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The globalization of corporate control☆

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ABSTRACT

The internationalization of corporate control is a complex and poorly understood aspect of globalization, as it is challenging to trace controlling shareholders due to often opaque structures of ownership. We identify controlling shareholders for 22,000 listed firms to study the globalization of control. The network of international control appears very sparse, with strong home bias. A baseline gravity structure works well, as bilateral links are more potent for populous, affluent, and proximate countries. Institutions and tax haven status at source and destination play a modest role. Legal similarities, economic policy coordination, and cultural, linguistic, and historical ties play a non-negligible role telling of asset market and informational frictions; policy and legal similarities matter for financial institutions and banks, while informational/cultural barriers for individuals/families. International diversification motives play no major role. The results have implications for theoretical works on the internationalization of corporate control markets.

1. Introduction

Much ink has been spilled studying the origins and implications of the expansion of trade, outsourcing, international banking, foreign direct and portfolio investment. There is, however, little work on the integration of the markets for corporate control. This may not be surprising, as mapping the global network of corporate control is challenging, even for publicly-traded companies under regulatory-supervisory scrutiny. Ownership structures of large listed companies are often esoteric; there are pyramid arrangements and equity cross-holdings between parents, subsidiaries, and holding companies. In addition, controlling ownership often goes through special investment vehicles in tax-havens, whose role is central in the international financial system (Zucman (2015)). The recent leaks on wealth held offshore brought these issues into the spotlight. The sanctions imposed on Russian high-net-worth individuals and corporates have further revealed the challenges of identifying controlling rights, even in large, eponymous companies. Here, we advance on the measurement of control of listed companies worldwide tracing ultimate controlling entities from pyramidal structures — often hidden behind shells. We provide mappings of the internationalization of

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corporate control, taking into account indirect links in 2019, just before the pandemic, and in 2012, after the global financial crisis. Our sample covers about 22,000 listed firms, both with a controlling shareholder (voting rights over 20%) and widely-held, in 81 countries. Shareholder entities come from 158 countries. We distinguish between three types of (controlling) shareholders: domestic, foreign, and in tax-haven jurisdictions.

Stylized Facts We commence the analysis presenting stylized facts to shed light on some core questions in international finance. First, home bias is considerable, as individuals, families, banks, governments, financial institutions, private, and public firms own and control about 75% of domestic market capitalization, with foreign shareholders holding the remaining 25%. Home bias in corporate control is, therefore, larger than in global portfolio equity (and bond) markets that hovers around 60% (Coeurdacier and Rey (2013)). The share of market capitalization controlled by foreign entities is tiny for some large advanced economies, like the United States. But, it is around 50% or higher for some emerging markets, mainly in Eastern Europe and Asia. Cross-border ownership and control appear, on average, larger (and home bias smaller) in smaller economies; entities from smaller economies hold a higher share of (controlling) equity stakes abroad. Second, we zoom into the role of offshore jurisdictions, as there is huge interest from policymakers and the public in their functions. On average, the use of holding companies and special investment/purpose vehicles in offshore jurisdictions is modest; tax haven entities appear in one out of seven controlled firms. But there is considerable variation. Shareholders in offshore centers hold controlling rights in more than a fourth of the market capitalization in many Eastern and Southern European countries. Besides, in some countries, a non-negligible portion of the market capitalization of controlled firms is by domestic shareholders, using intermediates in tax-haven jurisdictions. Third, studying bilateral positions reveals a very sparse network with few controlling links even when we zoom in on advanced economies.

Gravity Building on studies on other forms of financial integration, we estimate gravity specifications to characterize the heterogeneity of international ownership and control. First, links are stronger for proximate dyads, more populous, richer, and with larger equity markets countries, suggesting that gravity forces are first-order in control markets (as in Head and Ries (2008)' theoretical exploration). Tax haven status and institutions at destination and source explain a small to modest part of international control. Capital and labor taxes are weakly correlated with control and ownership, possibly because investors, controlling and passive, can bypass them or exploit loopholes and exemptions. Neither education nor trust correlates with international corporate control. Second, adding source and destination fixed effects to absorb all country features relevant to the globalization of control, we zoom into bilateral features. Building on theoretical and empirical research on home-bias (Coeurdacier and Rey (2013) and Pellegrino et al. (2021)), we distinguish between diversification motives related to economic similarities, frictions in asset markets related to legal system dissimilarities and limited policy coordination, and informational barriers, driven by deep historical and cultural factors. International controlling equity links are not much related to diversification. Controlling equity stakes are larger between countries with similar legal systems, policy coordination, and euro area members, suggesting that frictions in control markets (double taxation, common standards, legal convergence) play a non-negligible role. These features play a bigger role for banks and other financial institutions, telling of the role of regulatory-legal harmonization in cross-border capital market integration (Barth and Levine (2016); Kalemli-Ozcan et al. (2010)). Historical ties and cultural similarities are strong correlates, especially for individuals and families, telling of informational frictions and potentially behavioral biases of international corporate control markets.

1.1. Related literature

Our paper mainly contributes to research on the determinants of various aspects of globalization and the role of asset market, informational, and cultural barriers preventing the efficient allocation of capital across the world. Rather than looking at foreign direct investment (FDI), international banking, portfolio equity and debt flows (Portes and Rey (2005); Aviat and Coeurdacier (2007); Alfaro et al. (2008, 2020); Lane and Milesi-Ferretti (2008)), we look at the internationalization of control of listed corporations that, given data challenges, has not been much studied. As our data incorporate indirect investment, often via special purpose vehicles (SPVs) and holding companies in off-shore centers, it deals with a major shortcoming of most international asset and liabilities datasets (IMF International Financial Statistics, US Treasury International Capital System) that, following the *residence principle*, miss indirect exposure. While international institutions, policy-makers, and researchers have acknowledged this limitation, there has been little progress in capturing indirect exposure. In this regard, our paper relates to the parallel works of Coppola et al. (2021) and Damgaard et al. (2019) on equity issuance via SPVs and FDI, respectively. Damgaard et al. (2019) combine FDI data from various sources to approximate real and "phantom" FDI, often channeled via countries with tailored to multinationals tax systems. Coppola et al. (2021) match tax-haven-incorporated subsidiaries to their parents (country) with a mutual fund and exchange-traded-fund dataset on global holdings to restate bilateral passive equity positions to reflect actual, direct, and indirect linkages. We take a panoramic view and examine the role of many source and destination features related to size, taxation and institutional quality, and bilateral features, aiming to provide a set of patterns to guide theory. In line with the setting in Head and Ries (2008), which however, focuses on control by multinationals, informational frictions play a chief role on cross-border control. And so do legal system features that attenuate agency frictions in line with the setting of Shleifer and Wolfenzon (2002). Besides, historical and cultural ties matter, suggesting the need of theoretical explorations on cross-border control to delve into deep barriers to global capital allocation leading to segmented asset markets, as Pellegrino et al. (2021) do in parallel work.

Second, our evidence that a non-negligible portion of control of listed companies gets through offshore financial centers contributes to the fast-growing research agenda documenting and describing their role in the global economic system (Hines and

Rice (1994); Zucman (2015); Tørsløv et al. (2022)); enabling multinationals to shift earnings across jurisdictions, allowing the ultra-wealthy to hide assets (Alstadsæter et al. (2018)), and obscure criminal activity. We add to this genre that offshore centers are chief conduits in the internationalization of corporate control. As the data come from *publicly available* sources, our study highlights their tax and convenience benefits that theoretical work on the global network of financial globalization needs to consider.

Third, our paper adds to research in corporate finance that links corporate control across countries to differences in investor protection, legal origin, culture, financial, and economic development (Faccio and Lang (2002); Laeven and Levine (2008)). Our key contribution is zooming in on the internationalization of corporate control, which except for De La Cruz et al. (2019) has not been much studied. Works in corporate finance have examined the role of taxes, legal system efficiency, and trust in cross-border mergers and acquisitions (Rossi and Volpin (2004); di Giovanni (2005); Erel et al. (2012).

Structure Section 2 presents the ownership data of listed companies, summarizes our methodology to identify ultimate controlling shareholders, and discusses the aggregation of the firm information across countries and country-pairs. Section 3 gives some stylized facts of the internationalization of corporate ownership and control. Section 4 reports gravity specifications, zooming into the roles of source and destination countries' size, taxation, and institutions, alongside country-pair features, related to diversification, international policy coordination, legal system similarities, cultural and historical ties. In Section 5 we summarize and discuss avenues for future research.

2. Data and methodology

In this section, we first present the firm-level ownership data of public corporations. Second, we discuss our methodology to identify ultimate controlling shareholders. Third, we discuss the aggregation of the firm-level information into country and country-pair structures.

2.1. Ownership

Our corporate ownership and control data builds on and extends the work in Aminadav and Papaioannou (2020), who extend and update Bureau van Dijk's (BvD) ORBIS dataset for public companies in 2004–2012 to re-examine the link between corporate control and legal origin for the largest sample of publicly traded firms. We trace ultimate control for almost the universe of listed companies in 2012 when ORBIS coverage improves and in 2019, just before the pandemic. We retain firms appearing in both years to ensure comparability (though the results are similar in the unbalanced sample). We start with a sample of 23,776 firms listed in 114 jurisdictions with market capitalization data. For meaningful country-level statistics, we drop: (i) Jurisdictions with 10 or fewer public companies, losing 104 companies from 32 small jurisdictions; (ii) listed firms with a market capitalization below 1 million USD.

Our final sample consists of 21,709 listed firms in 81 jurisdictions, representing 95% of global GDP in 2019. According to World Bank statistics, the firms account for 77% of global market capitalization in 2019 and 66% in 2012. Shareholders come from 158 jurisdictions. We have information on the nationality for about 70%, accounting for the overwhelming majority of the market value of equity (94%). Regarding ultimate controlling shareholders, we have nationality information for 88%, accounting for 96% of the market capitalization of controlled firms; controlling shareholders come from 110 jurisdictions. The combined market capitalization is 35,888 and 60,801 billion USD in 2012 and 2019, respectively. Our data capture equity holdings for roughly half, 17,283 billion in 2012 and 26,504 bn in 2019.

2.2. Corporate control

It is challenging to identify controlling shareholders from the obscure, pyramidal, and esoteric firm ownership structures. We provide a summary of the procedure to trace ultimate controlling shareholders, in line with Aminadav and Papaioannou (2020), Unal (2022), and Aminadav et al. (2022). We start with the ORBIS database, which collects ownership information from roughly half of the equity stakes in listed companies. We look in 2012 and 2019, as coverage improves after the global financial crisis of 2008–2010. We correct inconsistencies, omissions, and errors. ORBIS data have gaps on shareholders for many private firms holding large equity stakes in listed companies, which prevents tracing control. We manually check and add information for listed firms with incomplete coverage, using regulatory filings, reports, financial press, media leaks on offshore wealth, and country-specific data providers. For 2004–2012, Aminadav and Papaioannou (2020) and Aminadav et al. (2022) gathered information for 14,859 firms. For 2019, we obtained information for 5003 private firms that hold controlling stakes in listed corporations.

We apply a 20% voting rights cutoff to identify controlled, as opposed to widely held companies, as La Porta et al. (1999). As in Aminadav and Papaioannou (2020), but in contrast to earlier studies, we aggregate the voting rights of all firms that an individual (family or entity) uses to exercise control and aggregate the voting rights of all family members. Fig. 1 shows the share of controlled and widely-held firms in 2012 and 2019.

2.3. International corporate ownership and control

We aggregate the firm-level data two ways. First, we compile corporate ownership and control statistics of listed companies, taking the country viewpoints of source (nationality of shareholding entity) and destination (nationality of listed firm). Second,

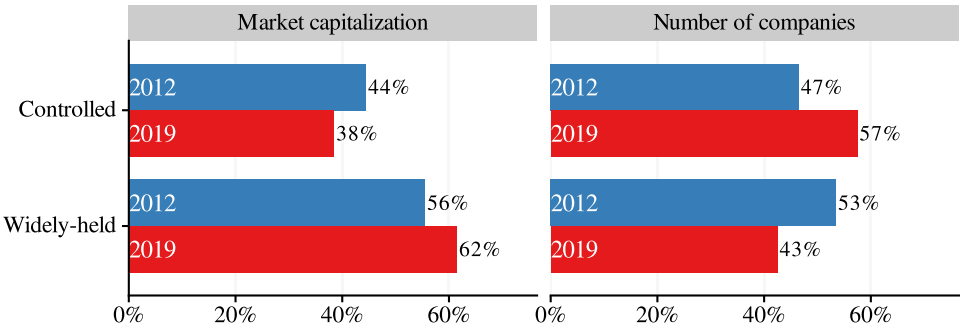

Fig. 1. Share of controlled and widely-held listed firms in 2012 and 2019. The sample covers 21,709 listed firms in 81 jurisdictions in both 2012 and 2019.

we compile bilateral integration statistics. For ownership, we focus on the value (in USD) of the stakes in listed firms in destination, *d*, held by entities from source, *s*, multiplying the market capitalization of the listed firm by the percentage of the equity held by various shareholders. We calculate equity positions across controlled and widely-held listed companies. For control, we focus on the total market capitalization of listed firms in destination country controlled by entities from source.

We distinguish between three nationality types for shareholders (in controlled and widely-held firms) and *ultimate* controlling entities (in controlled firms): (a) domestic, (b) foreign, and (c) tax-haven (foreign), using the classification in Tørsløv et al. (2022).[1] Thus, there are nine nationality types for the control chain, i.e., the nationality of the ultimate owner and the immediate shareholding entity. Three caveats apply. First, the tax haven classification misses control and ownership of regional subdivisions that offer convenience and tax incentives, as is the case of the state of Delaware in the United States. Second, there are some contentious countries, such as, for example, the United Kingdom and the Netherlands. Third, as we trace the nationality of ultimate controlling shareholders and of the immediate shareholder, but not other firms in the control chain, the tax-haven estimates are lower bounds on their role.

3. Stylized facts

We commence the analysis presenting some stylized facts on the internationalization of control that emerge from the newly-compiled statistics. We zoom into three aspects. First, we explore patterns of foreign control of listed companies, connecting them to the voluminous literature on home bias in international finance (Coeurdacier and Rey (2013); Lewis (1999)). Second, we portray the role of financial off-shore centers as conduits of international corporate control. Third, we graph the network of international (controlling) ownership links.

Fact 1. Sizable but Heterogeneous Home Bias in Corporate Control

Global Average Fig. 2 shows the proportion of controlled firms whose ultimate owner is a domestic, foreign, or tax haven entity. There is an evident home bias. Domestic entities control around three out of four listed firms. Within the 25% of control exercised by non-domestic entities, roughly three-fourths are foreign, and one-fourth in tax haven jurisdictions. There is a similar 75%–25% split between domestic and foreign ownership. However, there is a higher prevalence of tax haven entities for ownership than for control, suggesting that entities in tax havens often act as vehicles for ultimate owners in other jurisdictions. Home bias in control of listed companies appears higher than in portfolio equity investment that hovers around 60%; it is comparable to home bias in cross-border banking activities and bond portfolios (Coeurdacier and Rey (2013)).

Country Variation As the country-level tabulations, reported in Appendix Tables A.1, A.2, A.3, and A.4, show, there is non-negligible variation. Foreign control is smaller in large advanced economies, such as the US, Japan, Germany, and in large middle income economies such as China, Russia, and Mexico. Smaller economies display significantly higher levels of openness to foreign control. Fig. 3 explores the correlation. Fig. 3 - Panel *A* plots the share of non-domestic control in all controlled firms in a destination country against destination Gross National Income (GNI) in 2019. Panel *B* takes a source country viewpoint, plotting the share of foreign firms controlled by a source country against the source country's GNI. Panel A shows that the proportion of market capitalization controlled by foreign entities (regardless of their tax haven status) is negatively correlated with the size of the economy. The relation has a similar magnitude for tax havens, albeit at higher levels of openness. The proportion of foreign companies among those controlled by entities from source, the relation is also negative, but with weaker magnitude. Home bias is more potent for wealthier and larger economies, a pattern in line with the idea that these countries offer greater diversification opportunities.

Fact 2. Modest but Heterogeneous Role of Tax Havens

Global Average In Fig. 4 we split controlled companies by the nationality type (domestic, foreign, and tax haven) of *controlling* entity and of the *immediate* main shareholding entity in 2019 [Appendix Fig. A.7 shows equivalent statistics for 2012]. Out of the

[1] The tax haven jurisdictions are Andorra, Anguilla, Bahamas, Bahrain, Barbados, Belgium, Belize, Bermuda, British Virgin Islands, Cayman Islands, CuraÃ§ao, Cyprus, Gibraltar, Hong Kong SAR China, Ireland, Isle of Man, Jersey, Lebanon, Liberia, Liechtenstein, Luxembourg, Macao SAR China, Maldives, Malta, Marshall Islands, Mauritius, Monaco, Netherlands, Panama, Puerto Rico, Samoa, Seychelles, Singapore, St. Kitts & Nevis, St. Lucia, St. Vincent & Grenadines, Switzerland, and Vanuatu.

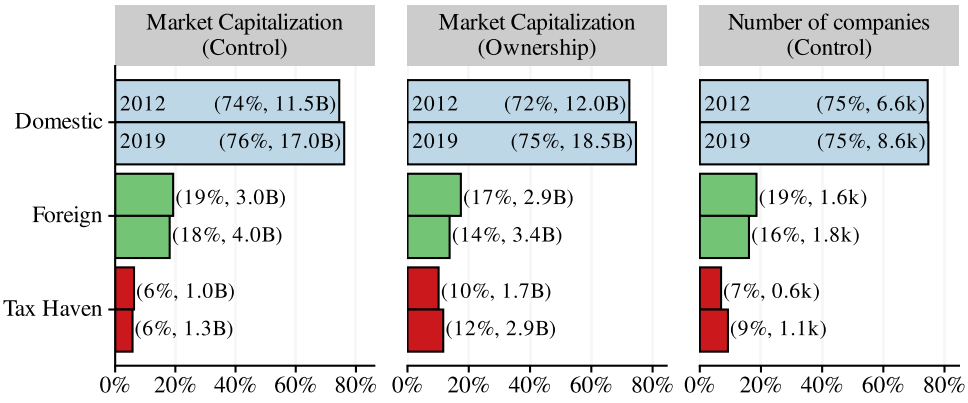

Fig. 2. Nationality of controlling shareholder entities in listed companies worldwide. The figure portrays the proportion of companies whose ultimate owner is a domestic, foreign, and (foreign) tax haven entity. The left and center panels show the proportions of the market capitalization of listed companies for control and ownership; the right panel shows the proportions of the number of controlled listed companies. For each group of controlling shareholders, the top bar shows the statistics for 2012, and the bottom bar shows the statistics for 2019. Besides proportions (in percentage points), the parentheses give the number of companies and market capitalization (in US dollars). The 2012 sample includes 10,100 controlled companies with USD 15.9 trillion market capitalization, listed in 81 countries, with controlling shareholders from 106 jurisdictions. The 2019 sample includes 12,479 controlled companies with USD 24.4 trillion market capitalization, listed in 81 countries, with controlling shareholders from 111 jurisdictions. The sum of these figures may not add up to the total reported in the main text due to incomplete coverage regarding the nationality of controlling and shareholding entities.

nine categories, five involve an entity in a tax haven; three with the ultimate controller in a tax haven jurisdiction (and a domestic, foreign, or tax-haven immediate controller) and three with a tax haven immediate controller (and domestic, foreign, or tax-haven ultimate controller), with the latter in each group overlapping. In 2019, tax haven entities are involved in the control of around 15% of listed firms with a controlling shareholder. Note that, as we trace the nationality of ultimate controlling entities and of the immediate shareholder, but not of other firms in the control chain, these estimates on tax-haven usage are lower bounds. We observe a tax haven incorporated controller in 8.3% of controlled firms globally, while shareholders from tax haven jurisdictions control 5% of the market capitalization of publicly-traded firms. In addition, quite often foreign shareholders

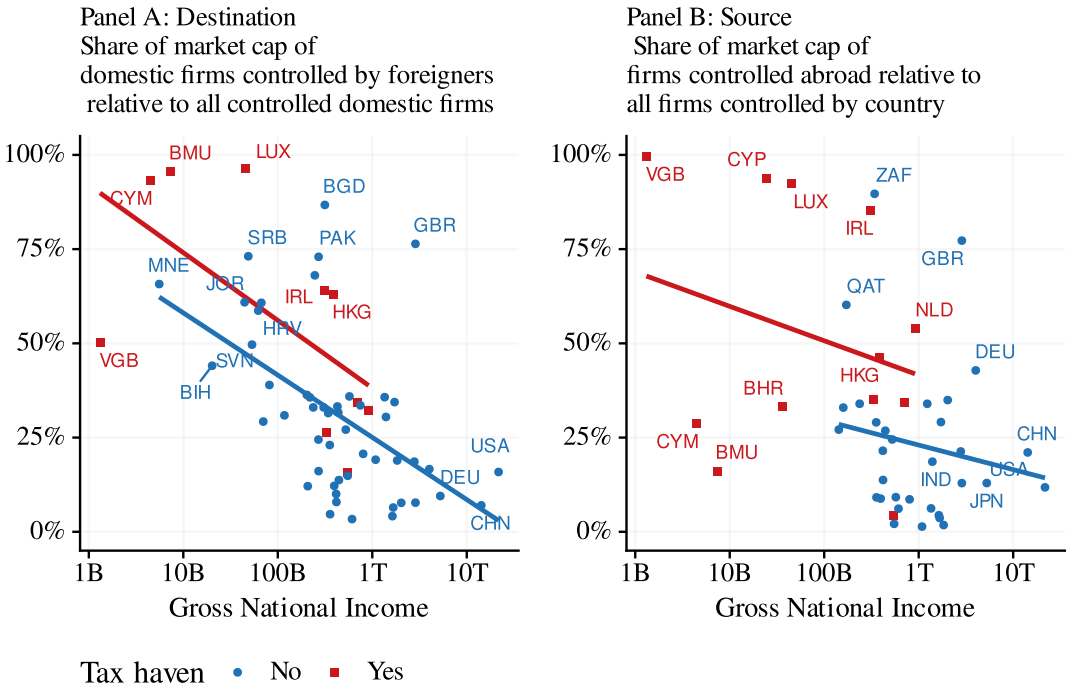

Fig. 3. Economy size and cross-border corporate control in 2019.
Panel *A* plots the share of total market capitalization at the destination country with a foreign controlling shareholder against destination countries' Gross National Income (GNI). Panel *B* plots the share of the total market capitalization controlled abroad by shareholders in the source country against the source country's GNI. The (red and blue) lines show least squares coefficients, estimated separately for tax-haven and non-tax-haven jurisdictions.

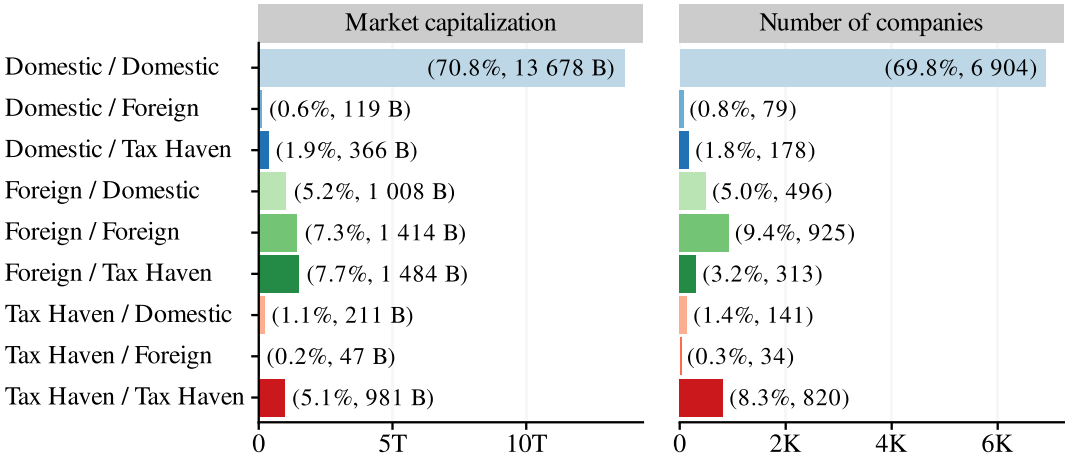

Fig. 4. Share of the different nationality types of control chains among controlled firms, worldwide, in 2019. Controlled companies are split according to the nationality type (domestic, foreign, and tax haven) of their *controlling* entity and of the *immediate* main shareholding entity. Market capitalization is measured in US dollars.

channel their controlling stakes via companies in tax-haven jurisdictions (about 1.5 trillion of a total of about 4 trillion). Besides, in 2% of controlled firms, we have a domestic shareholder channeling her controlling stake via a tax-haven incorporated company.

Country Variation Fig. 5 delves into the usage of tax haven entities for exercising control, plotting the shares of the five (out of nine) combinations involving a tax haven. There is wide country heterogeneity with some noteworthy regional patterns. Tax

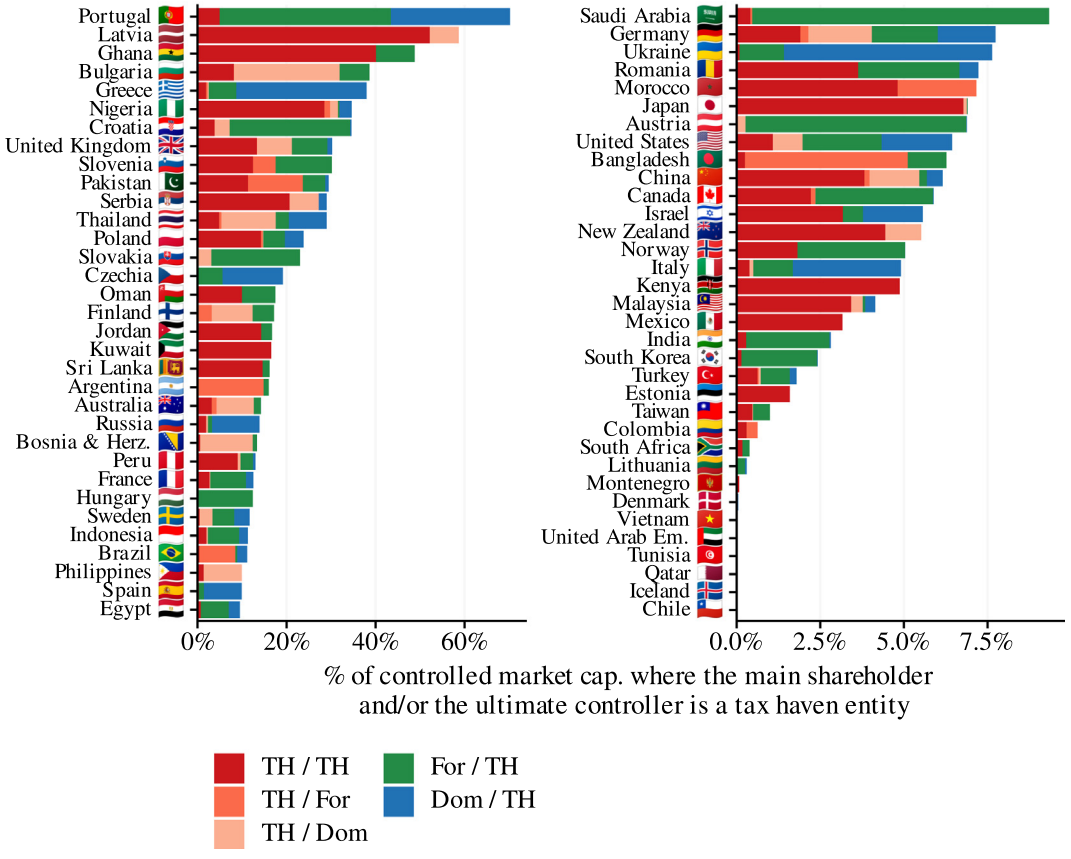

Fig. 5. Tax Haven Incorporated Vehicles in Corporate Control Chain across countries (Destination) in 2019. The chart shows the percentage of the market capitalization of controlled firms for which a tax haven entity is either the ultimate controller or the main immediate shareholder. The chart provides disaggregation of the five possible combinations: three with ultimate controller from a tax haven (and a domestic, foreign, or tax-haven immediate controller) and three with a tax haven immediate controller (and domestic, foreign, or tax-haven ultimate controller), with the latter of both groups overlapping. The chart is divided in two panels for convenience. Note that the x-axis of the right panel is in a different scale.

haven use is first order in Southern Europe (Portugal, Greece), Eastern Europe (Russia, Ukraine), including Baltic and Balkan countries (e.g., Latvia, Bulgaria, and Serbia), and some emerging markets in Asia (Indonesia, Philippines, and Pakistan) and Africa (Nigeria and Kenya). In contrast, tax-haven incorporated entities appear minimal in the United States (although we do not capture the role of Delaware) and Japan. A closer look at the types of control entailing tax-haven companies yields some additional insights. In Southern and Eastern Europe (Portugal, Greece, Czechia, Russia, Ukraine, Italy, and Spain), domestic residents exert control of local cooperates using firms in tax-haven jurisdictions [blue]. Besides, in Eastern and Southern Europe, we also observe foreign control often passing via tax-haven incorporated companies [green].

Fact 3. International Network of Corporate (Controlling) Ownership. Tax Havens, Regionalism, and Sparsity

We then turn to network structure, which helps grasp the interconnections and the features shaping the links between countries. The graphing of international (controlling) ownership links reveals a very sparse network with a few large connections among advanced economies and large emerging markets, regionalism with some links within (sub-)continents, and a prominent role of tax havens.

Largest Links. Tax-Havens Table 1 zooms into the biggest links in 2019 for the ten economies with the largest market capitalization of controlled firms. The largest ownership links globally are between the Cayman Islands and the BVI ($397*bn*) and

Table 1
Largest bilateral links for the ten economies with the largest market capitalization.

Panel A. Ownership

Destination	Market Cap. Owned		Largest 5 foreign ownership bilateral links				
	by Domestic	by Foreign	1	2	3	4	5
Cayman Islands	65B	551B	British Virgin I. (397B)	Hong Kong (64B)	United States (32B)	United Kingdom (12B)	China (12B)
China	2543B	338B	Hong Kong (286B)	United States (12B)	France (9B)	Singapore (9B)	British Virgin I. (6B)
France	924B	357B	United States (88B)	Switzerland (66B)	Luxembourg (48B)	United Kingdom (38B)	Netherlands (23B)
Germany	472B	279B	United States (109B)	United Kingdom (25B)	Norway (24B)	Luxembourg (16B)	China (16B)
Hong Kong	232B	451B	British Virgin I. (340B)	United States (41B)	United Kingdom (12B)	Cayman Islands (9B)	China (9B)
Japan	1656B	287B	United States (120B)	United Kingdom (53B)	Switzerland (32B)	Singapore (17B)	France (12B)
Russia	361B	164B	Cyprus (60B)	France (24B)	Netherlands (19B)	Singapore (15B)	United Kingdom (13B)
Switzerland	334B	319B	United States (135B)	United Kingdom (61B)	Netherlands (54B)	Germany (12B)	Luxembourg (12B)
United Kingdom	482B	532B	United States (138B)	Japan (85B)	Netherlands (61B)	Belgium (56B)	Norway (28B)
United States	4747B	710B	United Kingdom (188B)	Canada (86B)	Japan (73B)	Luxembourg (68B)	Netherlands (48B)

Panel B. Control

Destination	Market Cap. Controlled		Largest 5 foreign control bilateral links				
	by Domestic	by Foreign	1	2	3	4	5
Cayman Islands	70B	963B	South Africa (460B)	British Virgin I. (249B)	China (135B)	Hong Kong (87B)	United States (15B)
China	3061B	231B	Hong Kong (146B)	Thailand (46B)	British Virgin I. (18B)	France (10B)	Taiwan (6B)
France	829B	189B	Italy (85B)	Germany (56B)	Switzerland (20B)	United States (4B)	Spain (4B)
Germany	502B	100B	United Kingdom (18B)	France (16B)	Luxembourg (12B)	United States (10B)	Spain (9B)
Hong Kong	342B	583B	China (453B)	British Virgin I. (58B)	United Kingdom (50B)	Japan (14B)	Macao SAR China (6B)
Japan	1655B	174B	Switzerland (52B)	United States (38B)	France (34B)	Hong Kong (17B)	South Korea (13B)
Russia	641B	28B	Cyprus (7B)	France (4B)	Denmark (4B)	Finland (4B)	Luxembourg (3B)
Switzerland	334B	174B	China (44B)	South Africa (41B)	United States (32B)	Monaco (12B)	Germany (10B)
United Kingdom	134B	434B	United States (187B)	Netherlands (48B)	Switzerland (40B)	Japan (36B)	France (32B)
United States	3620B	683B	Germany (217B)	Japan (134B)	United Kingdom (112B)	Canada (60B)	Ireland (40B)

The table reports the largest five bilateral ownership (Panel A) and control (Panel B) links in 2019, in US Dollars, for the ten economies (destination) with the largest market capitalization of listed firms.

between Hong Kong and the BVI ($340*bn*). Of the ten largest ownership and control links, six entail a tax haven jurisdiction, with three of them being between two tax havens. [See Appendix Table A.1]. For comparison, tax haven jurisdictions appear once in the ten most extensive international trade links (Germany-Netherlands) and three of the largest service trade links in 2019 (Ireland-Netherlands, Ireland-US, and Hong Kong-China). The role of tax havens in ownership and control is prominent for all ten countries. Shareholding entities in Luxembourg and the Netherlands hold larger equity stakes in the US stock markets than many large economies. Shareholders in Switzerland and Luxembourg own larger stakes than British or German investors in France. Almost all foreign equity investment in China passes via Hong Kong; we observe $286*bn* in links from Hong to China compared to $12*bn* from the United States. American entities are the largest foreign shareholders in France, Germany, Japan, Switzerland, and the United Kingdom. Large American asset managers and investment banks are major contributors, as they own significant stakes in large companies worldwide. The United Kingdom is the most important foreign shareholder in the United States. Turning to control (Panel *B*), the largest bilateral link is between the Cayman Islands and South Africa, reflecting Tencent Holdings, incorporated in the Caribbean archipelago, where South African entity Naspers Limited holds a controlling stake. In the United States, Japanese and Germans are the largest international controlling shareholders (e.g., control of T-Mobile US by Deutsche Telekom and Morgan Stanley by Mitsubishi UFJ Financial Group, thanks to an equity stake exceeding 20%. In France, entities from other European countries are the largest foreign controllers (e.g., French Sartorius Stedim Biotech SA controlled by the German Sartorius family).

Sparsity Figs. 6-7 illustrate a subset of the network structure in 2019, plotting listed firms' jurisdictions (in the horizontal axis) against the nationality of shareholding entities, controlling or passive (in the vertical axis) for the 20 countries with the highest value of (controlling) equity stakes held by foreigners (excluding own-country stakes). Dark(er) squares indicate large(r) stakes held (controlled) by entities from the source country at the destination. Countries are sorted according to the similarity of ownership and controlling links. Countries closer to each other, especially at the extremes, have similar connections. The United States, the United Kingdom, Switzerland, Germany, Netherlands, Japan, and Canada appear first in Fig. 6, as shareholders in these countries hold large stakes in listed companies in each other. The lower half includes large emerging economies; the BRICs (Brazil, Russia, India, and China) appear grouped last. The other three countries display sparser links to the remaining jurisdictions in the heat map.

Some interesting patterns emerge when we look at control in Fig. 7, especially when contrasting with ownership. The control matrix appears sparser as there are fewer (significant) links. The matrix shows solid controlling investments in Japan from Europe (Switzerland, France, and Germany), while China is a sizable controlling shareholder in France and Switzerland. Countries are less clustered on a regional basis relative to ownership, as France and Switzerland appear next to Asia, and Japan is closer to Western economies. We see few, if any, controlling stakes from large economies, like Brazil or India, to many other large markets. The sparsity contrasts quite strongly with the international trade network, where the number of positive links between countries is one

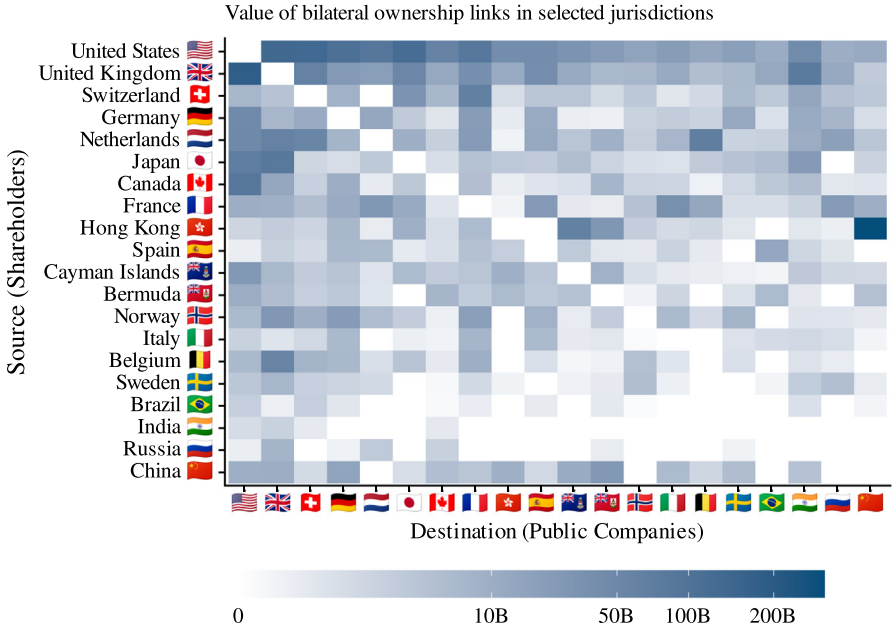

Fig. 6. Heat map of the value in US Dollars of bilateral ownership stakes in 2019, measured by the market value of equity stakes. Darker squares indicate larger values of equity stakes held by entities from source jurisdictions (y-axis) in public firms from destination jurisdictions (x-axis). Own-country (home bias) links are not shown. Countries are ordered according to the similarity of their international ownership links. Countries closer to each other, especially at the extremes, have similar links. The ordering of the countries was obtained from the loading of each (source) country on the first principal component of the matrix shown in the chart, with the addition of own-country links (diagonal).

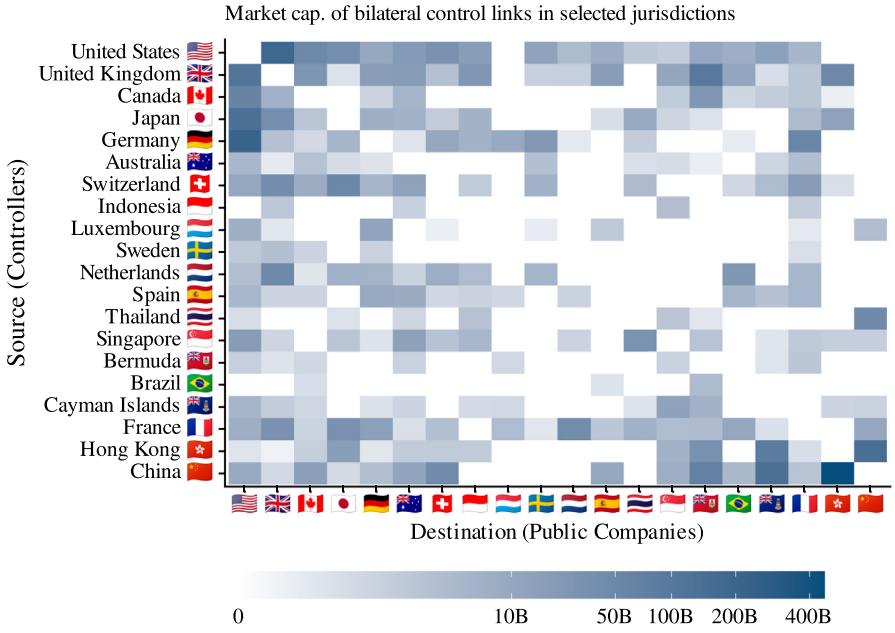

Fig. 7. Heat map of the value in US Dollars of bilateral control stakes in 2019, measured by the total market capitalization of firms. Darker squares indicate larger market capitalization values of the firms controlled by entities from source jurisdictions (y-axis) in public firms from destination jurisdictions (x-axis). Own-country (home bias) links are not shown. Countries are ordered according to the similarity of their international ownership links. Countries closer to each other, especially at the extremes, have similar links. The ordering of the countries was obtained from the loading of each (source) country on the first principal component of the matrix shown in the chart, with the addition of own-country links (diagonal).

order of magnitude larger. In our 2019 sample, with 81 destination countries and 161 source countries, we observe in a total of 10,592 and 12,147 non-zero links in international trade in goods and services, respectively. For our compiled statistics on control and ownership, we see only 967 and 1863 strictly positive links.

4. Gravity analysis

We now turn to our empirical exploration of the globalization of corporate control. First, we go over earlier and parallel research that provides justification for a gravity model for cross-border (controlling) investment. Second, we lay down the empirical framework and discuss estimation. Third, we report the cross-sectional estimates that explore the role of distance, countries' size, and other source and destination features. Fourth, we estimate gravity specifications with source and destination country fixed effects to isolate the role of bilateral features related to diversification motives, frictions in corporate control markets, and informational asymmetries. Fifth, we explore heterogeneity across controlling shareholder types to shed light on mechanisms.

4.1. Gravity in international finance

Empirical Studies We estimate "gravity" models to study the internationalization of corporate control, as earlier studies focusing on other aspects of financial integration show that international asset allocation is linked to countries' size and (inversely) distance (see Head and Mayer (2014) for a review). In an early contribution, Portes and Rey (2005) shows that a simple gravity equation, similar to the one used to model international trade, explains well cross-border equity flows. While transaction costs in equity markets are small (e.g., Tesar and Werner (1995)), Portes and Rey (2005) showed that distance captures information asymmetries related, among others, to linguistic differences. Subsequent empirical works with expanded coverage revealed similar regularities (Lane and Milesi-Ferretti (2008)), uncovering further a gravity structure for foreign direct investment (Head and Ries (2008)), cross-border mergers and acquisitions (di Giovanni (2005)), bonds (Coeurdacier and Martin (2009)), and banking activities (Papaioannou (2009)).

Theory Given the compelling evidence, theoretical explorations have provided justifications for the gravity structure of international finance. The first genre of studies connected cross-border financial transactions, bank lending, and equity investment to international trade (Lane and Milesi-Ferretti (2008), Rose and Spiegel (2004), Aviat and Coeurdacier (2007)). Complementarities between trade in goods and assets justify a gravity structure of international finances (Okawa and van Wincoop (2012)), given solid theoretical underpinnings of size and distance in goods trade (e.g., Anderson and van Wincoop (2003)). The second genre of theories focuses on imperfections in international markets. Martin and Rey (2004) derive a gravity specification for international equity positions in a setting where countries' assets are imperfect substitutes and investors have better knowledge of

local conditions. Population, income per capita, and market capitalization capture diversification opportunities. Rather than transportation costs, distance approximates asset trade frictions related to information asymmetries and familiarity effects that appear first-order in portfolio choice. Van Nieuwerburgh and Veldkamp (2009) build an endogenous information acquisition setup where even a tiny informational advantage of local investors can yield considerable home bias and limited international diversification. Third, looking at control by multinationals, Head and Ries (2008) develop a model where headquarters have imperfect information on destination countries. Lumpy monitoring and information gathering costs are increasing in distance; the destination's size matters as it offers a larger share of assets to foreign equity investors, while source country size shapes international control by supplying potentially more bidders. Fourth, Pellegrino et al. (2021) generate a gravity specification of international capital allocation, developing a multi-country model where rationally inattentive investors have imperfect knowledge of capital's return in various destinations. Agents can acquire information but at higher costs for more culturally, linguistically, and distant destinations. The model yields a rational inattention logit international asset demand system (Matæjka and McKay (2015)), where home bias and strong gravity emerge even though investors can theoretically learn about returns at all destinations. Market segmentation emerges from deep frictions, cultural differences, and international policy barriers.

4.2. Empirical framework and estimation

Cross-sectional Specification The gravity specification associates corporate control (and ownership) of all firms listed in the destination country, d, by shareholder entities in the source country, s to countries' size, X_d and X_s, and their distance, $D_{d,s}$, that captures relative financial frictions.[In most theories, the relative friction is the share of country-pair financial transaction costs to the product of multilateral resistance terms from the viewpoint of source and destination (e.g., Okawa and van Wincoop, 2012).] The cross-sectional specification reads:

$$Y_{d,s,t} = \exp\left[\beta^d \mathbf{X}_{d,t} + \beta^s \mathbf{X}_{s,t} + \beta^D \mathbf{D}_{d,s} + \beta^T \mathbf{T}_{d,s} + \phi_t + \eta_{d,s,t}\right]. \quad (1)$$

The dependent variable $Y_{d,s,t}$ reflects controlling shareholder links (in USD) in destination country d by residents in source country s in period/year t. We also run specifications using all ownership links, controlling and passive, across controlled and widely-held listed corporations. ϕ_t is a year constant in the specifications pooling across 2012 and 2019. $\mathbf{X}_{d,t}$ and $\mathbf{X}_{s,t}$ are vectors of destination and source "size" variables. The size proxies are log GNI per capita, log population, and stock market capitalization (as a share of GDP). We augment the specifications with proxies of source and destination countries' tax regimes, human capital, institutional quality, and trust, as earlier works show that these features partly explain trade, equity, bond, and bank investments. $\mathbf{D}_{d,s}$ denotes geographic but also cultural, linguistic, and genetic distance. $\mathbf{T}_{d,s}$ is a vector of countries' similarities, colonial ties, similar legal systems, etc.[2]

Source and Destination Country Fixed-Effects Gravity Specification We estimate specifications with source country s and destination country d constants ϕ_d and ϕ_s to isolate the role of distance and other bilateral features (Anderson and van Wincoop (2003)).

$$Y_{d,s,t} = \exp\left[\beta^D \mathbf{D}_{d,s} + \beta^T \mathbf{T}_{d,s} + \phi_{d(,t)} + \phi_{s(,t)} + \eta_{d,s,t}\right]. \quad (2)$$

Besides size, country constants absorb all source and destination-specific costs related to equity investment. Building on earlier theoretical work on home bias and gravity equations in international finance, we distinguish three categories of bilateral features other than geodesic distance (Coeurdacier and Rey (2013)): (i) Diversification motives; similarities in production, return differentials, and business cycle synchronization [*Diversif*]. (ii) Asset trade costs related to international taxation, trade and investment treaties, regulatory-legal harmonization in financial services, and legal system similarities [*IntPol*]. (iii) Informational frictions and behavioral biases, in turn, related to deep historical and cultural ties [*Inform*]:

$$Y_{d,s,t} = \exp\left[\gamma \mathbf{GeoD}_{d,s} + \lambda_1 \mathbf{Diversif} + \lambda_2 \mathbf{IntPol} + \lambda_3 \mathbf{Inform} + \phi_{d,(t)} + \phi_{s,(t)} + \eta_{d,s,t}\right]. \quad (3)$$

Estimation We estimate the gravity model with the Poisson Pseudo Maximum Likelihood (PPML) estimator, proposed by Santos Silva and Tenreyro (2006), which deals efficiently with heteroskedasticity and many zeros.[3] The PPML is well-behaved and efficient, even when the conditional variance is not proportional to the conditional mean (Gourieroux et al. (1984)). Standard errors are double clustered at source and destination with the method of Cameron et al. (2011).

[2] National accounts and population data are retrieved from UN National Accounts - Analysis of Main Aggregates database. We use World Bank data for a handful of small jurisdictions. Geodesic distance adjusted for population and other geographic variables comes from Dynamic Gravity Dataset (DGD) available on the US International Trade Commission's website. Other geographic and historical data come from CEPII's Gravity database (Head and Mayer (2014); Conte et al. (2021)).

[3] The concern with OLS of log-linearised parameters is that heteroscedasticity in the original multiplicative error term leads to biased estimates. The PPML estimator deals naturally with zeros, a common occurrence in country-pair data of international integration. We estimate the PPML specifications using the routine of Correia et al. (2020). Santos Silva and Tenreyro (2011) present simulation evidence showing that the estimator preserves its efficiency even in the presence of many zeros. Fernández-Val and Weidner (2016), Weidner and Zylkin (2021), and Santos Silva and Tenreyro (2011) show that the PPML with two-way fixed-effects remains asymptotically unbiased, maintaining its efficiency properties. The coefficients on logged regressors are elasticities. The coefficients on other regressors are semi-elasticities, whose impact on the outcome is given by $e^{\beta-1}$.

4.3. Cross-sectional gravity results

4.3.1. Size and cross-border corporate control and ownership

Table 2 reports PPML estimates with four outcomes: corporate control (in USD), which factors in indirect links (columns (1), (5), and (9)); all shareholder (not necessarily controlling) stakes by entities in the source country in listed companies in destination (columns (2), (6), and (10)); and, for comparability, international trade in goods (columns (3), (7), and (11)) and in services (columns (4), (8), and (12) using data from the IMF (DOTS), the UN (Comtrade), the BACI database from CEPII, and the BaTis (WTO) dataset.) As we want to compare the estimates and the fit for control and ownership to international trade, we include observations where we have data for all outcomes. The table gives the estimates in 2012 (columns (1)–(4)), in 2019 (in (5)–(8)), and pooling the two years (in (9)–(12)).

The gravity model performs well in explaining cross-border ownership and control. While the model fit for control is lower than for trade, the gravity terms explain a non-negligible portion of the variation. The pseudo-R^2 equals one minus the ratio of the log-likelihood of the fitted model (numerator) to the log-likelihood for the intercept-only model (denominator). In the control specifications, it is 0.32, and for ownership, it is 0.4, compared to about 0.8 for goods trade. Likewise, the Root Mean Squared Errors (RMSE) of the corporate control (and ownership) specifications lay around 25, while the for trade is 1.2 to 2.6. Turning now to the estimates. First, the elasticity on distance in the control and ownership specifications is closer to zero; in the pooled specifications, the distance elasticity is −0.34 for control and − 0.27 for ownership, compared to −0.88 and − 0.64 for trade in goods and services, respectively. This appears plausible as transportation costs in the goods market are larger than equity transaction costs. Second, population appears less relevant for ownership and control, as small jurisdictions play a disproportionate role. Third, when we augment the specification with stock market capitalization to capture better diversification opportunities and the market size of bidders and opportunities for corporate control (as in Martin and Rey (2004) and Head and Ries (2008)), we obtain highly significant estimates for both the source and destination country. [See Appendix Tables B.5-B.6].

4.3.2. Source and destination country features

We augment the cross-sectional specification (eq. (1)) with proxies of human capital, institutions, taxation, and trust at source and destination, as empirical studies in other forms of financial globalization and theoretical explorations of home bias stress their

Table 2
Cross sectional gravity estimates. Size and distance.

	2012				2019				Pooled			
	Control	Ownership	Trade		Control	Ownership	Trade		Control	Ownership	Trade	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	For. Ctrl.	All	Goods	Services	For. Ctrl.	All	Goods	Services	For. Ctrl.	All	Goods	Services
Log Pop-Wght dist.	−0.484**	−0.249	−0.881***	−0.665***	−0.240	−0.285	−0.878***	−0.626***	−0.339*	−0.271	−0.879***	−0.642***
	(0.202)	(0.195)	(0.051)	(0.060)	(0.192)	(0.174)	(0.055)	(0.051)	(0.195)	(0.181)	(0.052)	(0.053)
D. Log GNI per cap.	0.570***	0.861***	0.825***	0.981***	1.255***	1.075***	0.880***	1.053***	0.886***	0.974***	0.851***	1.020***
	(0.142)	(0.124)	(0.060)	(0.060)	(0.235)	(0.202)	(0.064)	(0.053)	(0.179)	(0.150)	(0.062)	(0.052)
S. Log GNI per cap.	1.020***	1.513***	0.806***	1.065***	0.995***	1.644***	0.840***	1.161***	1.003***	1.590***	0.823***	1.118***
	(0.156)	(0.295)	(0.041)	(0.098)	(0.220)	(0.372)	(0.052)	(0.088)	(0.181)	(0.325)	(0.045)	(0.091)
D. Log Pop.	0.222	0.463**	0.880***	0.706***	0.169	0.432*	0.852***	0.678***	0.179	0.444*	0.864***	0.689***
	(0.199)	(0.196)	(0.050)	(0.049)	(0.258)	(0.251)	(0.042)	(0.044)	(0.240)	(0.230)	(0.046)	(0.044)
S. Log Pop.	0.680***	0.419*	0.877***	0.712***	0.601***	0.363*	0.871***	0.670***	0.631***	0.381*	0.873***	0.686***
	(0.188)	(0.238)	(0.047)	(0.068)	(0.200)	(0.217)	(0.040)	(0.050)	(0.193)	(0.221)	(0.043)	(0.056)
Observations	12,960	12,960	12,960	12,960	12,960	12,960	12,960	12,960	25,920	25,920	25,920	25,920
Obs. total	12,960	12,960	12,960	12,960	12,960	12,960	12,960	12,960	25,920	25,920	25,920	25,920
Num. countries (D/S)	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161
RMSE	23.580	28.649	1.265	1.839	22.167	25.583	1.156	2.607	23.610	27.053	1.209	2.353
Pseudo-R^2	0.324	0.396	0.842	0.824	0.329	0.403	0.857	0.827	0.319	0.400	0.850	0.826
Deviance-R^2	0.324	0.396	0.842	0.827	0.329	0.403	0.857	0.829	0.319	0.400	0.850	0.828
Fixed Effects	Year FE	Year FE	Year FE	Year FE	Year FE	Year FE	Year FE	Year FE	Year FE	Year FE	Year FE	Year FE

Notes: The table reports Poisson Pseudo Maximum Likelihood (PPML) estimates. The outcomes are various forms of international integration across pairs of countries in 2012 (columns (1)–(4)), in 2019 (in columns (5)–(8)), and pooling 2012 and 2019 (in columns (9)–(12)). In columns (1), (5), and (9), the dependent variable denotes the logarithm of controlled listed firms' market capitalization in destination by shareholder entities in the source country. In (2), (6), and (10), the dependent variable is the market value of ownership (voting rights) from shareholding entities in source to firms in the destination country in both widely held and controlled firms, irrespective of whether the shareholder controls the company. In (3), (7), and (11), the dependent variable denotes international goods exports and imports from source to destination. In columns (4), (8), and (12), the dependent variable denotes international services trade between origin and destination. The explanatory variables are the logarithm of the population-weighted distance between origin and destination, the log of Gross National Income (GNI) per capita and log population at source and destination. Pseudo-R^2 is defined as one minus the ratio of the log-likelihood of the fitted model to the log-likelihood for the intercept-only model. Deviance-R^2 follows is defined as the difference between the model log-likelihood and the highest possible likelihood for a given dependent variable. Double-clustered at source and destination country standard errors are reported below the estimates. *, **, and *** denote statistical significance at the 10%, 5%, and 1% confidence level, respectively.

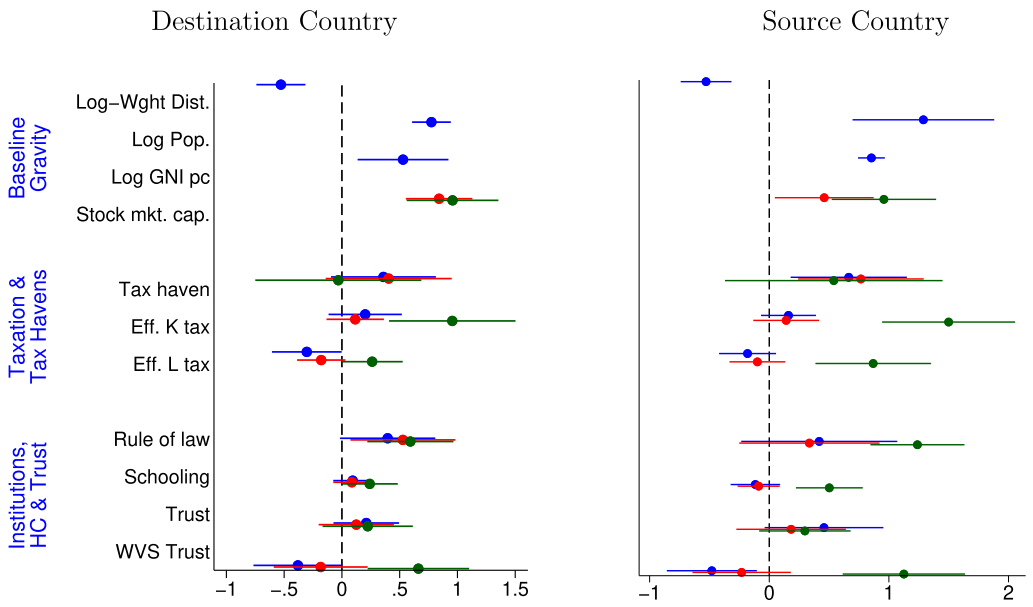

Fig. 8. Cross-sectional gravity specification PPML estimates: corporate control.
The figure plots coefficients and two standard error bands of Poisson Pseudo Maximum Likelihood (PPML) cross-sectional gravity specifications. The dependent variable is the market value of all controlling links from shareholding entities in the source country in listed companies in the destination country. The explanatory variables are the logarithm of the population-weighted distance between origin and destination, the logarithm of Gross National Income (GNI) per capita, the logarithm of the population at source and destination, stock market capitalization as a share of GDP, mean years of schooling, a rule of law index, binary variables for tax haven status, effective capital and labor taxes at source and destination countries. Coefficients from the specification, including all reported variables, are denoted in *blue*. Coefficients from the specification, including only the relevant variable (on top of the distance, national population, and national GNI per capita variables) are reported in *red*. Coefficients from the specification, including only the relevant variable, are reported in *green*. The pooled 2012 and 2019 specifications are estimated across 15,478 observations, although for some variables, there are missing values.

role in lowering returns and increasing risk. Fig. 8 plots coefficients (alongside two standard error bands) from three permutations: (i) Including only the relevant variable (in *green*). (ii) Adding the relevant variable to the baseline gravity terms (distance, population, and GNI per capita; in *red*). (iii) Including all independent variables (in *blue*), but trust and market capitalization as the sample declines (the patterns are similar when we include them). Fig. 9 does the same for corporate ownership. For brevity, the figure plots the coefficients from the pooled across the two years' specifications. Appendix Figs. B.1 and B.2 report the corresponding figures separately for 2012 and 2019, while Tables B.7-B.8 show the results of the respective regressions.

Taxation We commence exploring the role of taxes using indicators for tax havens and information on effective tax rates on capital and labor compiled by Bachas et al. (2022). The coefficients on tax-havens are significantly positive, reflecting their chief role as conduits of international equity investment. The estimate conditional on the baseline gravity terms (in blue) suggests that cross-border ownership is 174% higher when the source is a tax haven ($[exp(1.007) - 1]$). As tax haven jurisdictions are interconnected, the coefficient on the destination tax haven implies a doubling of ownership stakes ($[exp(0.706) - 1]$. When we look at control, the estimates on the tax haven indicator at the destination enter with smaller estimates, telling of the usefulness of our methodology that identifies ultimate controlling shareholders. The source tax haven indicator retains significance, as many ultimate controlling entities (and individuals) are in off-shore jurisdictions. Turning to the effective tax rates on capital, the estimates are small and, in general, insignificant when we condition on the baseline gravity terms. The estimates on effective labor taxes are negative and, in some specifications, significant. There is some weak evidence that high labor taxes decrease foreign control. The weak correlation of tax rates, which accords with empirical studies of other forms of financial integration, may reflect various mechanisms. First, tax rates rarely capture the actual levy of investors. Second, tax codes are esoteric, provisions on loss carry-overs vary, and depreciation and amortization calculations differ. Third, quite often, there are exemptions for foreign investors. Fourth, the use of intermediate shell companies reflects (controlling) shareholders' efforts to bypass taxation. Ultimately, it may not be surprising that taxes rates do not play much of a role.

Education We examine the role of human capital that features prominently in explanations on why capital does not flow from rich to poor countries (e.g., Lucas (1990)), augmenting the specification with mean years of schooling at source and destination, using data from Barro and Lee (2013). When we include only the human capital variables, the coefficients are significantly positive, revealing stronger (controlling) equity links between countries with high levels of education. However, when conditioning on size and distance, the estimates on education fall considerably and turn statistically indistinguishable from zero, suggesting a small – if any – role.

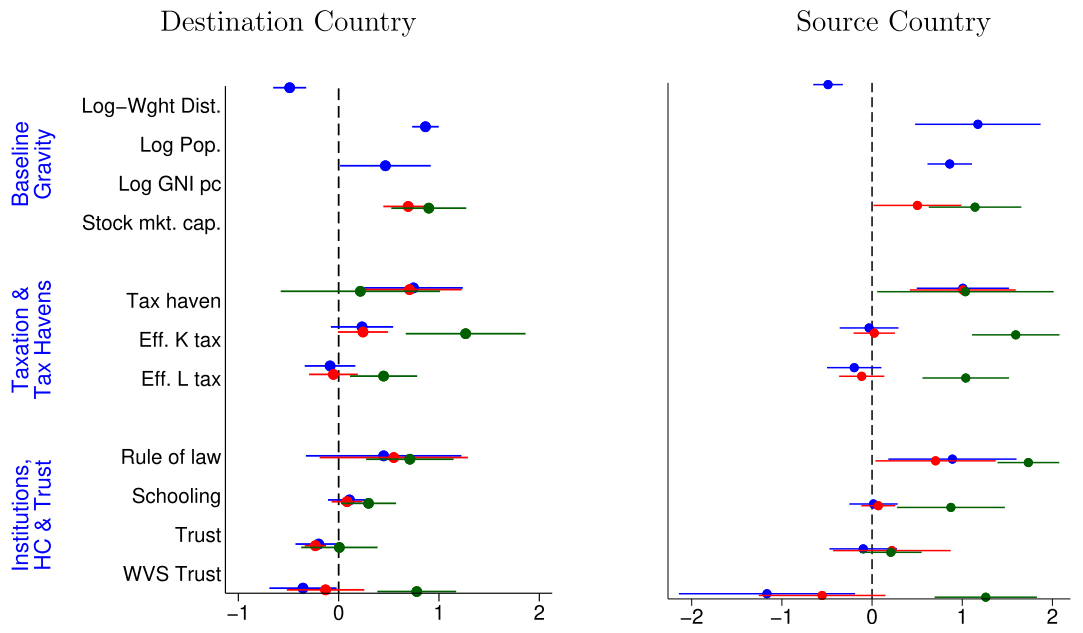

Fig. 9. Cross-sectional gravity specification PPML estimates: corporate ownership.
The figure plots coefficients and two standard error bands of Poisson Pseudo Maximum Likelihood (PPML) cross-sectional gravity specifications. The dependent variable denotes the market value of all ownership links from shareholding entities in the source country in listed companies in the destination country. The explanatory variables are the logarithm of the population-weighted distance between origin and destination, the logarithm of Gross National Income (GNI) per capita, the logarithm of the population at source and destination, stock market capitalization as a share of GDP, mean years of schooling, a rule of law index, binary variables for tax haven status, effective capital and labor taxes at source and destination countries. Coefficients from the specification, including all reported variables, are denoted in *blue*. Coefficients from the specification, including only the relevant variable (on top of the distance, national population, and national GNI per capita variables) are reported in *red*. Coefficients from the specification, including only the relevant variable, are reported in *green*. The pooled 2012 and 2019 specifications are estimated across 15,478 observations, although for some variables, there are missing values.

Institutions We then turn to the role of institutional quality, as it explains a non-negligible portion of the variation in FDI, international equity, and banking transactions (e.g., Wei (2000), Alfaro et al. (2008), Aviat and Coeurdacier (2007) and Papaioannou (2009)), using a composite rule of law index from the World Bank's Governance Indicators. The coefficient for the rule of law at the destination is significantly positive. Corporate control (and ownership) from foreign shareholding entities appear, on average, higher in destination countries with stronger and more efficient institutions. The estimate implies that corporate control increases by approximately 60% when the rule of law, ranging from −2.5 to 2.5, increases by one unit in the destination country. Take, for example, Italy and France, which differ in the rule of law index by one unit (0.3–0.4 vs. 1.4). Corporate control by foreigners is around 60% higher for France than Italy. As shown on Fig. 8, institutions at the destination are significant correlates of corporate control even when we condition on size, schooling, and taxation. The source country's rule of law index also enters with a positive coefficient; controlling investors from high institutional quality countries exert a disproportionate control of foreign listed firms.

Trust Building on works revealing cultural biases in global portfolios (Guiso et al. (2009)), mergers and acquisitions (Ahern et al. (2015)), we explored the role of general trust at source and destination using data from Falk et al. (2018), available for a small number of countries, and the World Value Surveys with wider coverage. The estimates on trust are unstable with large standard errors. There is little evidence that trust shapes cross-border control.

Taking Stock Fig. 10 summarizes the results on the role of size, distance, taxation, education, and institutions on the internationalization of corporate ownership and control, contrasting them with international trade in goods and services, where the gravity model is performing remarkably well. First, size (population and income per capita) explains a significant – more than half – portion of the variance in cross-border corporate control and ownership; this result supports the limited theoretical work (Martin and Rey (2004), Head and Ries (2008)) on international equity and control investment. Second, while geodesic distance is a significant correlate of cross-border (controlling) equity investment, its role is smaller than for trade, suggesting smaller bilateral transaction costs for equity as compared to goods markets. The increase in the *pseudo* $-R^2$ when adding distance to the population, GNI p.c., and stock market capitalization is about 0.05 in the corporate control specification, about 0.15 in goods trade. Third, the gravity model with human capital, institutions, and tax-haven status improves the fit for the (controlling) ownership specifications mainly because the tax-haven indicators and institutional quality are significant correlates, while their role in international goods trade is less significant.

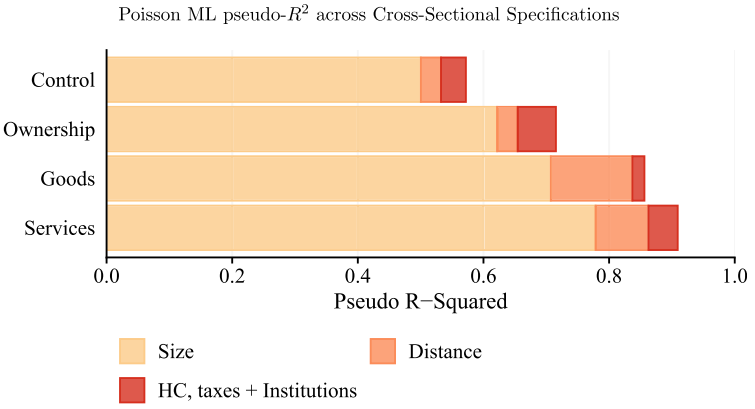

Fig. 10. Corporate control, augmented gravity, and country features.
The Figure plots the cumulative (McFadden's) pseudo-R^2 in Poisson Pseudo Maximum Likelihood (PPML) specifications in the pooled across 2012 and 2019 sample. The dependent variable in the three specifications in bar (1) is the market capitalization of controlled firms in the destination country from shareholding entities in the source. The dependent variable in bar (2) is the market value of all ownership links, passive and controlling, from shareholding entities in the source country in listed companies in the destination country. The dependent variable in columns (3) and (4) is the exports and imports (in USD million) from source to destination in goods and services, respectively. Each bar gives the *pseudo* $-$ R^2 for three specifications: (i) A cross-sectional specification with the log of Gross National Income (GNI) per capita and log population at source and destination (*beige*). (ii) A cross-sectional specification with the log of the population-weighted distance between origin and destination, the log of Gross National Income (GNI) per capita, and the log of the population at source and destination (*coral*). (iii) A cross-sectional specification that adds indicators for tax haven status, effective capital and labor taxes, human capital (HC) indicators measured by the mean years of schooling, and World Bank indicators of rule of law, at source and destination country (*red*).

4.4. Bilateral features

We now turn to the role of bilateral features on the globalization of corporate control running gravity specifications with source country and destination country fixed effects (interacted with a year indicator). Following upon theoretical explorations of home bias in equity and debt (Coeurdacier and Rey (2013), Maggiori (2022)), we distinguish between three broad categories. (i) Diversification-related motives (on top of countries' size, absorbed by the constants). (ii) Costs in international transactions stemming from differences in taxation, incomplete convergence of regulation, and differences in the legal system. (iii) Informational frictions and behavioral biases related to linguistic, religious, and cultural differences between origin and destination. Fig. 11 shows the PPML estimates on corporate control for all variables across three specifications: (i) Unconditional, with only the source country and the destination country constants (in *green*); (ii) Simply conditioning on log distance (in *red*); and (iii) Entering all variables of the three categories in the RHS (in *blue*). Appendix Section C gives additional results, zooming in 2012 and 2019, and also on ownership links, alongside summary statistics and decriptives.

4.4.1. Distance

We commence the analysis by examining the distance elasticity for corporate control when we absorb all source and destination features. Table 3 gives the estimates for corporate control, ownership, and, for comparability, international trade. The elasticity on distance for control is about $-0.75/-0.88$, somewhat lower than goods trade. The distance elasticity for ownership is significantly negative, albeit smaller in absolute value, as tax havens' play a chief conduit role. The improvement in the marginal pseudo R^2 when adding the log of distance is about 5 percentage points for corporate control, higher than with ownership, telling of the benefits of tracing indirect (controlling) equity positions channeled via offshore jurisdictions. But, the role of distance for trade in goods is twice as large as for corporate control.

4.4.2. Diversification

We examine the role of similarities in production structure and business cycle synchronization searching for potential diversification-related motives in international controlling investments across the world. [Appendix Table C.11 reports the regression estimates.]

Sectoral Dissimilarities As sectoral similarities correlate with international trade and financial integration (e.g., Imbs (2006), Lane and Milesi-Ferretti (2008)), using two-digit sector data from the UNIDO, we added in the RHS the sum of differences in gross value added between source and destination across sectors. The sectoral production dissimilarity proxy enters with an estimate that is small and statistically indistinguishable from zero, even when we do not condition on geodesic distance.

Output Synchronization We explored the role of output similarities at a business cycle frequency using the difference between annualized GDP growth between source and destination over the past five years. The output synchronization index is

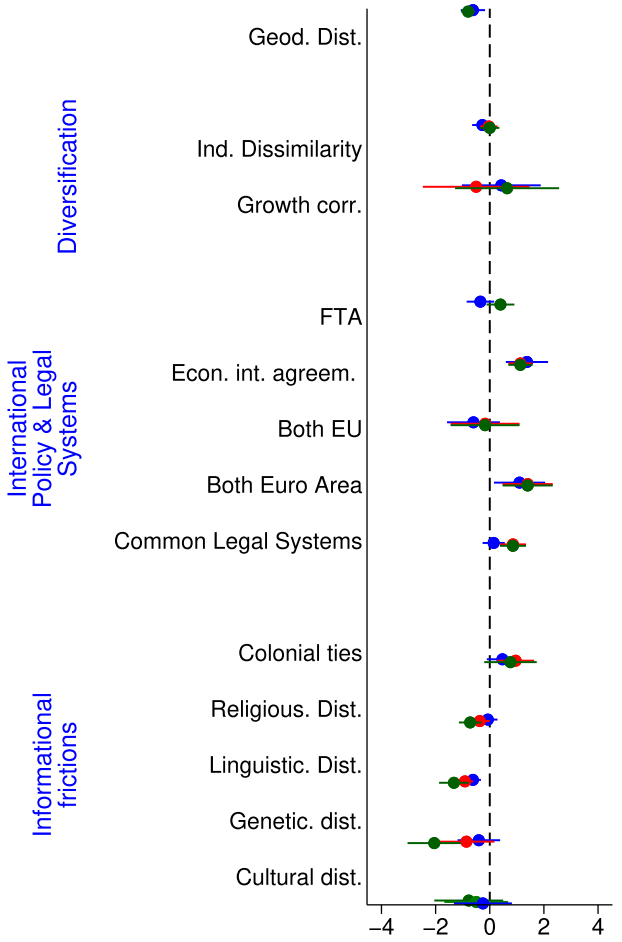

Fig. 11. Source and destination country fixed-effects PPML estimates - corporate control.
The figure plots Poisson Pseudo Maximum Likelihood (PPML) estimates from the specification where the dependent variable denotes the market value of all control links from shareholding entities in the source country in listed companies in the destination country. The three reported specifications are: (i) Unconditional with only the source country and the destination country constants and log distance (in *green*); (ii) Simply conditioning on log geodesic distance (in *red*); and (iii) Entering all variables of the last two categories in the RHS (in *blue*). For presentation reasons, the last four distance terms have been scaled by a factor of 2.

unrelated to cross-border control and ownership. [Using 5, 7, and 10-year correlations yields similarly insignificant estimates]. There is little evidence that shareholders seek to invest in countries with not very similar output dynamics.[4]

4.4.3. Asset trade frictions. Policy coordination and legal system similarities

We then turn to the role of frictions in the international market for corporate control, distinguishing between legal system dissimilarities and limited international economic policy cooperation. [Appendix Table C.12 reports the regression estimates.]

Legal Tradition Despite convergence in corporate law and securities legislation since the 1990s, there are still some non-negligible differences in stock market regulation, duties of company insiders and controlling shareholders, bankruptcy, and courts across the world. To examine the role of legal system similarities, we add an indicator that takes the value of one when both countries have either a common law or a civil law system, as there are vast differences in investor protection, courts, bankruptcy, securities, and corporate law across legal tradition; the omitted category consists of pairs of countries with different legal systems. The identifier for pairs with similar legal traditions enters with a highly significant coefficient in the unconditional specification, when we condition on geodesic distance, but also when we control for proxies of international economic policy coordination and deep ties. Corporate control is more than two times larger between countries with a similar law system and tradition than pairs with different legal families ($exp(0.88) - 1 = 1.4$).

[4] We also explored the role of equity return synchronization. While neoclassical finance theory suggests a negative correlation, as the gains of diversification are larger when equity markets are negatively correlated, we uncover positive associations with cross-border ownership and control. This result, which is in line with earlier research on cross-border equity flows (e.g., Portes and Rey (2005), Aviat and Coeurdacier (2007)) further weakens simple diversification motives on the globalization of corporate control.

Table 3
Geodesic distance in cross-border corporate control, ownership, and international trade source and destination country fixed-effects estimates.

	2012				2019				Pooled			
	Control	Ownership	Trade		Control	Ownership	Trade		Control	Ownership	Trade	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	For. Ctrl.	All	Goods	Services	For. Ctrl.	All	Goods	Services	For. Ctrl.	All	Goods	Services
Log Pop-Wght dist.	−0.881***	−0.572***	−0.963***	−0.803***	−0.744***	−0.683***	−0.931***	−0.757***	−0.800***	−0.641***	−0.946***	−0.776***
	(0.162)	(0.140)	(0.070)	(0.046)	(0.136)	(0.141)	(0.065)	(0.049)	(0.133)	(0.138)	(0.067)	(0.047)
Observations	7592	10,694	11,856	12,160	7752	11,502	11,856	12,160	15,344	22,196	23,712	24,320
Obs. total	12,960	12,960	12,960	12,960	12,960	12,960	12,960	12,960	25,920	25,920	25,920	25,920
Num. countries (D/S)	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161	81/161
RMSE	2.996	2.337	0.789	0.669	2.626	2.136	0.748	0.749	2.774	2.226	0.769	0.716
Pseudo-R^2	0.673	0.754	0.916	0.938	0.719	0.789	0.928	0.933	0.700	0.775	0.922	0.935
Marginal-R^2	0.058	0.021	0.106	0.074	0.040	0.035	0.100	0.066	0.047	0.029	0.103	0.069
Deviance-R^2	0.712	0.766	0.919	0.942	0.749	0.795	0.930	0.937	0.735	0.783	0.925	0.939
Fixed Effects	S&D	S&D	S&D	S&D	S&D	S&D	S&D	S&D	S&D-Y	S&D-Y	S&D-Y	S&D-Y

Notes: The table reports Poisson Pseudo Maximum Likelihood (PPML) estimates. The outcomes are various forms of international integration across pairs of countries in 2012 (columns (1)–(4)), in 2019 (in columns (5)–(8)), and in 2012 and 2019 (in columns (9)–(12)). In columns (1), (5), and (9), the dependent variable denotes the logarithm of controlled listed firms' market capitalization in destination by shareholder entities in the source country. In (2), (6), and (10), the dependent variable is the market value of ownership (voting rights) from shareholding entities in source and destination country in both widely-held and controlled firms, irrespective on whether the shareholder controls the company. In (3), (7), and (11), the dependent variable denotes international goods exports and imports from source to destination, while in columns (4), (8), and (12) the dependent variable denotes international services trade between origin and destination. The explanatory variable is the logarithm of the population-weighted distance between the source and destination. The specifications include source country and destination country constants, in columns (9)–(12) interacted with a year dummy variable. Pseudo-R^2 is defined as one minus the ratio of the log-likelihood of the fitted model to the log-likelihood for the intercept-only model. Deviance-R^2 is defined as the difference between the model log-likelihood and the highest possible likelihood for a given dependent variable. Double-clustered at source and destination country standard errors are reported below the estimates. *, **, and *** denote statistical significance at the 10%, 5%, and 1% confidence level, respectively.

International Policy Coordination We augment the specification with indicators that equal one when the source and destination are part of a customs union, have Economic Integration Agreements, and Free Trade Agreements (FTA) that often go together with capital taxation provisions to explore the role of international economic policy convergence. [Examples include the North American Free Trade Agreement (NAFTA), the Asian-Pacific Economic Cooperation Forum (APEC), the Central American Common Market, and the Gulf Cooperation Council.] The estimate is highly significant across all permutations. International economic agreements triple cross-border controlling (and passive) equity investment.

European Integration To examine the role of European Integration, we add indicators that switch to one when the two countries are part of the European Union and the Euro Area. The estimate on the EU indicator is unstable, changes sign, and mostly insignificant. But the indicator for euro area enters with a significantly positive coefficient. When the source and destination countries are members of the euro, cross-border controlling shareholding increase threefold. These results add to the literature on the effect of the EU and the euro on financial integration (e.g., Lane (2006), Kalemli-Ozcan et al. (2010)) that has not looked at cross-border corporate control.

4.4.4. Informational frictions and behavioral/cultural barriers

Motivated by recent works uncovering deep, geographic, cultural, and historical origins of comparative development, technology diffusion, and integration (e.g., Spolaore and Wacziarg (2018)), we examine their role in cross-border corporate control augmenting the specification with historical ties/distance measures. [Appendix Table C.13 gives the regression estimates.]

Colonial Ties First, we use a binary variable identifying country-pairs with similar colonial history, as many global firms with foreign (controlling) shareholders originate in the colonial times (e.g., Unilever, Anglo-American), as colonization was, to a great extent, a private enterprise endeavor. Besides, colonization was accompanied with population movements across countries and colonies of the same imperial power, mitigating asymmetric information. The indicator enters with a significantly positive estimate in both the control and ownership specification, implying a doubling of cross-border controlling equity links between pairs sharing a common colonial history.

Cultural Differences Second, we consider three proxies of cultural distance. (i) Cultural distance, retrieved from Spolaore and Wacziarg (2018) and Pellegrino et al. (2021), reflects the average of (Euclidean) differences across dozens of World Value Surveys questions about citizens' values and beliefs on politics, family, work, religion, the environment, and national identity. (ii) Differences in the dominant religion; and (iii) Linguistic distance. The underlying data come from Dow (2015). Cultural distance enters with a negative estimate that, in some specifications, passes significance thresholds. However, the underlying data are unavailable for many countries, preventing definitive conclusions. But linguistic distance enters with significantly negative estimates in most permutations (with and without conditioning on geodesic distance), even controlling for all bilateral controls. The coefficient on linguistic distance is the largest in absolute value, telling of the role of information costs alongside broader cultural differences.

Genetic Differences We also consider a genetic distance variable reflecting the allele frequency differences for about 120 gene loci, as earlier works connect trade and foreign investment and technology adoption to genetic similarities (Guiso et al. (2009), Spolaore and Wacziarg (2018)). The heterozygosity index (FST) measures the probability that two genes at a given locus, selected randomly from the populations of source and destination, will be different. Genetic distance that ranges from 0 to 1 enters with a highly significant unconditional estimate; however, once we condition on geodesic distance (and the other bilateral features), the estimate drops in absolute value and becomes statistically indistinguishable from zero.

4.4.5. Taking stock

The analysis in Fig. 11 (and in Appendix C) yields three main takeaways. First, there is no evidence that foreign controlling shareholders' behavior reflects a motive to invest in countries with dissimilarities in production, asynchronous business cycle dynamics, and low equity market return correlations, to realize international diversification gains. Second, frictions in corporate control markets, dissimilar legal systems and weak international economic policy coordination are correlated with lower integration of cross-border control markets. The use of the euro and the accompanying financial sector harmonization policies do seem to matter, with a caveat that estimates do not reflect a causal mechanism. Third, cultural, linguistic, and historical ties go hand in hand with cross-border controlling links, hinting at informational and perhaps behavioral biases which lead to the segmentation of the market for corporate control. The top-bar of Fig. 12 gives further insights on the role of the various country and bilateral factors in cross-border corporate control, plotting the increase in McFadden's pseudo R^2, as we progressively augment the baseline gravity specification. First, size alone yields a pseudo R^2 of about 0.5, telling of the role of market depth. Accounting for tax haven status and institutions improves modestly the gravity model fit. Second, the role of distance, while significant, is modest. Third, among bilateral features, legal system similarities and economic policy coordination can explain a similar amount as geodesic distance. Informational frictions and behavioral biases, stemming from linguistic, religious, and genetic distances are quite important, improving the pseudo R^2 by about 0.1.

4.5. Investor type heterogeneity

We explored heterogeneity of the role of size and distance, source and destination country features, diversification motives, asset market and informational frictions on cross-border corporate control distinguishing across investor types to inspect the underlying forces. We also distinguished between controlling shareholders in high and middle-income countries without detecting heterogeneity. (See Appendix Section D.2). Following ORBIS' classification of shareholder entities, we distinguish between banks, non-bank financial institutions (hedge funds, private equity, and venture capital), government, individuals/families, and other

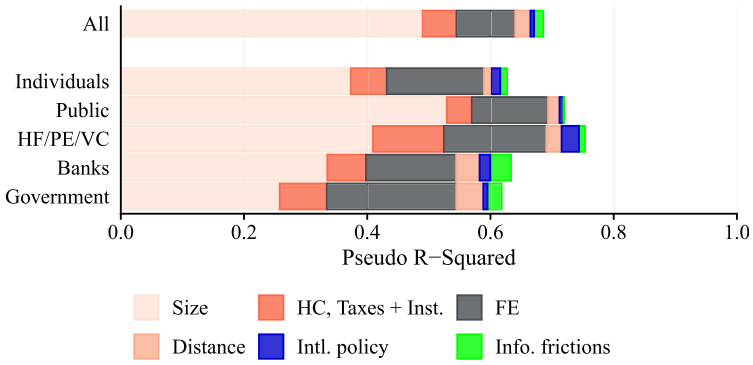

Fig. 12. Corporate control by shareholder type.
The Figure plots the cumulative (McFadden's) pseudo-R^2 in Poisson Pseudo Maximum Likelihood (PPML) specifications in the pooled across 2012 and 2019 sample. The dependent variable is the market capitalization of controlled firms in destination country from various types of shareholding entities in the source country. Each bar gives the *pseudo* $-$ R^2 from six specifications: ((i) Cross-sectional gravity with size (GNI per capita and population at source and destination) in *beige*. (ii) Adding to size, indicators of tax haven, effective capital, and labor taxes, schooling (Human Capital), and rule of law at source and destination (in *red*). (iii) A specification with source and destination country constants (in *dark grey*). (iv) Augmenting the source and destination country fixed-effects specification with the log of distance (in *light orange*). (v) Adding to the source and destination fixed-effects and log distance, all proxies of asset market frictions variables, international economic policy coordination (EU, Euro-area, investment treaties, Economic Integration Agreements, Free Trade Agreement) and legal similarities (in *blue*). We omit the diversification related variables (industrial and business cycle similarities) as they are insignificant and the sample drops. We report these results in the Appendix (Section D.1). (vi) Adding linguistic, religious, genetic, and historical similarities measures to capture information frictions and behavioral biases (in light *green*). The number of control links per category are as follows: There are 688 bilateral control links where the ultimate controlling shareholding entity is an individual or family; 560 with another public company being the controlling shareholder; 301 with non-bank financial companies (hedge funds, private equity, venture capital) as controlling shareholders; 181 with banks; and 214 with foreign government entity as the ultimate controlling shareholder.

public companies and repeated the analysis for each main controlling shareholder type. As the number of zeros in the matrix of cross-border control increases considerably when we look separately across investor types besides PPML, we estimate linear probability models (LPM).

Fig. 12 plots the evolution of McFadden's pseudo-R^2 for each block of explanatory variables from six specifications: (i) Cross-sectional gravity with GNI p.c. and the population at source and destination (in *beige*). (ii) Adding to size, indicators of tax haven, capital and labor taxes, schooling, and the rule of law at source and destination (in *red*). (iii) Simply with source and destination country constants interacted with a year index (in *dark grey*). (iv) Augmenting the source and destination country fixed-effects specification with the log of distance (in *light orange*). (v) Adding to the source and destination fixed-effects and log distance, all proxies of asset market frictions, international economic policy coordination, and legal similarities (in *blue*). (vi) Adding linguistic, religious, genetic, and historical similarities measures to capture information frictions and behavioral biases (in light *green*). Appendix Section D.1 gives PPML and LPM coefficients.

Some noteworthy patterns emerge that shed light on the mechanisms underlying the baseline results. First, the core gravity model does a good job across all types of investors (with the minor exception of governments' when investing abroad), suggesting that size effects are chief. Second, taxes institutions, and human capital features are most important for financial institutions (banks and HF/PE/VC), hinting at the prominence of financial regulation and supervision. Third, and in line with the conjecture that financial regulatory and legislative issues are chief for financial institutions, international economic policy agreements and legal system similarities explain a non-negligible portion of foreign controlling investment for banks and HF/PE/VC. International policy agreements and legal system similarities do not correlate with control by families/individuals. Fourth, informational frictions and behavioral biases, linked to historical and cultural differences are first-order for banks and HF/PE/VC.

5. Conclusion

Summary We provide new mappings of cross-border corporate control identifying controlling shareholder entities from the often obscure corporate ownership network for about 22,000 public companies listed in 81 countries after the global financial crisis, in 2012, and just before the pandemic, in 2019. Home bias in corporate control is sizable, especially in larger and more developed countries. The role of offshore financial centers appears on average modest, but heterogeneous. The network structure of control is sparse, with few links and mainly across developed and large emerging markets. We explore the correlates of bilateral links, aiming to grasp the underlying forces and to provide a guide to theoretical explorations of international control. First, a workhorse gravity model performs well in explaining cross-border corporate control; controlling shareholder links are higher for countries which are more populous, richer, and with more developed capital markets. While distance enters with a significantly negative elasticity, the magnitude is weaker than for international trade. Accounting for tax haven status and institutional quality improves modestly the model fit, while education, trust and capital tax rates do not correlate with control across borders. Second, we isolate the role of bilateral features. Frictions in the market of corporate control, related to differences in the legal system and imperfect international policy coordination matter, especially for banks and other financial institutions, telling of the role

of legislative-regulatory harmonization in global capital markets. Religious, genetic, and mainly linguistic differences are first-order, especially for individuals and families, revealing deeply-rooted informational frictions and behavioral/cultural barriers to the integration of corporate control markets.

Future Research Our mapping of cross-border corporate control calls for future research. On the theoretical side, the strong home-bias and network sparsity, coupled with the role of legal system similarities, international policy cooperation, and the importance of information and cultural barriers for individuals, can provide the empirical backbone for theoretical explorations on the globalization of control markets. Blending insights from international finance research justifying a gravity structure (e.g., Martin and Rey (2004); Head and Ries (2008)), based on market segmentation reflecting historical and cultural barriers (Pellegrino et al. (2021)) with agency costs on cross-border controlling equity investment (as in Shleifer and Wolfenzon (2002)) appears a fruitful avenue. On the empirical side, expanding the data backward to examine dynamics and advance on identification would be valuable. Besides, one can compare our mappings of corporate control taking direct and indirect links with other re-drawings of capital flows (Coppola et al. (2021)) to understand the propagation of shocks across countries, grasp, and model the special role of offshore jurisdictions. Finally, international corporate ownership and control could play a part in the diffusion of managerial practices across borders.

Declaration of Competing Interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jinteco.2023.103754.

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