction-level data enables us to build novel measures of core and peripheral syndication ties based on underwriters' co-membership of, and role in, underwriting syndicates. In the empirical implementation of our model, we account properly for multilateral resistance with country-time fixed effects, country-pair fixed effects, and apply state-of-the-art econometric methods (PPML). We find that newly formed core syndication ties are associated with a statistically and economically significant increase in exports of equity underwriting

services.

We argue that international syndication ties mitigate information frictions, which the literature argues are a major impediment to trade in financial services. We support this conjecture with several pieces of evidence. First, we show that newly formed peripheral syndication ties have a smaller positive effect on exports than core syndication ties. Peripheral syndication ties are associated with lower information flows between trading partners. The results therefore support the conjecture that syndicates have an impact on trade through the mitigation of information frictions. Second, we demonstrate that new core syndication ties have a stronger effect on exports of equity underwriting services when information frictions between the trading partners are more severe. We do this in two ways. First, we exploit cross-sectional variation in the riskiness of the issuing countries. The main information frictions affecting trade in equity underwriting services relate to the barriers that investors face in accessing and interpreting price relevant information about foreign issuers. This problem is more acute when the issuing country is perceived as riskier. We find that new core syndication ties have a stronger effect on exports of equity underwriting services when the issuing country is riskier. Second, we exploit cross-sectional variation in the information sensitivity of transactions. Exports of underwriting services emanating from primary equity issuance activity (IPOs) are likely to be more information sensitive than exports emanating from other transactions (follow-on offerings and convertible debt). Accordingly, we find that the effect of new core syndication ties is higher for IPOs.

Reverse causality is a priori a concern for the causal interpretation of our results. However, we provide several pieces of analysis that place limits on the extent to which reverse causality might be driving our findings. These include evidence for the fact that core syndication ties matter more than peripheral ones due to their higher information production, and IV estimation results that bolster our baseline findings. While we cannot fully rule out endogeneity concerns, our paper provides strong evidence for the effect that new syndication ties have on exports of equity underwriting services through the mitigation of information frictions.

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Appendix

A Countries included in the sample

The countries included in the sample are Algeria, Argentina, Armenia, Australia, Austria, Bahamas, Bahrain, Bangladesh, Barbados, Belgium, Bermuda, Bosnia and Herzegovina, Botswana, Brazil, British Virgin Islands, Bulgaria, Cambodia, Canada, Cayman Islands, Central African Republic, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, Estonia, Faeroe Islands, Fiji, Finland, France, Georgia, Germany, Ghana, Greece, Hong Kong, China, Hungary, Iceland, India, Indonesia, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, South Korea, Kuwait, Lao PDR, Latvia, Lebanon, Lithuania, Luxembourg, Macao SAR, China, Macedonia, Madagascar, Malawi, Malaysia, Mauritius, Mexico, Mongolia, Morocco, Myanmar, Namibia, Netherlands, New Zealand, Nigeria, Northern Mariana Islands, Norway, Oman, Pakistan, Papua New Guinea, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Reunion, Romania, Russian Federation, Rwanda, Saudi Arabia, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, St. Kitts and Nevis, Sweden, Switzerland, Syrian Arab Republic, Taiwan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Vietnam, Zambia, and Zimbabwe.

B Robustness tests

We perform a couple of robustness checks for the results in column (2) of Table 1 . First, we control for the degree of financial integration between the trading partners. While syndication ties are themselves a key feature of global financial market integration, the existing degree of integration might matter for trade in financial services beyond the formation of new ties. [26] We augment Equation (2) with a proxy for financial integration, using two different proxies in turn. The first proxy is a measure of the equity asset holdings of the exporting country (underwriter) in the importing country (issuer) as a percentage of the total overseas equity asset holdings of the exporting country (Equity holdings$_{jkt}$). This proxy is constructed using data from the IMF Coordinated Portfolio Investment Survey (CPIS). The second proxy is a measure of the stock of lending ties between the trading partners as in Caballero et al. (2018) (Lending ties$_{jkt}$). These proxies are described in section 4.5. The results are in columns (1) and (2) of Table A1. In both cases, the coefficient on newly formed core syndication ties is robust to the inclusion of financial integration. The latter attracts a non-significant coefficient independent of the proxy we use.

[26] In the context of lending markets, financial integration has been shown to increase lending to commercial borrowers (see e.g. Berger et al., 2021).

Table A1: Robustness checks for Table 1

	(1)	(2)	(3)
$s_{jkt}^{\mathbf{core}}$	0.282***	0.233***	0.245***
	(0.0262)	(0.0412)	(0.0322)
Equity holdings$_{jkt}$	-0.000326		
	(0.00289)		
Lending ties$_{jkt}$		-0.000138	
		(0.000770)	
Ownership ties$_{jkt}$			-0.00764
			(0.00776)
Constant	17.79***	19.21***	19.14***
	(0.0636)	(0.298)	(0.113)
Observations	9,758	11,156	14,997
Exporter-year FE (jt)	Yes	Yes	Yes
Importer-year FE (kt)	Yes	Yes	Yes
Pair FE (jk)	Yes	Yes	Yes
Number of exporters	47	67	67
Number of importers	60	96	97
Prop. of zero trade flows	0.492	0.509	0.539
Pseudo R^2	0.962	0.986	0.986

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered on origin and destination countries.

Next, we turn to the issue of ownership ties. In some cases, an underwriter is a parent of a bank located in the issuer's country. If the issuer has a pre-existing lending relationship with the subsidiary, it may seem natural for a parent to underwrite the issuer's equity offering. This could mean that patterns of international trade in equity underwriting services might be driven by pre-existing lending relationships. Despite its apparent plausibility, this mechanism is very unlikely to be the only channel, or even the most important channel, explaining the underlying choice processes of issuers and underwriters, which ultimately translate into patterns of international trade. We can tell from our data set if the underwriter parent owns a subsidiary in the issuer's country. Underwriter parents own a subsidiary that is located in the same country as the issuer client for 45.7% of cross-border equity underwriting trade flows (42.4% when value weighted). Our data set, however, does not include information on pre-existing lending ties. Therefore, we cannot tell what fraction of underwriters had a pre-existing lending relationship with the issuers for whom they have underwritten an equity offering. We therefore reviewed the literature on the link between pre-existing lending relationships and the

choice of equity securities underwriters in order to assess the relevance of this channel for our analysis.

The literature finds that pre-existing lending relationships with issuers can give underwriters a small advantage in winning equity underwriting mandates. Bharath et al. (2007) find that "A bank that had been a lender in the past had a three-times higher probability of winning the future IPO underwriting business (increasing from 0.48% to 1.81%)" (p.411). This is, however, not the case for secondary equity offerings (SEOs). In this case, past lending relationships do not provide any additional benefit over and above what a prior underwriting relationship provides (Bharath et al., 2007). In addition, Ljungqvist et al. (2006) find that on average only 2.4% of loans were provided to issuers by their equity underwriters in the five years prior to their equity offering. The literature finds that prior underwriting relationships matter more than prior lending relationships. Indeed, a prior underwriting relationship between an underwriter and an issuer is one of the key factors influencing the odds of selecting a particular underwriter (Ljungqvist et al., 2006; Bharath et al., 2007). Crucially, underwriters that do not win a lead management mandate to underwrite an equity offering for an issuer can still participate in the issue by winning a co-management appointment in the underwriting syndicate. These appointments allow them to develop new underwriting relationships with issuers and win more lucrative lead management appointments in the future (Ljungqvist et al., 2009). Consequently, participation in underwriting syndicates creates a virtuous cycle whereby underwriters develop relationships not only with other underwriters, but also issuers, which ultimately gives underwriters better access to deals. In conclusion, despite some evidence that pre-existing lending ties can help underwriters win new business, in particular in IPOs, their economic significance is modest in comparison to prior underwriting ties with issuers (Ljungqvist et al., 2006; Bharath et al., 2007) and access to deal flow through underwriting syndicates (Lljungqvist et al., 2009).

The literature points to a very limited role for pre-existing lending relationships. We nevertheless perform a robustness check where we augment Equation (2) with a proxy for parent-subsidiary networks (Ownership ties$_{jkt}$). The construction of this variable is described in section 4.5. While this is not a direct measure of past lending relationships, it captures ownership ties between the parent underwriter and subsidiaries located in the country of the issuer. If past lending relationships are the main channel driving the results, the effect should show up in the coefficient on ownership ties. The results are in column (3) of Table A1. The coefficient on Ownership ties$_{jkt}$ is insignificant.