Capital Controls and International Trade: An Industry Financial Vulnerability Perspective*

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Abstract

Capital control policies have consequences on economic growth and international trade. Using data on 99 countries from 1995-2014, we find evidence that the effect of capital controls on trade vary across industries that have differing levels of external financing and asset tangibility. For exporter countries that tighten capital controls, industries that rely more heavily on external financing experience a larger decline in exports, while industries that possess more tangible assets experience a smaller decline in exports. For importer countries, tighter capital controls imply a decrease in trade, and this effect is uniform across all industries. The pattern with respect to external financing persists after accounting for availability of domestic credit and the differences in industry shares, and are predominantly found in countries with low levels of financial development. On the other hand, the varying effect related to asset tangibility is mostly absorbed by domestic credit market.

JEL Classification: F14, F38, F68.

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1 Introduction

International trade typically involves cross-border capital flows. Liquid and free capital flows facilitate global exchange of goods and services, as they lower the financial barriers in trade transactions and promote trade-related investment. Capital controls interrupt cross-border capital flow and have important implications for international trade. First, firms require financing, including foreign capital, for their international trade transactions. Capital controls increase the cost of financing, both directly and through bank mediation. The literature has emphasized the heterogeneity of financial vulnerabilities across industries, and since industry heterogeneity contributes significantly to trade adjustment, it profoundly affects the impact of capital controls on trade across different industries. Second, capital controls could affect the relative prices of goods through the exchange rate. But there is limited research on the direct links between capital control policy and trade.

Our paper evaluates how capital controls impact trade across industries with differing levels of financial vulnerability. Tamirisa (1998) and Wei and Zhang (2007) present evidence of how capital controls, specifically exchange controls, directly impact trade. Wei and Zhang (2007) find that increases in exchange controls imply a sizable decline in trade, equivalent to a tariff increase of around 11 to 14 percentage points. At a more granular level, Manova (2008) exploits the industry heterogeneity of financial vulnerability and finds that equity market liberalization, an aspect of capital account liberalization, disproportionately increases exports in sectors with higher levels of financial vulnerability. Expanding the instruments of capital controls under study, this paper examines how industry financial vulnerability influences the impact of capital controls on trade.

Our paper contributes to the literature in a number of ways. First, we extend the analysis of current literature using more comprehensive data of capital controls, trade, and financial vulnerability. Our data exploit variations in both capital control intensity across 99 countries from 1995 to 2014 and in financial vulnerability across 27 sectors. We adopt a new *de jure* measure on capital control intensity from Fernández et al. (2016) which breaks down capital control policy by resident basis in ten asset classes. This gives us a more detailed perceptive on capital control policy compared to widely-used indicators, including the Chinn-Ito index (Chinn and Ito 2008) and some *de facto* measures (Lane and Milesi-Ferretti 2003). We update measures of financial vulnerability

(Rajan and Zingales 1998; Braun 2003) to our period of interest and create country-variant industry measures (Choi 2019).

Second, we examine the effects of capital controls of both exporting and importing countries on bilateral trade flows. The literature has focused on exporting countries (Manova 2008; Eichengreen, Gullapalli and Panizza 2011), but capital control policies of exporting and importing countries impact capital flows. We argue that restrictions on capital inflows and outflows by either the exporter or importer in a trade transaction have important implications.

Additionally, we identify the direct effect of capital control policies on trade. These policies affect a firm's direct access to foreign capital, but also have important implications for domestic credit availability, for instance, through their impact on commercial banks' access to international markets. We attempt to separate these effects by recognizing the heterogeneous effect of domestic credit on export (Manova 2013). In line with the literature that well-developed financial institutions and related legal systems mitigate the impact of capital control policies (Schmukler and Vesperoni 2006; Forbes 2007), we also contrast the effect between financially developed and less-developed economies.

Our empirical model explores the interactions of capital control tightness and industry financial vulnerabilities from Rajan and Zingales (1998) and Braun (2003). We employ a difference-in-difference design similar to that used in other studies (Manova (2008), Friedrich, Schnabel and Zettelmeyer (2013), and Eichengreen, Gullapalli and Panizza (2011)). We also include variables pertaining to the importing countries and control for the availability of domestic credit in the exporting countries. Our innovation to the empirical model allows us to do two things: first, we are able to see the differential effects of capital control policies in both the exporting and importing countries on trade flows across the different industries; and second, we are able to disentangle the effects between domestic and foreign capital flows. We then set up a triple interaction model that adds in the dimension of financial development and explore how capital controls impact trade in less versus highly financially developed countries.[1]

We find that industries that require higher levels of external financing are more exposed to the

[1]Unlike Manova (2013), our model incorporates capital control policies in addition to interactions between financial development and industry financial vulnerability.

negative effects on trade of exporter capital controls, while industries that have higher levels of asset tangibility are better shielded from such effects. On the other hand, our results suggest that higher levels of capital controls by an importing country imply lower levels of trade, but this effect tends to be homogeneous across all industries. These results are consistent with the findings in Manova (2008). After controlling for the availability for domestic credit, the heterogeneous effects of external financing dependence remains robust, though the effects of capital controls no longer vary across industries of different asset tangibility. This is consistent with the idea that asset tangibility tends to be more important for domestic financial markets (Braun 2003).

Furthermore, we find that the negative effects of tighter capital controls on external-financing-dependent industries are less pronounced in exporting countries with more developed financial systems. This result coincides with the findings of Beck (2003) and Manova (2013) that financially developed countries have a comparative advantage in industries more intensive in external financing.

Our results are robust to using alternative measures of key variables. First, our results using alternative measures of capital control intensity, including Chinn-Ito, and $defacto$ capital controls measure, are consistent with the baseline results. Second, we explore alternative assumptions on measures of industry financial vulnerability to those in Rajan and Zingales (1998). We update the industry measures using data from 1995 2014, to account for technology development relative to late '80s and early '90s, adopted in Rajan and Zingales (1998). We also create country-variant industry measures, relaxing the assumption of representing the world with US industries (Choi 2019).

The paper is structured as follows. Section 2 provides macro- and microeconomic motivations for our empirical strategy. Section 3 presents our baseline estimation strategy. Section 4 describes the data. Section 5 presents our main results and findings, along with robustness checks. Section 6 discusses the role of financial development in the relationship between capital controls and trade. Section 7 concludes.

2 Background on Capital Controls and International Trade

Capital control policy has been a highly debated topic in macroeconomics. Despite a rich and long-lasting debate on the relationship between capital controls, or capital account liberalization, and overall growth, the results have been inconclusive. Henry (2007) and Quinn and Toyoda (2008) point to a positive relationship between capital account liberalization and growth, while Rodrik (1998) and Kose et al. (2009) fail to find the same. The disagreement in the literature encourages further studies of the impacts of capital controls on specific components of economic growth.

Capital control policies affect international trade through multiple channels. First, they can be used to maintain a fixed, and sometimes undervalued, exchange rate, which spurs export growth. According to the trilemma in international economics, if an economy is to retain monetary autonomy, it faces a trade-off between a stable exchange rate and free capital movement. A stable exchange rate is conducive to trade growth as it eliminates the uncertainty of exchange rate fluctuations (Fleming 1962; Mundell 1963). For example, Jeanne (2012) argues that China's capital control policies prevented domestic investors from borrowing abroad when its central bank accumulated massive foreign reserves. This contributed to a high domestic savings rate and real undervaluation of the currency, a driver for the Chinese export hikes of the 2000s. In this case, capital control policies have affected trade growth directly by altering the relative prices of goods across countries.

Second, capital control policies also affect trade through their impact on the cost and supply of domestic capital. Firms borrow externally when internal cash flow is not sufficient to maintain production and daily operations. Surveying both micro- and macroeconomic evidence, Forbes (2007) argues that capital controls reduce the supply of capital, raise the cost of firm financing, and increase financing constraints, especially for firms that do not have access to international capital markets or preferential lending. These effects of capital flow restrictions are heterogeneous across firms. Chor and Manova (2012) and Manova (2013) further propose detailed mechanisms through which credit constraints affect exports during the global financial crisis and through a country's financial development respectively. Looking specifically at trade credit, Auboin and Engemann (2014) and Eck, Engemann and Schnitzer (2015) document the stimulating effect of credit availability on international trade. Manova (2008) bridges the literature of capital account

openness and credit constraints, and shows that financial liberalization promotes trade through a credit availability channel, arguing that financial liberalization promotes trade disproportionately in sectors intensive in external finance or with softer assets.

Third, capital controls create frictions that add to the cost of trade. A transaction of international trade usually takes at least weeks, if not months, to close. The extended length of transactions exacerbates the effect of rising cost of capital on international trade. If financial guarantee is absent from banks, capital control policies further discourage trade transactions by amplifying the uncertainty of capital availability. Government enforcement further imposes additional administrative costs, such as intensified border inspections and increased documentation requirements, further increasing the cost of trade (Wei and Zhang 2007).

The effect of capital control on international trade is also heterogeneous across industries. Manova (2013) provided plausible explanations of why and how exporters use external finance. Firms incur fixed costs for R&D, product development, marketing and advertising, and investment in equipment. For exporting firms, additional fixed costs are incurred from involvement in foreign markets, including making further market-specific investments, customizing products for individual markets, complying with international regulatory standards, and constructing foreign distributional networks. Firms also incur upfront variable costs in intermediate input purchases, advanced salary payments, and land or equipment rentals. Differences among industries' reliance on external finance, especially foreign capital finance, and their ability to secure credible collateral to access funding leads to heterogeneous trade impacts of capital flow restrictions.

The Bank for International Settlements (2014) provides a recent snapshot of the structure of international trade financing: roughly 40 percent of global trade transactions are financed by bank-intermediated trade finance and the remainder by inter-firm trade credit. Regardless of the means of finance, an international trade transaction entails a capital flow from the importing to the exporting economy and a flow of goods or services in the opposite direction. We hypothesize that capital control policy influences the pattern of international trade as follows. In the exporting country, higher levels of capital controls, particularly those on inflows, reduce the amount and raise the cost of capital an exporting firm is able to borrow, especially from foreign sources. In the destination country, higher levels of capital controls, especially on outflows, restrict an importing

firm's ability to transfer capital out of the country, whether it is used for transaction costs or to fund the exporter. In this regard, capital control policy can be viewed as a source of comparative advantage, where a country that imposes tighter capital controls has comparative advantages in industries that depend less on external finance or cross-border capital finance.

3 Empirical Strategy

Tamirisa (1998) and Wei and Zhang (2007) suggest that capital controls have adverse effects on international trade. Our simple approach, explained in Appendix A.2, replicates the empirical strategy from the earlier literature using our larger paneled sample. The coefficients suggest that capital controls negatively affect international trade for the average industry.

Our baseline empirical approach posits that, because of their technological nature, different industries have varying degrees of dependence on external finance (efd), as opposed to internal finance, typically referring to the cash flow generated from firm operations. Industries also have varying degrees of asset tangibility (at), which further accounts for investor behavior in an environment of poor financial contractibility. Specifically, efd describes the extent to which the median firm of an industry relies on capital external to the firm and at describes the proportion of hard assets in total book-value assets for the median firm of an industry, an approximation for the strength of collateral and assurance for financiers.

To explore further the dynamics between capital controls and trade, we hypothesize that for both the exporting and importing countries, (1) industries that rely more on external financing are more exposed to the negative effects of capital controls, and (2) industries with higher asset tangibility are less exposed to these effects. In other words, the effects of capital controls are stronger on industries that have higher levels of financial vulnerability.

This hypothesis can be tested by estimating a differences-in-differences regression in which the effect of capital controls on trade varies with the level of financial vulnerability, for both exporters

and importers. Formally, the estimation equation underlying the baseline specification is:

$$log(Trade_{i,j,n,t}) = \beta X_{i,n,t} + \gamma M_{j,n,t} + \xi Z_{i,j} + \theta_1 KC_{j,t} + \boldsymbol{\theta_{2i} KC_{i,t} \times efd_n} + \boldsymbol{\theta_{2j} KC_{j,t} \times efd_n} + \boldsymbol{\theta_{3i} KC_{i,t} \times at_n} + \boldsymbol{\theta_{3j} KC_{j,t} \times at_n} + \delta_{it} + \delta_{jn} + \epsilon_{i,j,n,t} \quad (1)$$

where the dependent variable $log(Trade_{i,j,n,t})$ is the natural log of the value of trade flow from exporting country i to importing country j in industry n at time t. For our primary measurement of capital controls, $KC_{i,t}$ is the level of capital inflow controls of the exporter country over time, and $KC_{j,t}$ is the level of capital outflow controls of the importing country over time. $X_{i,n,t}$ and $M_{j,n,t}$ are vectors of country and industry controls for exporter i and importer j respectively at time t.[2] $Z_{i,j}$ is a vector of gravity model variables between the trading partners.[3] The use of exporter $\times$ time (δ_{it}) and importer $\times$ industry (δ_{jn}) fixed effects help mitigate endogeneity problems.[4] Following standard trade literature, we cluster the standard errors in all our specifications on country pair. Our preferred specification uses export data to exclude insurance and transaction costs in the trade value. These costs are potentially endogenous to the use of capital controls, and are usually included in the import data.

The main coefficients of interest are θ_{2i}, θ_{2j}, θ_{3i} and θ_{3j}. θ_{2i} and θ_{2j} capture the differential impacts of capital controls of the exporting and importing countries on bilateral trade across industries with varying external finance dependence, respectively. If the negative effects of capital controls are exacerbated in industries with higher external finance dependence, θ_{2i} and θ_{2j} will be negative. Similarly, θ_{3i} and θ_{3j} capture the differential impacts of capital controls on trade based on varying degrees of asset tangibility across industries for the exporters and importers respectively. If the negative effects of capital controls are mitigated in industries with higher assurance

[2] $X_{i,n,t}$ (exporter controls): Capital-Labor Ratio $\times$ Physical Capital Intensity and Human Capital Index $\times$ Human Capital Intensity. $M_{j,n,t}$ (importer controls): capital-labor ratio, human capital index, real GDP, real effective exchange rate, tariffs, capital-labor ratio $\times$ physical capital intensity, and human capital index $\times$ human capital intensity, and GATT/WTO affiliation.

[3] $Z_{i,j}$ (gravity variables): distance, common language, former colony, common currency, and common religion.

[4] These fixed effect choices follow from Chor (2010).

for investors, θ_{3i} and θ_{3j} will be positive.

Manova (2013) shows that domestic financial frictions impede exports differently based on industry financial vulnerability. In order to isolate the direct effect of capital control policy on international trade, we further control for domestic credit interaction variables. Formally, we extend Equation 1:

$$\begin{aligned} log(Trade_{i,j,n,t}) = \beta X_{i,n,t} + \gamma M_{j,n,t} + \xi Z_{i,j} + \theta_1 KC_{j,t} + \boldsymbol{\theta_{2i} KC_{i,t} \times efd_n} + \boldsymbol{\theta_{2j} KC_{j,t} \times efd_n} \\ + \boldsymbol{\theta_{3i} KC_{i,t} \times at_n} + \boldsymbol{\theta_{3j} KC_{j,t} \times at_n} + \phi_1 DomCredit_{i,t} \times efd_n + \phi_2 DomCredit_{i,t} \times at_n \\ + \delta_{it} + \delta_{jn} + \epsilon_{i,j,n,t} \end{aligned} \tag{2}$$

θ_{2i}, θ_{2j}, θ_{3i}, and θ_{3j} remain the main coefficients of interest, but interpretation is however slightly different. In this specification, θ_{2i}, θ_{2j} θ_{3i} and θ_{3j} capture only the direct impacts of capital controls on trade depending on the financial vulnerability of the industry for both the exporting and importing countries. The indirect effects, whereby capital control affects trade by affecting domestic credit availability, are captured by the interaction of financial vulnerability and domestic credit availability.

A limitation to this empirical strategy lies in the difficulty of identification of industry in the importing country. While it is safe to assume that exporting firms specialize in the industry identified by the trade flow, the importing firms do not have to be in the same industry. In other words, the consumers are not necessarily in the same industry as the producer. Hence, we recognize that our explanation for effects on the importer side is limited.

4 Capital Controls, Industry, Trade, and Country Data

Our data consist of four main parts: measures of capital controls, measures of industry financial vulnerability, international trade statistics, and additional control variables. In this section, we highlight the construction and limitations of our final sample.

Capital Controls

It is difficult to precisely measure the intensity of capital control policies. Past studies have used *de jure*, *de facto*, or hybrid indicators. Quinn et al. (2011) argue that *de jure* indicators are subject to error since the actual implementation of the policy might be different from what the policy intended. Additionally, the International Monetary Fund (IMF) *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER), on which most *de jure* indices are based, never methodologically defines the "switch point" of binary transition between restriction to no restriction in its categorical tables. On the other hand, *de facto* measures are highly susceptible to endogeneity problems, where outcomes are likely a consequence of more than one policy. Following the majority of studies in the literature, we adopt *de jure* measurement of capital control intensity as our preferred measurement. We utilize a comprehensive dataset on *de jure* capital controls, compiled by Fernández et al. (2016) based on the text descriptions of capital controls in AREAER. Compared to a construction based on the categorical tables, text-based *de jure* indicator has the advantage of covering a wider range of asset categories, and distinguishing between inflow and outflow transactions. The dataset reports annual restrictions on inflow and outflow for 10 asset categories across 99 countries from 1995 to 2015.[5] The direction of flow is determined by the residency of the buyer or seller of a transaction, and whether the transaction denotes a purchase or a sale. Each transaction category is characterized binarily, with 1 representing presence of restriction and 0 representing absence of restriction.[6] This binary measure is assigned based on the authors' interpretations of the detailed narrative descriptions for each country in yearly AREAER reports.

The richness of this dataset enables a detailed analysis of the effects of capital restrictions at different levels. Three different specifications of capital control are used in our analysis. First, we measure capital control intensity at the inflow and outflow level by taking the average across 10

[5] 10 asset categories: money market instruments, bonds, equity, collective investment securities, financial credit, derivatives, commercial credit, guarantees, real estate, and direct investment.

[6] There are four transaction categories for most asset categories, each assigned a binary variable based on AREAER. Inflow refers to assets purchased locally by nonresidents or sold abroad by residents. Outflow refers to assets purchased abroad by residents or sold locally by nonresidents.

asset categories for inflow or outflow. Second, overall capital control intensity is constructed as an average of inflow and outflow capital control intensity. Third, capital control intensity is measured for only a subset of asset categories that are closely related to international trade.

Fernández et al. (2016) also groups countries into three categories based on capital control strictness: wall (high level of capital controls), gate (some capital controls), and open (few or no capital controls). These groups are consistent over time and do not change much beyond 2000. Countries are also considered based on income levels (advanced economies, emerging-market economies, and low-income countries) as classified by the IMF. Figure 1 shows average levels of capital control over time by capital control strictness group (panel a) and by income group (panel b), from 1995 to 2014. The levels of capital controls remain fairly stable over the past 20 years regardless of strictness. Panel b shows that there is a clear separation in capital control intensity between the emerging markets and advanced economies.

In our baseline test, we focus on capital control measures for inflow or outflow, using capital control inflow intensity for exporters and outflow intensity for importers. In our robustness test, we consider four additional capital control measures: *KC All*, *KC Trade*, *de facto* capital controls, and the Chinn-Ito index. *KC All* represents the overall level of capital control based on Fernández et al. (2016), with no differentiation based on inflow or outflow restrictions. $KCTrade$ uses only the four main categories of assets that pertain to trade from Fernández et al. (2016): commercial credits, financial credit, guarantees, and direct investment. *De facto* capital controls are calculated as the ratio of foreign assets and liabilities to GDP, following the approach outlined in Lane and Milesi-Ferretti (2003). The Chinn-Ito index from Chinn and Ito (2008) is a widely used *de jure* measurement of financial openness.[7]

Industry Financial Vulnerability

We obtain measures on industry financial vulnerability from Rajan and Zingales (1998), Manova (2008), and Braun (2003). Table A1 presents the data for 27 industries at the three-digit level of

[7]Chinn and Ito (2008) use data based on categorical tables in IMF's AREAER to construct their financial openness index, $KAOPEN$. The index aims at measuring the extent of the overall openness in cross-border transactions related to capital control policies and regulations.

International Standard Industrial Classification (ISIC) Revision 2, along with factor intensities for the industries from standard sources.

External finance dependence, defined by Rajan and Zingales (1998), is calculated as the ratio of capital expenditures less cash flow from operations to capital expenditures for the median firm in each industry. It measures an industry's reliance on external capital. Asset tangibility, defined by Braun (2003), is calculated as the share of net property, plant, and equipment in total book-value assets for the median firm. It measures an industry's typical strength of collateral, a crucial precondition to access external financing. Both measures are based on data on US-headquartered firms and are averaged over the period of 1986 1995. These two measures are of particular interest to us as exporting firms tend to incur significant upfront costs that are typically financed by external capital, which is backed by collateral in the form of tangible assets.

Manova (2013) argues that external finance dependence may not capture all expenditures for international trade, but it is an appropriate proxy. The empirical data used to construct the variables are mainly based on large US exporters, further suggesting that external finance is more connected to international trade than domestic activities. While both external finance dependence and asset tangibility measures are constructed using US company data, Rajan and Zingales (1998) and Braun (2003) argue that their respective measures capture a large technological component innate to the manufacturing process in a sector and are good proxies for ranking industries across all countries in terms of their financial vulnerabilities. The highly developed US financial system implies that these measures tend to reflect a firm's optimal choice over external financing and asset structure.[8]

International Trade

We obtain annual export and import trade data from the UN Comtrade Database for each country at the six-digit Harmonized System (HS) product level from 1995 to 2014. Using appropriate industry concordances from World Integrated Trade Solution (WITS), we aggregate trade flows to the three-digit ISIC level. While export and import data reflect the same trade transactions

[8]The industrial measures are treated as time-invariant over the period of interest to smooth fluctuations over time and reduce the effects of outliers.

between two countries, the trade values might vary because different calculation methods might be used. We use export data in our preferred specification and import data in our robustness check. The trade values are normalized to 2010 US dollars, using personal consumption expenditures index from Federal Reserve Economic Data (FRED). Figure 2 presents the levels of exports from 1995 to 2014 by income group.

Country Variables

We include essential control variables that have profound effects on countries' bilateral trade. We control for a country's economic size with its real GDP level taken from the World Development Indicators (WDI) database of the World Bank. To capture the effects of trade barriers, we include yearly tariff data from WDI, a simple average of tariff rates across all manufactured products. We obtain data on domestic credit from two sources: private credit over GDP from the World Bank for our full sample of countries, and domestic credit to the non-financial sector from the BIS for a smaller sample of 43 countries. To control for the effect of exchange rate fluctuation, we use real effective exchange rate (REER) data from Darvas (2012). For our gravity model specification, we include standard gravity model variables from CEPII.[9] For financial development, we use financial development data from Svirydzenka (2016), who constructs and classifies financial development indices for 180 countries since 1980. We use Penn World Table 9.0 for information on a country's capital stock, physical capital, human capital, engaged population, and employment to control for a country's factor endowments (Feenstra, Inklaar and Timmer 2015). To account for a country's production capabilities and comparative advantage in global trade, we construct our country capital-labor ratio using the Penn World Table from 1995 to 2014 (Feenstra, Inklaar and Timmer 2015).[10]

[9] `http://www.cepii.fr/cepii/en/bdd_modele/bdd.asp`

[10] We define the capital-labor ratio as the capital stock divided by engaged person. Capital stock reflects the prices for structures and equipment within the countries and engaged person is defined as employees or self-employed.

4.1 Summary Statistics

For our empirical analysis, we primarily look at 2,112,778 annual export trade entries that span 27 industries and 99 exporting and importing countries from 1995 to 2014. Each trade entry we look at contains a full set of country observables for both the exporting and importing countries. We use export entries for two reasons: (1) export entries exclude any additional cost of shipment, insurance, and other trade costs, and we want to eliminate the noisy and potentially endogenous factors of trade or transaction costs, and (2) because of reporting standards, export data are more consistent for identifying the source country and the amount it is exporting. We use the 2,352,595 import trade entries as an added robustness check. Table 1 presents the summary statistics of the variables in our dataset, where each unit of observation is at the exporter-importer-industry-time level.

5 Baseline Results

Table 2 reports the baseline results from equations 1 and 2. Columns 1 and 2 examine the dynamics from exporter and importer capital control policies respectively. Column 3 reports the results of equation 1. The main coefficients of interest are those on the interaction terms involving exporter capital control policies (KC), which correspond to θ_{2i} and θ_{3i} in equations 1 and 2. The two coefficients capture the differential impact of exporter capital inflow control policies on industries of varying financial vulnerabilities. We find strong evidence that a more external financing dependent industry is more negatively impacted by the imposition of capital inflow control in an exporting country. The estimated coefficient is negative and significant at 1 percent level consistently. We also find evidence that an exporting economy's capital control policy has a varying effect depending on an industry's ability to access funding and assure investors, proxy-measured by asset tangibility. The estimated coefficient is positive and significant at the 1 percent level in columns 1 and 3. The result confirms the idea that the effect of exporter capital inflow control in general is exacerbated for industries with higher reliance on external finance, and mitigated for industries with higher asset tangibility.

However, capital control policies affect both domestic and foreign credit environment. Manova

(2013) argued that domestic credit condition affects trade heterogeneously depending on the financial vulnerability of the industry. Columns 4 and 5 attempt to isolate the effects of changes in foreign credit environment, induced by capital control policy, on international trade, by further controlling for the domestic credit market dynamics explained in Manova (2013). Two measures are used to proxy domestic credit condition. Column 4 uses domestic credit to non-financial sector, a more direct measure of credit directed to potential exporting firms provided by BIS, while column 5 adopts a more conventional metric of domestic credit to private sector as a share of GDP, used in the literature including Manova (2013).

The differential impact of export capital inflow control on industries with varying external finance dependence remains strong. The estimated coefficient remains significant and negative, with an expected drop in magnitude due to the removal of domestic credit market dynamics. The direct impact of capital inflow control, however, no longer varies across industries of different asset tangibility, as the coefficients become insignificant. This implies that asset tangibility tends to be more important for domestic financial markets, as shown by the statistically significant coefficients on domestic credit market dynamics (Braun 2003). It is consistent with the idea that less stringent credit conditions promote the growth of industries with higher reliance on external finance and are more advantageous for industries with weaker collateral (Eichengreen, Gullapalli and Panizza 2011; Manova 2013).

We calculate differentials in trade volumes in order to gauge the economic significance of the statistically significant coefficients, following the methodology from Rajan and Zingales (1998) and Friedrich, Schnabel and Zettelmeyer (2013). Consider two industries at the 25th and 75th percentiles in terms of external finance dependence, and two countries at the 25th and 75th percentiles in terms of exporter capital control intensity. We compare the differentials in export volume of the two industries across two countries. Column 5 reports our preferred baseline results. The estimated coefficient of -0.46 implies that the difference in export volume between the two industries is 12 percent more negative or less positive in a country with high capital control intensity compared to a country with lower capital control intensity.[11]

[11] We arrive at this value by doing the following back of the envelope calculation: $-0.46 * (KC_{p75} * efd_{p75} - KC_{p25} * efd_{p25})$. So, $-0.46 * (0.67 * 0.40 - 0.05 * 0.06) = -0.12$

The next set of coefficients of interest are those on the interaction terms with importer KC (corresponding to θ_{1j} and θ_{2j} in equations 1 and 2). The point estimates for the interaction effects on the importer side are insignificant for all but one specification, suggesting that industries of varying degrees of financial vulnerabilities are impacted similarly by an importer's capital outflow restrictions. The lack of findings is potentially caused by the fact that the industry of a trade flow tends to characterize the exporting firm correctly, but often does not match the industry of an importing firm.[12]

5.1 Robustness Checks

We conduct a series of robustness checks for our baseline results. First, we check against choices of KC measures. Second, we check the robustness to alternative constructions of external finance dependence and asset tangibility. Finally, we conduct robustness checks for other considerations, including the use of different data and samples, simultaneity biases, and the inclusion of industry shares in the regressions.

Alternative Measures of Capital Control

We first examine our results remain robust to the choice of capital control measures, as seen in table 3. In addition to capital inflow and outflow controls imposed by the exporting and importing countries respectively in the baseline result, we adopted four other capital control measures. First, we use $KCAll$, an aggregated measure of capital control intensity that includes restrictions on inflows and outflows from Fernández et al. (2016). As reported in column 2, the interactive effects of exporter capital controls and external finance dependence remain negative and significant, and the order of magnitude is similar to that of our baseline result. We create another capital control measure, $KCTrade$, from Fernández et al. (2016), including only the asset categories that are potentially related to international trade. As reported in column 3, when using capital control measures that pertain to international trade, the differential effect of capital control depending on external finance dependence is more prominent. We also use the widely cited Chinn-Ito index, a *de jure* measure of overall financial openness based on AREAER categorical tables Chinn and Ito

[12]Further analyses using input-output matrices might be useful to address this issue.

(2008). Contrary to the scoring system in Fernández et al. (2016), a higher score implies a more open capital account in Chinn-Ito index. Hence, we expect an opposite sign on the coefficients to our baseline result. A positive and statistically significant point estimate in column 4 hence also supports our baseline result. A *de facto* measure, defined as the ratio of the sum of foreign assets and liabilities to GDP and constructed following Lane and Milesi-Ferretti (2003), is used in column 5. The amount of capital involved in lending to or borrowing from the international community relative to its economic size can be viewed as a proxy for the openness of a country's capital account. A higher ratio implies a more open capital account. A positive and statistically significant point estimate in column 5 confirms our baseline result.

Overall, using alternative capital control measures does not alter our main results, as seen with the consistent signs of our interaction coefficients. The statistically significant estimates in table 3 confirm that capital controls do have varying effect based on the external financial dependence of the industry.

Alternative Measures of Industry Financial Vulnerability

We explore two further variations of our measures of financial vulnerability. Our baseline result adopts the financial vulnerability data directly from Rajan and Zingales (1998) and Braun (2003), which are based in the 1980s and early 1990s.

Considering that industry characteristics evolve over time, we first reconstruct the financial vulnerability measures using firm-level data in the concurrent period of our analysis (1995-2014). An important assumption in Rajan and Zingales (1998) is that external financial dependence is an inherent technological nature of an industry that persists across all countries. The use of US-headquartered firms for the construction of industry characteristics further embeds the assumption that the US financial market is the closest to a complete market with little financial friction. On the other hand, Choi (2019) argues that external finance dependence is country-variant due to differences in institutional policies and market situations. To examine the effect of this proposition, we construct country-varying measures of external financial dependence and asset tangibility.[13] When reconstructing these measures, we also consider two different periods: before the global

[13]Detailed methodology and summary statistics of the reconstruction are documented in appendix section A.3.

financial crisis (1995-2007) and after (2008-2014).

Table 4 presents the results using the new efd and at measures computed using North American Compustat for US firms and Global Compustat for firms in other countries. Column 1 replicates the baseline results from table 2. Column 2 presents the results using the updated efd and at constructed based on US firms from the period 1995-2014. Columns 3 and 4 report the results of updated efd and at in pre- and post-crisis periods. Despite a drop in magnitude, the point estimates on the interaction terms of capital controls and external financing dependence remain negative and statistically significant. Our baseline result remains robust to different measures of external financing dependence. The point estimates on interaction terms of capital controls and asset tangibility vary in both signs and statistical significance. Overall, results in columns 1 through 4 confirm that our baseline results are robust, with the construction of industry characteristics closely following the assumptions suggested in Rajan and Zingales (1998).

Column 5 presents the results using the country-variant efd and at measures, as suggested by Choi (2019). The interaction between capital controls and external financing remains negative, but is smaller in magnitude and loses statistical significance. On the other hand, the interaction between capital controls and asset tangibility is positive and statistically significant. Accounting for institutional differences between countries, industries that have more tangible assets incur a smaller decline in exports upon increasing the level of capital controls on inflows. The results are in line with Choi (2019) that efd is subject to more variation across countries while at is a better measure of industry characteristics. Nonetheless, these country-varying measures are likely subject to endogeneity problems as capital control policies affect financial market situations that dictate the firms' realized external financing levels.[14] Therefore, our preferred measure for industry financial vulnerability is based on US data.

[14] Additionally, the limited country coverage in Global Compustat reduces the sample size significantly. Limited firm coverage in available countries with less developed financial systems also potentially creates bias in the country-variant industrial measures.

Other Considerations

In table 5, we consider additional robustness checks to address other potential problems. In column 1, we consider replacing export data with import data in the regression. Although import data include shipment and insurance costs, which could be endogenous to the capital control policy of a country and add more noise to the results, the data are usually considered more accurate than export data because a country has more incentive to collect accurate import data as they are related to tariff revenue. The point estimates in column 1 suggest qualitatively similar results to our baseline results in table 2.

Column 2 considers the scenario where capital controls have a delayed effect on trade. Using one-year lagged capital control variables, we find similar results to our baseline specification. Columns 3 and 4 add country-industry weights, from United Nations Industrial Development Organization (UNIDO), to account for the fact that countries have varying levels of output in different industries.[15] Column 3 considers the country-industry weight for the start of our period of interest, 1995-1997. However, UNIDO lacks data for many emerging economies in this time period. In order to include more emerging economies in the sample, including important players such as China, we consider country-industry weights in the median years of the period of interest (2005-2007) in column 4. Controlling for industry share accounts for the fact that young industries may grow on average at higher rates than mature industries (Friedrich, Schnabel and Zettelmeyer 2013). We find that controlling for industry size, our qualitative results remain unchanged from our baseline results. The magnitudes of the coefficients of importer capital controls and the interaction of exporter capital controls and efd are even larger.

Overall, the point estimates in table 5 confirm our baseline results that capital control policy has varying effects depending on the external financial dependence of an industry. Analogous to our baseline results, the point estimates for the interaction term for external financial dependence remain significantly negative at the 1 percent level across all specifications. We also note that the magnitude of the point estimates is larger in 3 out of 4 robustness checks.

[15] Country-industry data are converted from ISICver3 to ISICver2. The lack of some industrial data at a more detailed 4-digit level is accounted for by splitting the corresponding 3 digit level data evenly.

6 Financial Development

In this section, we examine the effect of financial development on the interaction of industry financial vulnerability and capital control policies to see whether our results are similar between countries with low vs. high levels of financial development.

With regards to financial development and trade, using cross-sectional and panel approaches, Beck (2003) and Manova (2013) show respectively that financially developed countries have a comparative advantage in industries more intensive in external financing. An important reason is that better accounting standards, disclosure rules, and financial institutions reduce the cost gap between internal and external funds, and hence enhance growth especially for firms in more external financing dependent industries (Rajan and Zingales 1998). At a more general level, Eichengreen, Gullapalli and Panizza (2011) find evidence that financial openness has positive effects on the growth of financially depending industries. With regards to financial development and capital control policy, Schmukler and Vesperoni (2006) and Forbes (2007) use firm-level data to show that firms in exporting countries with more developed domestic financial markets and more robust financial institutions are less affected by capital control policies, since such countries are more capable of efficiently allocating capital across firms.

We use five measures of financial development for our empirical analysis. Svirydzenka (2016) provides a comprehensive financial development index that includes aspects from both the financial market and financial institutions.[16] In addition, we include two other conventional measures frequently used in the literature: private-sector credit to GDP and stock market capitalization to GDP from Beck et al. (2000). Table 6 presents the summary statistics of the five financial development variables we use.

We modify equation 2 to examine the relationship between financial develop and capital control policy dynamics explored in the previous section. We determine low and high financial development

[16] Svirydzenka (2016) evaluates two parts of the financial system separately: the financial market, defined as the stock and bond markets; and the financial institutions, including banks, insurance companies, pension funds, and mutual funds. Hence, the index incorporates key metrics from both sides, including but not limited to the size and liquidity of financial markets, the ability of individuals and firms to access financial services, and the ability of institutions to provide low-cost financial service with sustainable revenue.

by the country's financial development index relative to a median cutoff in 1995 for all 99 countries in our sample. A binary variable $HighFD$ denotes whether the country has relatively high financial development in our sample. This allows us to assign time-consistent groupings of high and low financial development. Formally, we estimate

$$\begin{aligned} log(Trade_{i,j,n,t}) = {} & \beta X_{i,n,t} + \gamma M_{j,n,t} + \xi Z_{i,j} + \theta_1 KC_{j,t} + \boldsymbol{\theta_{2i} KC_{i,t} \times efd_n} + \boldsymbol{\theta_{2j} KC_{j,t} \times efd_n} \\ & + \boldsymbol{\theta_{3i} KC_{i,t} \times at_n} + \boldsymbol{\theta_{3j} KC_{j,t} \times at_n} + \phi_1 DomCredit_{i,t} \times efd_n + \phi_2 DomCredit_{i,t} \times at_n \\ & + \boldsymbol{HighFD_i} \times (\boldsymbol{\psi_{2i} KC_{i,t} \times efd_n} + \boldsymbol{\psi_{3i} KC_{i,t} \times at_n}) \\ & + \boldsymbol{HighFD_j} \times (\psi_1 KC_{j,t} + \boldsymbol{\psi_{2j} KC_{j,t} \times efd_n} + \boldsymbol{\psi_{3j} KC_{j,t} \times at_n}) \\ & + HighFD_i \times (\tau_1 DomCredit_{i,t} \times efd_n + \tau_2 DomCredit_{i,t} \times at_n) + \delta_{it} + \delta_{jn} + \epsilon_{i,j,n,t} \end{aligned} \tag{3}$$

Capital control measures and industry vulnerability measures remain unchanged from our specification in equation 2. We also maintain the same fixed effect specifications and standard error clustering. In this estimation, θ_{2i}, θ_{2j}, θ_{3i}, and θ_{3j} measure the industry-varying effects of capital controls in exporter and importer countries with low levels of financial development, and $\theta_{2i} + \psi_{2i}$, $\theta_{3i} + \psi_{3i}$, $\theta_{2j} + \psi_{2j}$, and $\theta_{3j} + \psi_{3j}$ now measure the effects in countries with high levels of financial development.

Table 7 presents the regression results of equation 3. We report only the results on the exporter side, where most of the dynamics are observed. The second line shows that in less financially developed exporting countries, capital inflow restrictions affect industries with higher external financing reliance more adversely. Four out of five point estimates are negative and statistically significant. The differential impact observed is much smaller for countries with higher levels of financial development. The sum of the two point estimates, $\theta_{2i} + \psi_{2i}$, takes on values close to zero for four of the five measures. The point estimates suggest that the differential impact of capital controls on trade is more prominent in less financially developed countries. In line with Calvo et al. (1996), countries that are less financially developed benefit greatly from foreign capital in terms of investment and economic growth. It is possible that this implies that restrictions on these capital flows in less financially developed countries reduce the availability of foreign investments in

industries that are highly dependent on external finance. The results are consistent with findings from Schmukler and Vesperoni (2006) and Forbes (2007) that robust domestic financial markets and financial institutions shield firms from the effects of capital control policy, and with the argument presented in Rajan and Zingales (1998). The third and fifth lines report the interaction terms between capital control and asset tangibility in less and more financially developed countries. The point estimates vary in their significance and magnitudes across the five financial development measures, without a clear pattern.

The point estimates of the interaction of capital controls of the importing countries and external finance or asset tangibility ($\theta_{2j}, \psi_{2j}, \theta_{3j}, \psi_{3j}$) remain insignificant and are not reported in the table. We do not observe clear distinctions in capital control dynamics with respect to the importing country's level of financial development. The point estimates of the interaction of domestic credit availability and capital control, for both financially more and less developed countries, are consistent with our estimates in previous tables.

7 Conclusion

This paper provides an empirical attempt to explain how capital controls can affect international trade, and how these effects vary across industries with varying levels of external finance and asset tangibility. Using comprehensive panel data, we find that capital controls influence trade patterns via differences in external financing across different industries, controlling for the availability of domestic credit in the exporting country. A tightening of a country's capital controls is associated with a reduction in its exports, and industries with higher levels of external financing are associated with larger reductions. Importer capital control implies a decrease in trade regardless of levels of external finance dependence across industries. Our results remain robust across specifications, including using different measures of capital controls and changes to other variables. Additionally, consistent with the existing literature, the effect of capital control varies among countries with varying degrees of financial development. We find that higher levels of financial development have a dampening effect on the heterogeneous impacts of capital controls on trade across industries.

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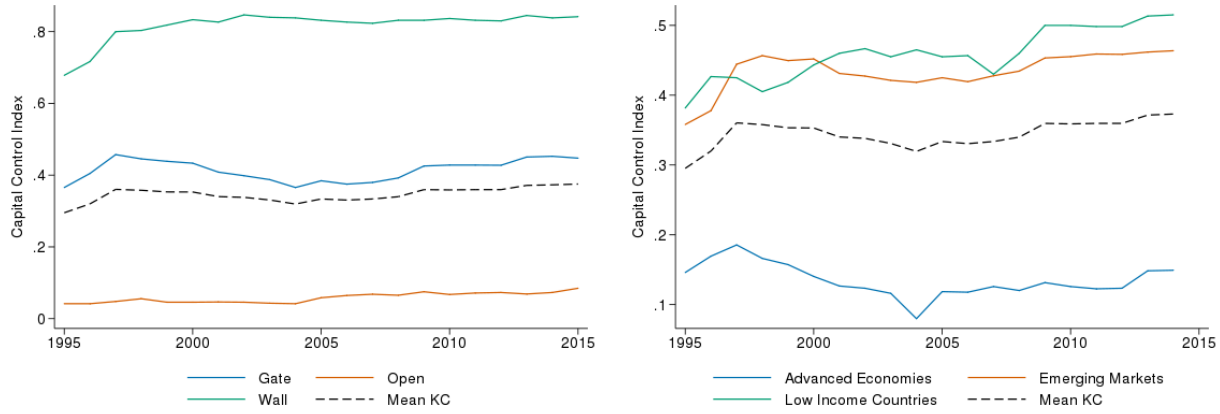
Figures and Tables

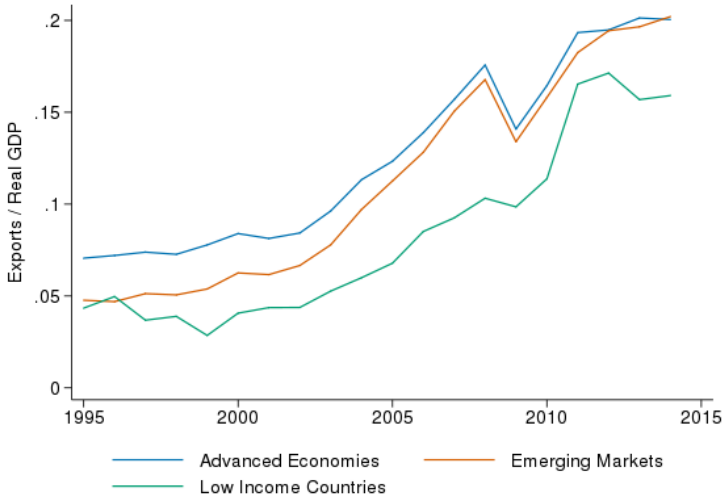
Figure 1: Capital controls index and trade over time by income group, 1995-2015



(a) Capital Controls by Capital Control Strictness (b) Capital Controls by Income Group

Note: Panel (a) presents capital control strictness, classified by Fernández et al. (2016), of the exporter countries over time. Panel (b) presents the average level of capital controls by income group in 1995 to 2014. Income groups are defined according to IMF income categories.

Figure 2: Trade over time by income group, 1995-2014



Note: This graph presents the the average of exports/GDP for each income group from 1995 to 2014. Income groups are defined according to IMF income categories.

Table 1: Summary statistics of variables, 1995-2014

	mean	sd	min	p25	p50	p75	max	count
A. Trade								
Trade value ($, millions) - export data	57.11	680.06	0.00	0.04	0.51	6.19	165537.33	2500473
Trade value ($, millions) - import data	52.85	643.33	0.00	0.02	0.36	4.97	134434.70	2717653
B. Capital controls								
KC	0.34	0.32	0.00	0.05	0.20	0.65	1.00	1966
KC inflows	0.32	0.30	0.00	0.10	0.20	0.55	1.00	1966
KC outflows	0.37	0.37	0.00	0.00	0.20	0.75	1.00	1966
KC Trade inflows	0.29	0.34	0.00	0.00	0.12	0.62	1.00	1966
KC Trade outflows	0.35	0.41	0.00	0.00	0.00	0.75	1.00	1966
Chinn-Ito	0.63	0.36	0.00	0.17	0.70	1.00	1.00	1934
De-facto KC (%)	3.61	7.18	0.12	1.01	1.52	2.80	77.02	1462
C. Industry level								
External finance dependence (Rajan-Zingales)	0.25	0.33	-0.45	0.06	0.22	0.40	1.14	27
Asset tangibility (Rajan-Zingales)	0.30	0.14	0.07	0.20	0.30	0.38	0.67	27
Human capital intensity	1.02	0.27	0.50	0.80	1.01	1.21	1.66	27
Physical capital intensity	0.07	0.04	0.02	0.05	0.07	0.09	0.20	27
Exporter Ind. Share (95-97, adj)	0.03	0.04	0.00	0.01	0.02	0.04	0.46	1404
Exporter Ind. Share (05-07, adj)	0.03	0.05	0.00	0.00	0.02	0.04	0.55	2025
D. Country level								
Real GDP ($, millions)	564927.16	1610960.19	2072.63	25241.17	129626.00	375349.00	16177500.00	1961
REER	97.56	18.83	27.81	89.79	98.72	103.58	269.26	1946
Human capital index	2.56	0.64	1.05	2.09	2.59	3.07	3.73	1906
(Log) K/L	11.97	1.17	6.87	11.46	12.20	12.71	14.68	1966
Tariff (%)	7.07	6.60	0.00	2.23	4.76	10.42	86.48	1675
Domestic credit/GDP (WDI)	0.59	0.50	0.00	0.21	0.41	0.88	3.12	1838
Nonfin. credit/GDP (BIS)	1.57	0.88	0.24	0.82	1.43	2.21	4.75	746

Note: This table presents the summary statistics for all variables used in all specifications.

Table 2: Capital controls levels regressions

	Baseline			w/ Domestic Credit	
	(1)	(2)	(3)	(4)	(5)
	Ex. Side	Im. Side	Full Reg	BIS Banks	Full Sample
Exporter KC inflows × external finance dependence	-1.225***		-1.225***	-0.530***	-0.459***
	(0.06)		(0.06)	(0.06)	(0.06)
Exporter KC inflows × asset tangibility	1.064***		1.064***	-0.169	-0.112
	(0.16)		(0.16)	(0.17)	(0.15)
Importer KC outflows		-0.082*	-0.079*	-0.114**	-0.091*
		(0.04)	(0.04)	(0.05)	(0.05)
Importer KC outflows × external finance dependence		0.008	0.011	-0.124***	-0.004
		(0.05)	(0.05)	(0.05)	(0.05)
Importer KC outflows × asset tangibility		0.049	0.034	0.154	0.010
		(0.12)	(0.12)	(0.14)	(0.14)
Exporter Dom. Credit × external finance dependence				0.390***	1.288***
				(0.02)	(0.03)
Exporter Dom. Credit × asset tangibility				-0.953***	-2.558***
				(0.06)	(0.10)
Observations	2112778	2112778	2112778	1354840	1957117
R^2	0.619	0.618	0.619	0.673	0.620
Ex. × Time, Im. × Industry FE	Y	Y	Y	Y	Y

Note: This table presents the results of our baseline regression, seen in Equation 1. Columns 1 and 2 present the results by exporter and importer sides separately. Column 3 presents the results when we include both the exporter and importer sides in the same regression. Columns 4 and 5 include the interaction between exporter domestic credit (divided by GDP) and efd/at. Column 4 only includes countries that are a part of the BIS Locational Banking Statistics and column 5 uses the domestic credit/GDP metric from the World Bank WDI statistics. Log trade value is the dependent variable. Exporter, importer, and gravity controls are included in the regressions but not reported. Standard errors are clustered by country pair. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3: Capital controls levels regressions: robust KC measures

	(1) Baseline	(2) KC All	(3) KC Trade	(4) Chinn-Ito	(5) De Facto
Importer KC	-0.091*	-0.056	-0.109**	-0.011	-0.006***
	(0.05)	(0.06)	(0.04)	(0.05)	(0.00)
Exporter KC × external finance dependence	-0.459***	-0.426***	-0.634***	0.730***	0.016***
	(0.06)	(0.05)	(0.05)	(0.05)	(0.00)
Exporter KC × asset tangibility	-0.112	0.065	0.077	-1.161***	-0.072***
	(0.15)	(0.15)	(0.14)	(0.14)	(0.01)
Importer KC × external finance dependence	-0.004	0.002	0.025	-0.071	-0.001
	(0.05)	(0.06)	(0.05)	(0.05)	(0.00)
Importer KC × asset tangibility	0.010	-0.246	-0.126	0.723***	0.014***
	(0.14)	(0.17)	(0.12)	(0.14)	(0.01)
Exporter dom. credit × external finance dependence	1.288***	1.287***	1.240***	1.189***	1.214***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)
Exporter dom. credit × asset tangibility	-2.558***	-2.530***	-2.533***	-2.322***	-1.831***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Observations	1957117	1957117	1957117	1937855	1491137
R^2	0.620	0.620	0.620	0.620	0.636
Ex. × Time, Im. × Industry FE	Y	Y	Y	Y	Y

Note: This table presents the regression results using different capital control (KC) measures. In Fernández et al. (2016), 0 refers to no capital control and 1 refers to consistent full capital control. The measure is reversed for Chinn-Ito and De facto, where 0 refers to consistent control and 1 refers to open capital accounts. Log trade value is the dependent variable. Exporter, importer, and gravity controls are included in the regressions but not reported. Standard errors are clustered by country pair. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 4: Capital controls levels regressions with different financial vulnerability Assumptions

	(1) RZ (1998) (1980-1990)	(2) US Comp (1995-2014)	(3) US Comp (1995-2007)	(4) US Comp (2008-2014)	(5) Ex. Vary (1995-2014)
Importer KC outflows	-0.091*	-0.052	-0.056	-0.057	-0.317***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.12)
Exporter KC inflows × external finance dependence	-0.459***	-0.088***	-0.083***	-0.124***	-0.051
	(0.06)	(0.02)	(0.03)	(0.02)	(0.04)
Exporter KC inflows × asset tangibility	-0.112	0.450**	0.272	0.653***	1.833***
	(0.15)	(0.18)	(0.19)	(0.20)	(0.26)
Importer KC outflows × external finance dependence	-0.004	-0.019	-0.057*	0.049***	-0.003
	(0.05)	(0.02)	(0.03)	(0.02)	(0.03)
Importer KC outflows × asset tangibility	0.010	-0.139	-0.154	-0.065	0.581
	(0.14)	(0.17)	(0.17)	(0.18)	(0.35)
Exporter dom. credit × external finance dependence	1.288***	0.278***	0.442***	-0.016	-0.133***
	(0.03)	(0.01)	(0.02)	(0.01)	(0.01)
Exporter dom. credit × asset tangibility	-2.558***	-4.070***	-4.130***	-4.906***	-0.295*
	(0.10)	(0.11)	(0.12)	(0.13)	(0.18)
Observations	1957117	1825267	1825267	1562449	284294
R^2	0.620	0.619	0.619	0.625	0.758
Ex. × Time, Im. × Industry FE	Y	Y	Y	Y	Y

Note: This table presents the regression results using different variants of efd and at. Column 1 presents the results using the Rajan and Zingales (1998) efd and at measures. Columns 2-4 use our calculated efd and at from the North American Compustat data. Column 5 uses our calculated efd and at from the Global Compustat data by headquarter location (loc). Log trade value is the dependent variable. Exporter, importer, and gravity controls are included in the regressions but not reported. Standard errors are clustered by country pair. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 5: Capital controls levels regressions robustness

	Import Data	$t-1$ lags	Ind. Share	
	(1)	(2)	(3)	(4)
			95-97 (adj)	05-07 (adj)
Importer KC outflows	0.052	-0.112**	-0.128**	-0.114**
	(0.05)	(0.05)	(0.05)	(0.05)
Exporter KC inflows × external finance dependence	-0.117**	-0.491***	-0.611***	-0.627***
	(0.05)	(0.06)	(0.08)	(0.05)
Exporter KC inflows × asset tangibility	-0.539***	-0.176	-0.126	-0.559***
	(0.16)	(0.16)	(0.23)	(0.15)
Importer KC outflows × external finance dependence	-0.032	-0.003	-0.053	-0.032
	(0.05)	(0.05)	(0.06)	(0.05)
Importer KC outflows × asset tangibility	0.056	0.057	-0.010	0.053
	(0.13)	(0.14)	(0.14)	(0.14)
Exporter Dom. Credit × external finance dependence	1.330***	1.197***	0.655***	0.731***
	(0.03)	(0.03)	(0.04)	(0.03)
Exporter Dom. Credit × asset tangibility	-2.739***	-2.570***	-1.027***	-1.572***
	(0.10)	(0.10)	(0.10)	(0.09)
Observations	2199941	1796800	1307854	1715318
R^2	0.639	0.613	0.676	0.655
Ex. × Time, Im. × Industry FE	Y	Y	Y	Y

Note: Column 1 presents the results of our baseline regression using Imports Data. Column 2 presents the results of our baseline regression using lagged variables ($t-1$) on the right hand side. Columnss 3-4 present the results when we include industry share variables as a right-hand side variable (Friedrich, Schnabel and Zettelmeyer 2013). Log trade value is the dependent variable. Exporter, importer, and gravity controls are included in the regressions but not reported. Standard errors are clustered by country pair. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 6: Summary statistics of financial development variables

	mean	sd	min	p25	p50	p75	max	count
FD: Financial development index	0.39	0.23	0.04	0.19	0.34	0.57	1.00	1980
FM: Financial markets	0.32	0.26	0.00	0.06	0.28	0.51	1.00	1980
FI: Financial institutions	0.46	0.23	0.06	0.27	0.41	0.67	1.00	1980
Priv. credit by banks & fin. inst. to GDP (%)	58.08	48.10	0.85	20.86	42.56	87.18	262.46	1938
Stock market cap to GDP (%)	54.73	87.57	0.03	14.76	32.59	68.72	1086.34	1580

Note: Financial development (FD), financial market (FM), and financial institution (FI) indicies from Svirydzenka (2016) are computed at the country-year level, and is scaled between 0 and 1. Private credit by banks and financial institutions to GDP and stock market capitalization to GDP ratios from Beck et al. (2000) are computed at the country-year level.

Table 7: Capital controls levels regressions with financial development

	(1) Fin dev	(2) Fin mkt	(3) Fin inst	(4) Priv cred	(5) St mkt cap
Importer KC outflows	-0.316***	-0.309***	-0.281***	-0.118	-0.039
	(0.09)	(0.09)	(0.08)	(0.09)	(0.07)
Exporter KC inflows × external finance dependence	-0.379***	-0.638***	-0.109	-0.644***	-0.565***
	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)
Exporter KC inflows × asset tangibility	0.040	-0.223	-1.068***	-0.198	-0.605***
	(0.26)	(0.25)	(0.23)	(0.26)	(0.23)
Exporter High Fin Dev=1 × Exporter KC inflows × external finance dependence	0.349***	0.781***	-0.391***	0.445***	0.240***
	(0.09)	(0.08)	(0.10)	(0.09)	(0.08)
Exporter High Fin Dev=1 × Exporter KC inflows × asset tangibility	-0.558*	-0.403	1.597***	-0.020	0.764***
	(0.30)	(0.28)	(0.30)	(0.29)	(0.28)
Observations	1957117	1957117	1957117	1957117	1957117
R^2	0.621	0.622	0.620	0.621	0.620
Ex. × Time, Im. × Industry	Y	Y	Y	Y	Y

Note: This table presents the results of the impact of capital controls on trade by industry, for exporters and importers of low vs. high financial development based on measures constructed by Svirydzenka (2016). Column 1 presents the results using the metric of overall financial development. Columns 2 and 3 present the results using components of financial development: development of financial markets and financial institutions. Columns 4 and 5 measure financial development using private credit to GDP ratio and stock market capitalization respectively from Beck et al. (2000). Interactions of financial vulnerability and domestic credit are included but not reported. The importer variables are included and not statistically significant, so they are not reported. Log trade value is the dependent variable. Exporter, importer, and gravity controls are included in the regressions but not reported. Standard errors are clustered by country pair. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

A Appendix

A.1 Industry Characteristics

Table A1: Industry Characteristics from Manova (2008)

isic3d	industry	efd	at	pci	hci	nri
311	food products	0.137	0.378	0.062	0.812	0
313	beverages	0.077	0.279	0.062	1.135	0
314	tobacco	-0.451	0.221	0.018	1.354	0
321	textiles	0.401	0.373	0.073	0.688	0
322	wearing apparel, except footwear	0.029	0.132	0.019	0.502	0
323	leather products	-0.140	0.091	0.032	0.687	0
331	wood products, except furniture	0.284	0.380	0.065	0.741	1
332	furniture, except metal	0.236	0.263	0.039	0.698	0
341	paper and products	0.176	0.558	0.132	1.139	1
342	printing and publishing	0.204	0.301	0.052	0.934	0
352	other chemicals	0.219	0.197	0.060	1.209	0
353	petroleum refineries	0.042	0.671	0.196	1.656	1
354	misc. petroleum and coal products	0.334	0.304	0.074	1.153	1
355	rubber products	0.227	0.379	0.066	0.985	0
356	plastic products	1.140	0.345	0.088	0.827	0
361	pottery, china, earthenware	-0.146	0.075	0.055	0.804	0
362	glass and products	0.529	0.331	0.090	1.012	0
369	other non-metallic products	0.062	0.420	0.068	0.952	1
371	iron and steel	0.087	0.458	0.102	1.251	1
372	non-ferrous metals	0.006	0.383	0.101	1.098	1
381	fabricated metal products	0.237	0.281	0.056	0.914	0
382	machinery, except electrical	0.445	0.183	0.058	1.119	0
383	machinery, electric	0.768	0.213	0.077	1.064	0
384	transport equipment	0.307	0.255	0.071	1.322	0
385	prof and scient. equipment	0.961	0.151	0.053	1.234	0
390	other manufactured products	0.470	0.188	0.039	0.755	0
3511	industrial chemicals	0.205	0.412	0.124	1.408	0

Note: This table presents industry characteristics from Manova (2008). efd and at are external finance and asset tangibility respectively. pci, hci, and nri are the intensity indices of physical capital, human capital, and natural resources.

A.2 Overall Effects of Capital Control Policy

This section empirically examines the overall effects of capital control policies, imposed by both exporter and importer, on international trade. Our specification follows from specifications in previous literature (e.g. Beck 2003; Manova 2008; Manova 2013). The specification is shown in the following equation:

$$log(Trade_{i,j,n,t}) = \beta X_{i,n,t} + \gamma M_{j,n,t} + \xi Z_{i,j} + \theta_1 KC_{i,t} + \theta_2 KC_{j,t} + \delta_i + \delta_j + \delta_n + \delta_t + \epsilon_{i,j,n,t} \quad \text{(A1)}$$

where $X_{i,n,t}$ and $M_{j,n,t}$ are the vectors of country and industry controls for exporter country i and importer country j respectively, in industry i at time t; $Z_{i,j}$ is a vector of gravity model variables between exporter country i and importer country j; and δ's are exporter-importer pair, time, and industry fixed effects.[1] Country and industry fixed effects control for time-invariant country and industry characteristics, and time fixed effect controls for macro-environment at the time trade transaction occurs. $KC_{i,t}$ and $KC_{j,t}$ measure the level of capital control of exporting and importing countries in the trade transaction. We include exporter and importer country (δ_i and δ_j respectively), industry (δ_n), and time (δ_t) fixed effects and cluster our standard errors by country pair and industry.

We examine the overall effects of capital control policy using four measures of capital restrictions. Columns 1 and 2 of table A2 use our main measure of capital control, from Fernández et al. (2016), whose details are elaborated in section 4. Column 3 measures capital account openness with the Chinn-Ito index, a *de jure* measurement frequently featured in relavent literature.[2] Column 4 measures capital account restriction with a de facto index, the sum of foreign asset and liability relative to GDP, proposed by the pioneering work of Lane and Milesi-Ferretti (2003).

Overall, results in Table A2 show that higher levels of capital controls correlate with lower

[1] $X_{i,n,t}$ (exporter controls) & $M_{j,n,t}$ (importer controls): Capital-Labor Ratio, Human Capital Index, Real GDP, Real Effective Exchange Rate, Tariffs, and GATT/WTO Affiliation. $Z_{i,j}$ (Gravity variables): Distance, Common Language, Former Colony, Common Currency, and Common Religion.

[2] The Chinn-Ito index (Chinn and Ito 2008) measures capital account openness in normalized fashion, with values ranging from 0 to 1, with 0 being the least open and 1 the most open.

levels of international trade, considering all countries in the sample. Column 1 suggests a mixed result that higher overall levels of capital controls by exporters lead to higher trade, but higher levels of capital controls by importers reduce trade. However, if we carefully examine the two capital control restrictions most pertinent to international trade, namely inflow restrictions by exporters and outflow restrictions by importers, higher levels of capital control by both exporters and importers discourage international trade, as suggested by the results in column 2. Column 3 echoes the results in column 2, where more capital account openness correlates with higher levels of international trade. Column 4 suggests that increases in *de facto* capital control measures for the exporters and importers are correlated with lower levels of trade, but these point estimates are either tiny or insignificant. Overall, the results show that in a simple cross-country setting higher levels of capital control correlate with lower levels of trade. The capital control measures from column 2 are our measures of choice in the results section.

Table A2: Capital controls sign

	(1) KC All	(2) KC in/out	(3) Chinn-Ito	(4) De facto KC
Exporter KC	0.089	-0.126*	0.210***	-0.010***
	(0.06)	(0.06)	(0.06)	(0.00)
Importer KC	-0.129***	-0.101***	0.206***	-0.002
	(0.04)	(0.03)	(0.04)	(0.00)
Exporter Log Real GDP	0.656***	0.654***	0.648***	0.565***
	(0.10)	(0.10)	(0.10)	(0.10)
Importer Log Real GDP	0.921***	0.919***	0.930***	0.992***
	(0.07)	(0.07)	(0.07)	(0.09)
Exporter REER	0.003***	0.003***	0.002***	0.005***
	(0.00)	(0.00)	(0.00)	(0.00)
Importer REER	0.004***	0.004***	0.003***	0.006***
	(0.00)	(0.00)	(0.00)	(0.00)
Exporter Log real K/L - pop.	0.129***	0.124***	0.119***	0.175***
	(0.03)	(0.03)	(0.03)	(0.03)
Importer Log real K/L - pop.	-0.053***	-0.051***	-0.054***	0.010
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	2112778	2112778	2089407	1580624
R^2	0.585	0.586	0.586	0.603
Ex., Im., Time, Industry	Y	Y	Y	Y

Note: This table presents the results from equation A1 using different measures of capital controls. In Fernández et al. (2016), 0 refers to no capital control and 1 refers to consistent full capital control. The measure is reversed for Chinn-Ito and de facto, where 0 refers to consistent control and 1 refers to open capital account. Log trade value is the dependent variable. Standard errors are clustered by industry and country pair. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

A.3 Recalculating External Finance Dependence and Asset Tangibility

This section covers how we recompute external finance dependence and asset tangibility using fields from both the North American Compustat and Global Compustat data.

The construction of efd and at follow from Rajan and Zingales (1998), where we first sum the fields capital expenditures (capx), net property plant & equipment (ppent), total assets (at), and cashflow from operations from 1995-2014 by firm. Cashflow from operations is defined as the sum of funds from operations, decreases in inventories (invch), decreases in accounts receivable (recch), and increases in accounts payable (apalch in NA Compustat or apch in Global Compustat).[3]

We then compute the ratios:

$$efd = \frac{\text{Capital Expenditures} - \text{Cashflow from Operations}}{\text{Capital Expenditures}} \tag{A2}$$

$$at = \frac{\text{Net Property, Plant \& Equipment}}{\text{Total Assets}} \tag{A3}$$

Similar to the literature, we use the median efd and at measures by ISIC 3-digit industry and country of the headquarters to avoid excessively weighting large firms in an industry.

We also compute the efd and at over 1995-2014 using the North American Compustat to check the time-invariance assumptions made by Rajan and Zingales (1998). We also compute the efd and at for pre- and post-global financial crisis periods (1995-2007 and 2008-2014). We compute the efd and at over 1995-2014 using the Global Compustat to compute time-invariant measures by exporting country, defined by headquarter locations (loc). We exclude industries that contain fewer than 15 firms in either the Global Compustat or North American Compustat data. Furthermore, we winsorize the exporter country efd at the 1st and 99th percentiles. Table A3 presents the summary statistics of the new efd and at measures. Due to data constraints, we compute exporter efd and at measures for only 36 of the 99 exporter countries.

[3]For more detailed accounts of calculating funds from operations, see the appendix in Choi (2019).

Table A3: Summary statistics of robust industry variables

	mean	sd	min	p25	p50	p75	max	count
NA external finance dependence (1995-2014)	-0.25	1.10	-4.37	-0.41	-0.32	-0.03	2.40	25
NA asset tangibility (1995-2014)	0.29	0.12	0.10	0.17	0.27	0.37	0.58	25
NA external finance dependence (1995-2007)	-0.28	0.76	-3.33	-0.34	-0.28	-0.08	0.76	25
NA external finance dependence (2008-2014)	-0.51	0.94	-2.88	-0.74	-0.60	-0.29	2.01	21
NA asset tangibility (1995-2007)	0.29	0.12	0.12	0.19	0.29	0.38	0.57	25
NA asset tangibility (2008-2014)	0.26	0.12	0.09	0.16	0.26	0.35	0.56	21
Exporter external finance dependence	0.17	1.15	-2.37	-0.25	0.07	0.41	10.12	198
Exporter asset tangibility	0.32	0.12	0.03	0.24	0.32	0.39	0.72	198