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Revisiting the effects of exchange and capital restrictions on trade☆

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Abstract

This paper examines the effects of exchange and capital restrictions on trade and compares them with those associated with trade restrictions. Our main result is that capital account restrictions have large and statistically significant effects on trade flows. Such effects are smaller than those from trade restrictions, however. The effects of exchange and capital restrictions are larger for trade in goods, especially for agriculture and manufacturing, and smaller for trade in services.

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☆ The views expressed in this paper are those of the authors and do not necessarily represent the views of Banco de España or the Eurosystem, nor those of the International Monetary Fund (IMF), its Executive Board, or IMF management.

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1. Introduction

There is a vast and still growing literature assessing the economic benefits and costs associated with exchange and capital controls. Studies have typically focused on economic growth (Eichengreen, 2001; Prasad et al., 2003; Edison et al., 2004; Kose et al., 2009; Blanchard et al., 2016; Furceri et al., 2019; Ostry et al., 2021), capital mobility (Younas, 2011; Ostry et al., 2015; Ghosh et al., 2018), and income inequality (Furceri and Loungani, 2018; Furceri et al., 2019).

One important—but less studied—channel through which capital account regulation can affect these economic benefits and costs is through its impact on trade flows. From a theoretical point of view, the effect of capital account policies on trade is ambiguous as there are multiple (and interrelated) channels in play. On the one hand, capital controls can foster trade growth by limiting exchange rate volatility or export growth by sustaining an undervalued exchange rate. Capital controls can also help to retain domestic saving (by limiting capital outflows) which can be used to finance investment, including in export sectors. On the other hand, exchange controls, by taxing capital inflows which may be needed for the purchase of imports, could reduce trade as well as making imported products more expensive domestically. Exchange and capital controls can also reduce trade by increasing trade-related transaction costs. Moreover, capital controls can reduce trade by reducing capital inflows and the availability of credit to finance investment, while increasing the financing costs of export firms. In addition, exchange and capital controls can reduce trade by hampering foreign direct investment and knowledge spillovers.

Despite the ambiguous theory, the empirical literature tends to suggest that exchange and capital controls have negative effects on international trade. Tamirisa (1999) is the first paper examining the empirical relation between exchange capital controls and trade. Using a gravity model for about 40 economies for 1996, she finds that exchange and capital controls reduce significantly bilateral trade. Similar results have been found by Wei and Zhang (2007), which consider a longer time period and a larger sample of countries than in Tamirisa (1999). Some recent studies find that the trade effect of capital controls depends on the type of controls and is heterogeneous across sectors. For example, Fu and Cao (2020) find that while capital controls have negative impacts on trade, outflow controls tend to have positive effects. Lai et al. (2021) find that the negative effect of capital controls on trade is larger for industries that rely more heavily on external financing while it is smaller for those that are characterized by more tangible assets.

In this paper, we revisit the empirical relation between exchange and capital controls and trade. Our contribution to this literature is threefold. First, we use a novel indicator of exchange and capital account restrictions—taken from the Measure of Aggregate Trade Restrictions (MATR) database of Estefania-Flores et al. (2022)—which allows one to cover a larger sample of countries and time period than used in the previous literature and, more importantly, to compare the effect of exchange and capital restrictions with restrictions imposed directly on exports and imports (e.g., tariff and quotas). Second, we consider state-of-the-art techniques to estimate a theory-consistent structural gravity equation (Yotov et al., 2016), which enables us to consider a large set of fixed effects to control for many of the potential confounding factors associated with exchange and capital account restrictions, and thus facilitate a better identification of causal effects on trade. Third, we examine the effects of trade restrictions across various sectors (agriculture, mining, manufacturing and services).

Our main result is that capital account restrictions have large and statistically significant effects on trade flows. The effect is smaller than that of trade restrictions, however. In particular, we find that a one standard deviation increase in our indicator of capital account restrictions is associated with a reduction in bilateral trade of between 5 % and 14 %, depending on the

sector—compared to between 17 % and 39 % for a one standard deviation increase in trade restrictions. The effects are larger for trade in goods, especially for agriculture and manufacturing, and smaller for trade in services. Our estimates also indirectly suggest that some reductions in trade and capital restrictions may be implemented through trade agreements or the GATT/WTO.

The remainder of the paper is structured as follows. Section 2 presents the data. Section 3 presents some stylized facts on the evolution of exchange and capital account restrictions and compares them with those associated with trade restrictions. Section 4 presents the empirical methodology. Section 5 discusses the results. Section 6 concludes.

2. Data

Our data on capital and trade restrictions are taken from the Measure of Aggregate Trade Restrictions (MATR) database of Estefania-Flores et al. (2022). MATR is constructed combining the IMF's Annual Report of Exchange Arrangements and Exchange Restrictions (AREAER) online database (available from 1999 onwards) and the information from the country-year specific printed reports (available from 1949 onwards). The online database codes the information by type of restriction in a binary way and is extended back in time by the authors by coding the information found in the printed reports using a narrative approach. The resulting database is an unbalanced panel of 157 economies, which we have updated to provide coverage from 1949 to 2021. The coverage increases from about 30 economies in 1949 to more than 100 countries in 1973, and over 150 countries by 2000 (Fig. 1).

MATR provides information on the existence of restrictions related to: a) exchange measures; b) arrangements for payments and receipts; c) imports and import payments; d) exports and export proceeds; and e) payment and proceeds from invisible transfers and current transfers.

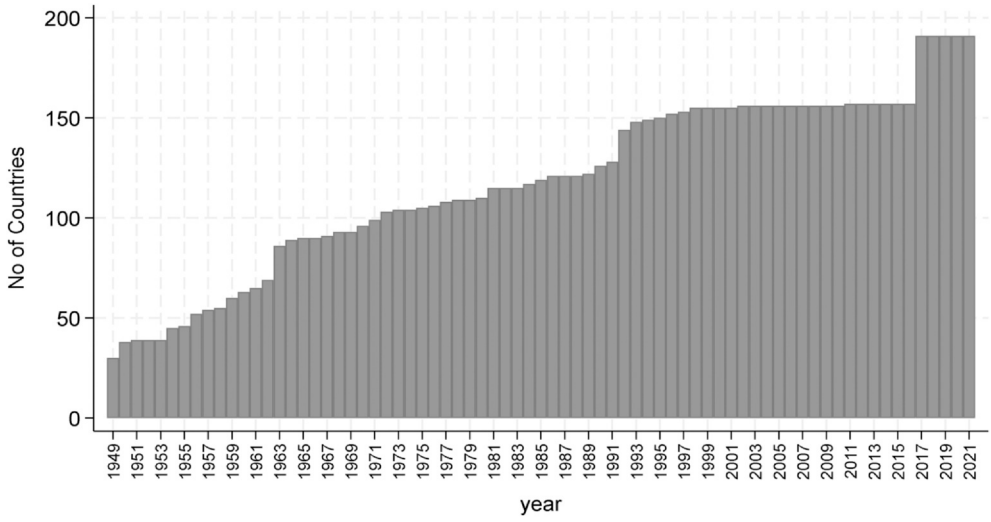

Fig. 1. Sample availability.
Source: Estefania-Flores et. al (2022) and Penn World Table.

Each of these categories is further decomposed into sub-indicators.[1] Each sub-indicator is assigned a score of one if a restriction is present in a particular country for a particular year, and zero otherwise.

We classify and distinguish restrictions that are directly related to trade (such as import/export licenses and tariffs/taxes) from those pertaining to exchange and capital restrictions (such as exchange measures, restrictions on the use domestic currency for capital transactions or controls on investment-related payments). The selection of variables to be included in each category is defined in Table 1.[2] Based on this classification, we construct the indexes of restrictions ("Trade MATR" and "Capital MATR") as a simple average of each the sub-indicator for each category. As a result, both indicators vary between 0 and 1, with a higher value indicating more restrictiveness.[3]

Data on trade flows (1995–2019) are taken from the OECD TiVA database. This database collects and reports bilateral international trade flows for 45 industries, including both merchandise and services trade, for 76 economies. These data can be aggregated into four main economic sectors: agriculture, mining, manufacturing, and services. The OECD TiVA database also reports data on gross output, allowing us to calculate domestic trade as output minus exports. Both output and export data are gross, reported in nominal terms, and expressed in the same currency.

Table A1 reports descriptive statistics for the MATR and trade variables used in the regression.

3. Stylized facts

In this section, we present an overview of Trade MATR and Capital MATR. We show how these new measures have evolved over time, compare them to each other, and check whether they are sensible by comparing them to some macroeconomic indicators and matching them up to other broadly accepted measures existing in the literature.

Figs. 2–4 depict the evolution of these indexes through time. Fig. 2 illustrates that in the 1950s trade restrictions were higher than capital restrictions. Both started to decline in the early 1970s, with the reduction in trade restrictions typically larger than the reductions in capital account restrictions. Restrictions then leveled off after the mid-/late 1990s, with capital account restrictions being, on average, higher than trade restrictions by the end of 2022. Fig. 3 shows the evolution of the indexes according to countries' income levels. It suggests that the most substantial reductions in both trade and capital restrictions occurred in Advanced Economies. For both indexes, Advanced Economies significantly reduced barriers, which reached very low levels. Although Emerging and Developing Economies also reduced their trade barriers, particularly during the mid-1980s, trade restrictions seem to have plateaued at relatively high values (Fig. 3.1). Regarding capital controls, Emerging and Developing Economies display a relatively flat trajectory over time, maintaining high levels of restrictions from the 1950s up to the present (Fig. 3.2).

[1] See Estefania-Flores et al. (2022) for a more detailed description on how the raw data and the index are constructed.

[2] Note that this disaggregation is not always straightforward. In instances where a measure can potentially influence both accounts, we have decided to classify these restrictions as pertaining to the capital account.

[3] To compare the two indexes, we consider the average rather than the sum of the sub-indicators (as in Estefania-Flores et al., 2022) because there are more categories for trade restrictions than for capital restrictions.

Table 1
Trade MATR and Capital MATR components.

AREAER Indicator			MATR	Trade MATR	Capital MATR
Classification	Code	Description			
II. Exchange measures	**II.A**	Restrictions and / or multiple currency practices	1		1
	II.B	Exchange measures imposed for security reasons	1		1
IV. Restrictions to payments	**IV.A**	Arrangements for Payments & Receipts, Prescription of currencies	1		
	IV.A.1	Controls on the use of domestic currency			
	IV.A.1.a	For current transactions and payments		1	
	IV.A.1.b	For capital transactions			1
	IV.A.2	Use of foreign exchange among residents			1
	IV.B	Payments arrangements	1		
	IV.B.1	Bilateral payments arrangements			1
	IV.B.2	Regional arrangements			1
	IV.B.3	Clearing agreements		1	
	IV.B.4	Barter agreements and open accounts		1	
	IV.C	Administration of control	1		1
	IV.D	Payments arrears	1		1
	IV.E	Controls on trade in gold (coins and/or bullion)		1	
	IV.F	Controls on exports and imports of banknotes	1		1
VII. Import Restrictions	**VII.A**	Imports and Import Payments, Foreign exchange budget	1		
	VII.B	Financing requirements for imports	1	1	
	VII.C	Document'n req's for release of forex for imports	1	1	
	VII.D	Import licenses and other nontariff measures	1	1	
	VII.E	Import taxes and/or tariffs	1	1	
	VII.F	State import monopoly	1	1	
VIII. Export Restrictions	**VIII.A**	Exports and Export Proceeds, Repatriation requirements	1		
	VIII.B	Financing requirements	1	1	
	VIII.C	Documentation requirements	1	1	
	VIII.D	Export licenses	1	1	
	VIII.E	Export taxes	1	1	
IX. Payments and X. Proceeds for Invisibles Restrictions	**IX.A**	Payments for Invis. Trans. & Curr Transfers, Transfers controlled	1		
	IX.A.1	Trade-related payments		1	
	IX.A.2	Investment-related payments			1
	IX.A.3	Payments for travel		1	
	IX.A.4	Personal payments		1	
	IX.A.6	Credit card use abroad		1	
	IX.A.7	Other payments		1	
	X.A	Proceeds from Invis Trans's & Current Transfers, Repatriation req's	1	1	
	X.A.1	Surrender requirements	1	1	
	X.B	Restrictions on use of funds	1	1	

Note: the 1 in columns Trade MATR and Capital MATR describe that the indicator has been included in the index.

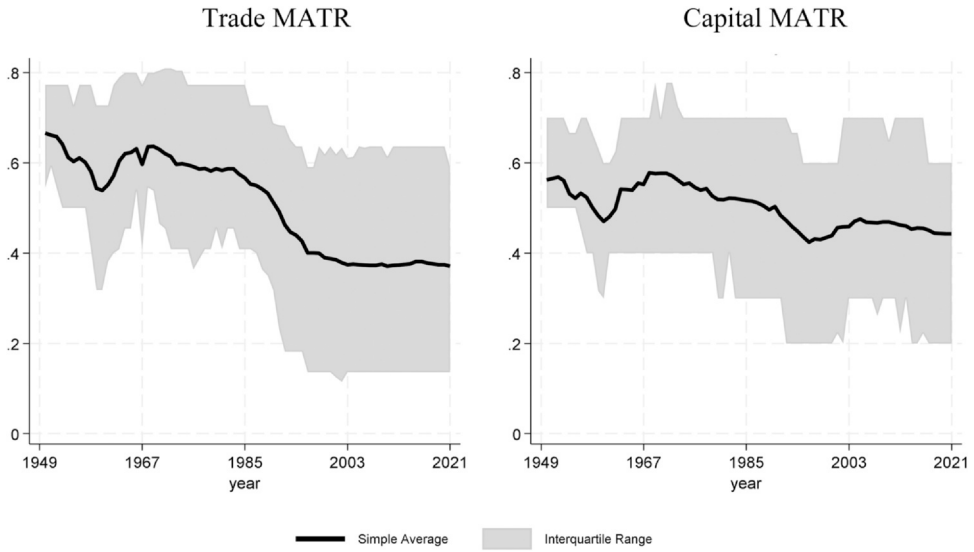

Fig. 2. Evolution of Trade MATR and Capital MATR over time.
Source: Based on data from Estefania-Flores et. al (2022).

Fig. 4 presents the evolution of both indexes by regions. While the trends are broadly aligned with the previous patterns overall, a few additional patterns are noteworthy. First, Africa stands out as the region with the highest restrictions in both indexes and Europe shows the lowest score in both indexes during the last decades. The second region with high restrictiveness is Asia-Pacific, but the Middle East and North Africa region surpassed the Asia-Pacific level of restrictiveness during the 1990′s, especially in respect of capital controls. Finally, in terms of capital restrictiveness, the Americas saw a significant liberalization post WWII, but this was reversed in the 1960s. Liberalization resumed after the mid-1980s, eventually stabilizing back to levels similar to those seen during the initial period of liberalization. While MATR effectively captures significant variations within its various subcomponents, it is important to note that it is insensitive to variations in the intensity of these measures. As a result, MATR moves little over a typical year for most countries, and so do our two newly constructed indexes.

Fig. 5 scatters these new measures with the size of the economy (measured as the log of real GDP in USD). There is no significant correlation between our indexes and the size of economies. Nonetheless, large and somewhat closed economies such as India are on the top-right of the picture; large but more open economies like USA or Germany are on the bottom right and small open economies like Hong Kong are at the bottom. Often, countries get similar scores on both measures, but a few differ significantly. For example, while Thailand or Egypt both show medium-low trade restrictiveness, their scores are on the medium-high side for capital restrictions. Fig. 6 provides scatterplots of our two measures against three key variables: income, size, and trade openness, using data from 1996. The scatterplots suggest that wealthier, smaller and more trade-open countries tend to score lower in both of our indexes.

We check how our new measures correlate with other well-established indicators in the literature. For capital controls, a natural comparator would be the Chinn and Ito (2008) capital

Figure 3.1. Trade MATR.

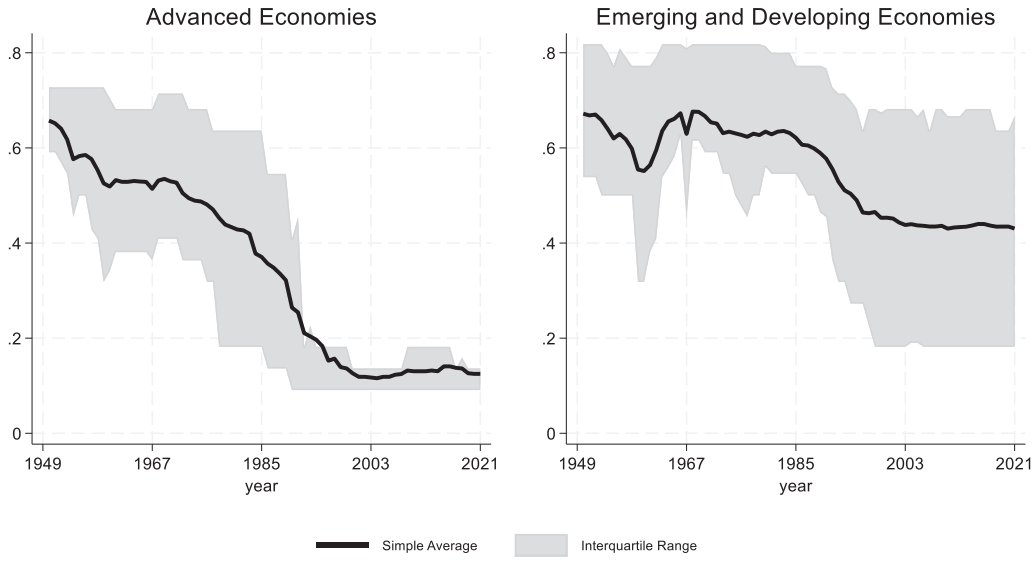

Figure 3.2. Capital MATR.

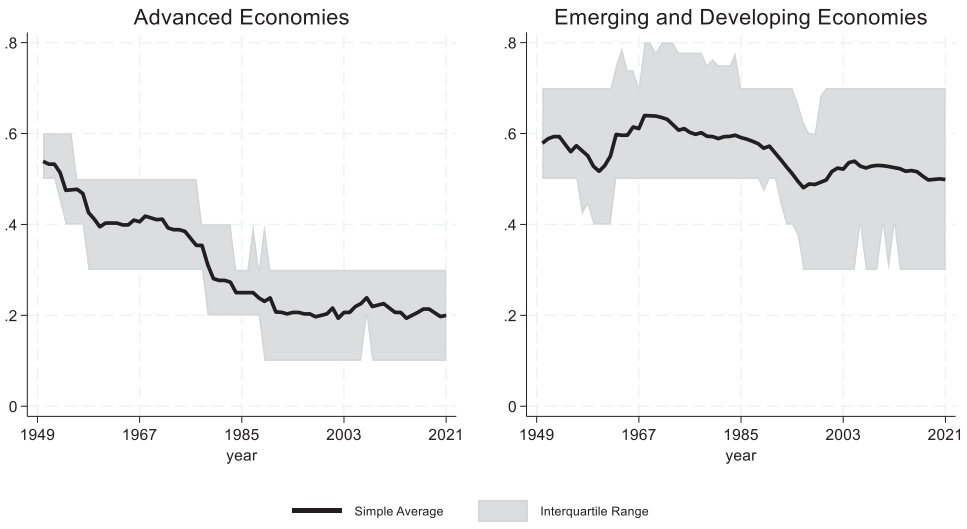

Fig. 3. Evolution of Trade MATR and Capital MATR by countries income levels. 1. Trade MATR. 2. Capital MATR. Source: Based on data from Estefania-Flores et. al (2022).

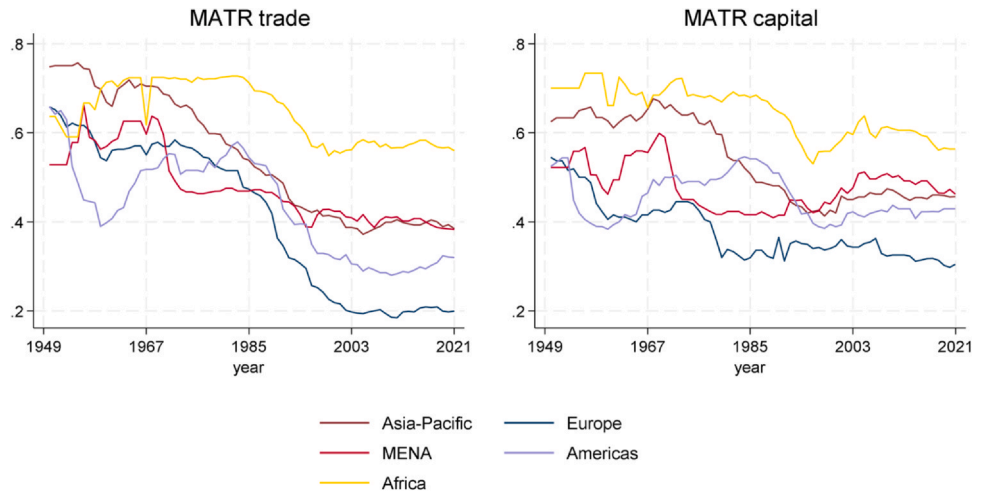

Fig. 4. Evolution of Trade MATR and Capital MATR by regions. Note: Lines show simple average.
Source: Based on data from Estefania-Flores et. al (2022).

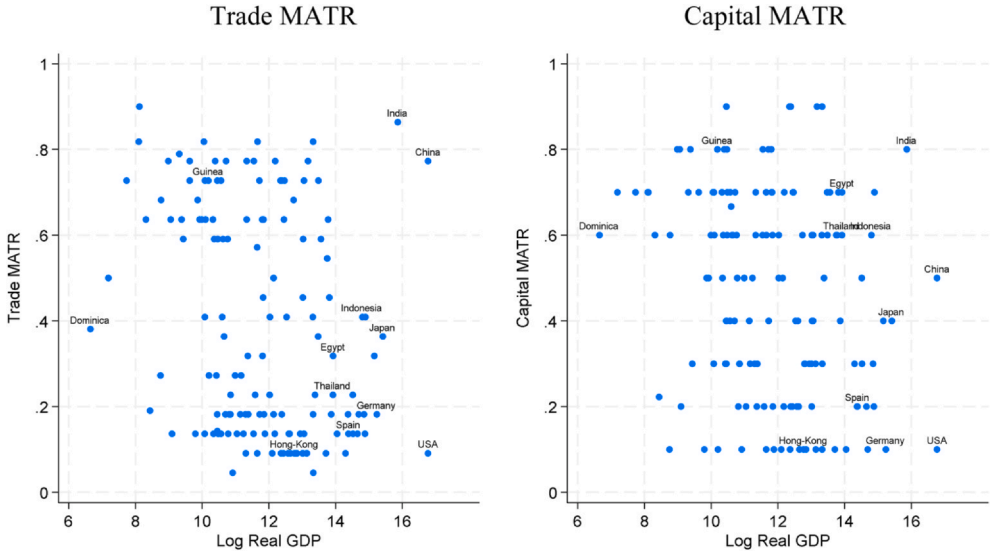

Fig. 5. Trade MATR and Capital MATR vs size of the economy, 2016.
Source: Based on data from Estefania-Flores et. al (2022) and Penn World Table.

controls index ("KAOPEN"). This index, although using a different methodology,[4] is also constructed from the AREAER database. As shown in Fig. 7, Capital MATR is highly correlated with KAOPEN—the average correlation across time is −0.75. For trade, we compare our

[4] While Capital MATR is the average of the binary variables related to capital controls, KAOPEN is calculated as the first principal component of its underlying four variables.

Figure 6.1. Capital MATR.

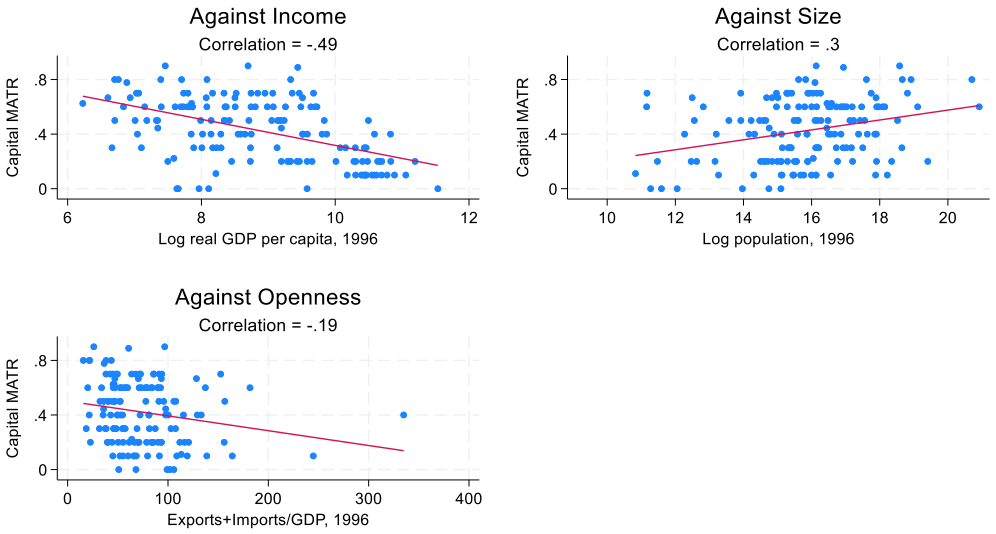

Figure 6.2. Trade MATR.

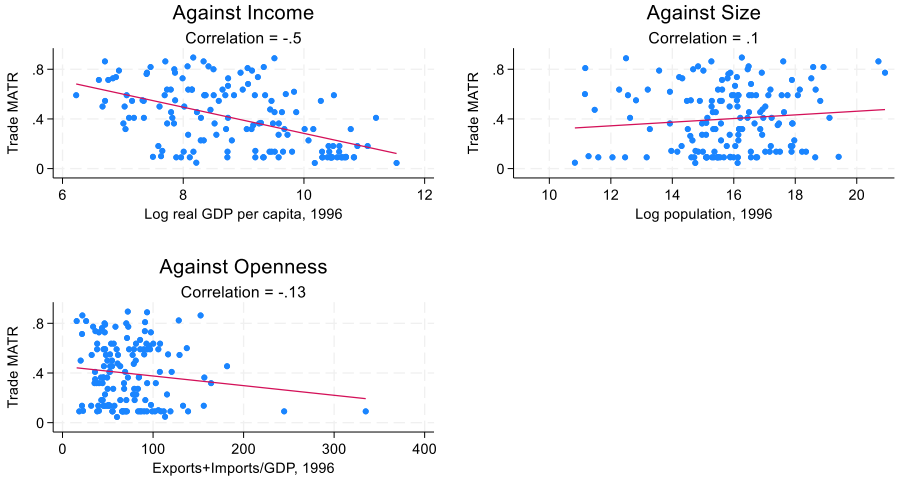

Fig. 6. Capital MATR and Trade MATR vs other macro indicators.1. Capital MATR. 2. Trade MATR. Source: Based on data from Estefania-Flores et. al (2022) and World Bank Development Indicators.

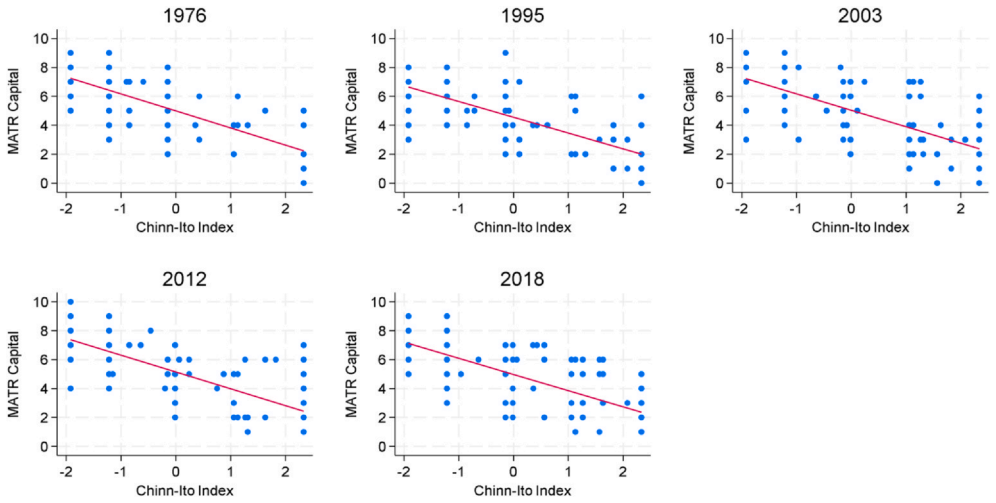

Fig. 7. Capital MATR and Capital mobility (KAOPEN Index).
Source: Based on data from Estefania-Flores et. al (2022) and Chinn and Ito (2008).

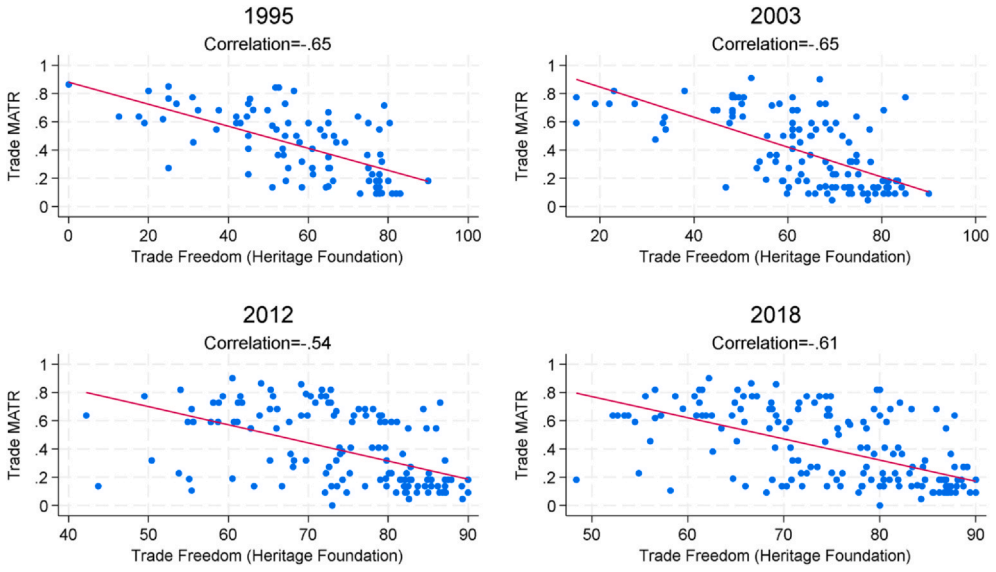

Fig. 8. Trade MATR and Trade Freedom.
Source: Based on data from Estefania-Flores et. al (2022) and Heritage Foundation.

index to the Trade Freedom Index from the Heritage Foundation. This index, like MATR, covers a wide range of countries and assesses both tariff and non-tariff barriers. However, while MATR is available since 1949, Trade Freedom only starts in 1995. Fig. 8 shows, reassuringly, that the Trade Freedom Index is strongly negatively correlated with Trade MATR—the average correlation is about −0.56.

4. Empirical strategy

We use these new measures to assess the effect of trade and capital restrictiveness on bilateral trade flows for different sectors (agriculture, mining, manufacturing, and services) using a theory-consistent structural gravity model. We follow Anderson and Van Wincoop (2003), Baier and Bergstrand (2007), and Yotov et al. (2016), and estimate the following specification:

$$X_{ijt}^{k} = \exp(\beta_0^k + \beta_1^k MATR\_T_{ijt} + \beta_2^k MATR\_C_{ijt} + \psi Z'_{ijt} + \delta_{it}^k + \gamma_{jt}^k + \omega_{ij}^k) + \varepsilon_{ijt}^k \quad (1)$$

The dependent variable X_{ijt}^{k} denotes gross bilateral trade flows between the exporter i and importer j, at time (year) t. The superscript k denotes sectors, where $k = \{$agriculture; mining; manufacturing; services$\}$.[5] To closely follow gravity theory, our dependent variable also includes domestic trade flows (the case $i = j$).[6] Following standard practice, we use nominal trade data because the set of country-time fixed effects accounts for inflation differentials (Baldwin & Taglioni, 2007). The variables $MATR\_T_{ijt}$ and $MATR\_C_{ijt}$ are measures of trade and capital restrictions, respectively. We construct these variables as the interaction of $MATR\_T_{jt}$ and $MATR\_C_{jt}$, which vary along the country-time dimension, with a dummy variable indicating international trade (i.e., whether country $i \neq j$). For domestic trade flows, the variables $MATR\_T_{ijt}$ and $MATR\_C_{ijt}$ are equal to zero, as restrictions that impede international flows do not apply to domestic transactions. We standardize $MATR\_T_{ijt}$ and $MATR\_C_{ijt}$ within the sample for estimation by first subtracting the mean and then dividing by the standard deviation. Standardization has the advantage that the coefficients we report directly indicate the effect of a one standard deviation increase in $MATR\_T_{ijt}$ and $MATR\_C_{ijt}$ on international trade flows. The simultaneous use of observations on domestic and international trade flows follows gravity theory and is essential to identify the effect non-discriminatory trade and capital restrictions, such as our two measures of aggregate trade and capital restrictions (Heid et al., 2021).[7]

The vector Z'_{ijt} contains control variables capturing other trade policies. In our main specification, this vector includes dummies indicating membership in trade agreements (TAs) and membership in the GATT/WTO. The terms δ_{it}^k and γ_{jt}^k are exporter-time and importer-time fixed effects, respectively. Apart from absorbing all features with country-time variation characteristics (such as GDP, GDP per capita, population, etc.), these fixed effects control for multilateral trade resistances (Anderson & Van Wincoop, 2003). The term ω_{ij}^k denotes

[5] Structural gravity models are separable, that is, "bilateral expenditures across countries both at the aggregate and at the sectoral level are separable from output and expenditure at the country level" (Yotov et al., 2016). Empirically, this means that gravity models can be estimated at both the aggregate and disaggregated (sectoral) levels, and that sectoral regressions yield the same results as regressions pooled across sectors that properly account for multilateral trade resistances.

[6] Yotov (2022) summarizes the reasons why domestic trade should be used in estimating structural gravity models.

[7] Structural gravity models include several sets of fixed effects, including exporter-time and importer-time fixed effects. Because non-discriminatory trade policy variables vary only along the exporter-time or importer-time dimension, they are perfectly collinear with the aforementioned fixed effects when only international trade flows are considered (Head & Mayer, 2014). However, using observations on both domestic and international trade flows introduces variation in the vector of nondiscriminatory policy variables that remain after parsing out the exporter-time and importer-time dimensions (the nondiscriminatory trade policy variable is always equal to zero in the case of domestic trade flows, because nondiscriminatory trade policies do not apply to transactions that occur within a country's borders, while exporter and importer dummies do not).

exporter-importer fixed effects, a standard way of controlling for endogeneity in the literature (Baier and Bergstrand, 2007). This term absorbs all characteristics with (directional) pairwise variation (such as the standard gravity variables: distance, contiguity, common language, colonial relationship, etc.). The inclusion of this large set of fixed effects is key to controlling for many of the potential confounding factors associated with MATR, thus allowing for the identification of the causal effect of trade and capital restrictions on international trade flows.

We estimate Equation (1) using a Poisson Pseudo-Maximum-Likelihood (PPML) procedure (Santos Silva and Tenreyro, 2006) and compute standard errors by clustering on (directional) country pairs. The period of analysis is 1995–2019, and the country sample size is determined by the availability of MATR and sector-level trade data.

5. Results

Table 2 reports the estimates of the effects of trade ($MATR\_T_{ijt}$) and capital ($MATR\_C_{ijt}$) restrictions on agricultural, mining, manufacturing, and services trade flows obtained running separate sectoral regressions,[8] derived from our estimation framework described in the previous section. The main coefficients of interest correspond to $MATR\_T_{ijt}$ (β_1 in Equation 1) and $MATR\_C_{ijt}$ (β_2 in Equation 1). Given the inclusion of country-pair and country-time fixed effects, these coefficients capture the marginal effect of trade and capital restrictions on trade flows, respectively.

In Column 1 of Table 2, we run a specification that includes only $MATR\_T_{ijt}$ and $MATR\_C_{ijt}$. In this first regression, the estimated effect of a one standard deviation increase in the index capturing trade restrictions leads to a reduction in international trade flows of between 17 % and 39 %, depending on the sector, while a one standard deviation increase in the index capturing capital restrictions leads to a reduction in international trade flows between 5 % and 14 %, depending on the sector.[9] These effects are larger for trade in goods, especially for agriculture and manufacturing, and smaller for trade in services. Given our identification strategy, which relies on the fact that trade and capital restrictions do not apply to domestic trade, these effects should be interpreted as relative to domestic trade flows.

In Columns 2 and 3 of Table 2, we expand the set of explanatory variables to control for trade agreements and GATT/WTO membership. In this specification, we control for trade agreements and GATT/WTO membership. However, some of the variation incorporated in $MATR\_T_{ijt}$ and $MATR\_C_{ijt}$ may be incorporated in these two new dummies. In this sense, the values reported in Column 1 can be interpreted as an upper bound of the effects of $MATR\_T_{ijt}$ and $MATR\_C_{ijt}$, while the values in Column 3 are lower bounds. The coefficient of $MATR\_T_{ijt}$ remains economically and statistically significant with these additional controls in all sectors, while the coefficient of $MATR\_C_{ijt}$ remains economically and statistically significant particularly for agriculture and manufacturing.

The estimated effects of trade agreements and GATT/WTO membership on trade are large, positive, and statistically significant. They suggest that trade agreements and GATT/WTO membership increase trade among members in both goods and services. The effect of trade

[8] As explained in footnote 5, given the properties of gravity models, results using a regression pooled across sectors would be equivalent.

[9] The effect is computed as $100*[e^{\beta_{MATR\_T}} - 1]$ and $100*[e^{\beta_{MATR\_C}} - 1]$ respectively.

Table 2
MATR_T (Trade MATR) and MATR_C (Capital MATR) effects on trade – Main estimates by sector.

	MATR (1)	MATR and TA (2)	MATR, TA, and GATT/WTO (3)
Agriculture			
$MATR\_T_{ijt}$	-0.496 ***	-0.465 ***	-0.458 ***
	(0.0638)	(0.0626)	(0.0610)
$MATR\_C_{ijt}$	-0.152 ***	-0.147 ***	-0.0798 *
	(0.0415)	(0.0411)	(0.0434)
TA_{ijt}		0.220 ***	0.193 ***
		(0.0378)	(0.0364)
$GATT/WTO_{ijt}$			0.371 ***
			(0.0562)
Observations	125,885	125,885	125,885
Mining			
$MATR\_T_{ijt}$	-0.349 ***	-0.344 ***	-0.344 ***
	(0.110)	(0.109)	(0.110)
$MATR\_C_{ijt}$	-0.140	-0.151 *	-0.130
	(0.0856)	(0.0854)	(0.0881)
TA_{ijt}		-0.150 **	-0.153 **
		(0.0658)	(0.0660)
$GATT/WTO_{ijt}$			0.158 **
			(0.0715)
Observations	120,967	120,967	120,967
Manufacturing			
$MATR\_T_{ijt}$	-0.233 ***	-0.201 ***	-0.218 ***
	(0.0368)	(0.0350)	(0.0301)
$MATR\_C_{ijt}$	-0.107 ***	-0.112 ***	-0.0584 *
	(0.0267)	(0.0277)	(0.0315)
TA_{ijt}		0.183 ***	0.161 ***
		(0.0293)	(0.0289)
$GATT/WTO_{ijt}$			0.331 ***
			(0.0555)
Observations	133,807	133,807	133,807
Services			
$MATR\_T_{ijt}$	-0.185 ***	-0.177 ***	-0.186 ***
	(0.0330)	(0.0333)	(0.0338)
$MATR\_C_{ijt}$	-0.0497 **	-0.0475 *	-0.0149
	(0.0248)	(0.0251)	(0.0266)
TA_{ijt}		0.129 ***	0.114 ***
		(0.0276)	(0.0284)
$GATT/WTO_{ijt}$			0.215 ***
			(0.0316)
Observations	134,087	134,087	134,087
δ_{it}^{k}	YES	YES	YES
γ_{jt}^{k}	YES	YES	YES
ω_{ij}^{k}	YES	YES	YES

Note: PPML regressions. Fixed effects and constant not reported for the sake of simplicity. Standard errors (in parentheses) are clustered on country pairs. ***p < 0.01, **p < 0.05, *p < 0.1.

agreements and GATT/WTO membership on trade in services is between one-half and two-thirds of the effect on trade in agriculture or manufacturing.[10]

To summarize, our preferred estimates indicate that both trade and capital-restrictive measures lead to reductions in international trade flows. These trade-reducing effects tend to be larger for trade-related than for capital restrictions, and for trade in goods, especially for agriculture and manufacturing, compared to services.

6. Conclusions

The economic impacts associated with exchange and capital controls have been the focus of a large literature. However, studies have typically focused on quantifying the impact of exchange and capital controls on economic growth, capital mobility, and income inequality.

In this paper, we focus on an important—but less studied—channel through which exchange and capital controls can affect economies around the world: through their impact on trade flows. We contribute to the literature in three different ways. First, we construct a novel indicator of exchange and capital account restrictions—using information contained in the Measure of Aggregate Trade Restrictions (MATR) database of Estefania-Flores et al. (2022). In doing so, we are able to obtain information on a very large sample of countries and time periods, and to construct measures of exchange and capital restrictions, as well as of trade restrictions, that are consistently constructed from the underlying data, and therefore more easily comparable. Second, we implement state-of-the-art gravity models (Yotov et al., 2016), which allow us to better identify the causal effect of these restrictions on international trade. Third, we examine the impact of trade restrictions across different sectors (agriculture, mining, manufacturing and services).

Our results indicate that capital account restrictions have large and statistically significant adverse effects on trade flows, although their effect is smaller than that of trade restrictions. These effects are heterogeneous across sectors, being larger for trade in goods, especially for agriculture and manufacturing, and smaller for trade in services.

Further research is needed to delve into the heterogeneous effects of capital restrictions through the trade channel across firms and households. This is especially important given the broader frame of the issues explored in this paper, which are related to Keynes's view that capital account restrictions are an essential underpinning of free trade. After the interwar period of the last century—which showed the conflict between unregulated capital flows, effective economic governance, and free trade— Keynes's view influenced the post-WWII international financial architecture (Ostry, 2022). Future research should investigate the salience of Keynes's thinking on this issue in the 21st century.

[10] The effect is computed as $100*[e^{\psi_{TA}} - 1]$ and $100*[e^{\psi_{GATT/WTO}} - 1]$ respectively.

Appendix

Table A1
Summary statistics.

Variable	Observations	Mean	Std. dev.	Min	Max
Export flows: agriculture	134,140	574276	1.55e+ 07	0	1.96e+ 09
Export flows: mining	134,140	864252	1.99e+ 07	0	2.06e+ 09
Export flows: manufacturing	134,140	5380695	1.29e+ 08	0	1.43e+ 10
Export flows: services	134,140	1.15e+ 07	2.93 +e08	0	2.79e+ 10
$MATR\_T_{ijt}$ (standardized)	134,140	0	1	-1.28	2.28
$MATR\_C_{ijt}$ (standardized)	134,140	0	1	-1.64	2.42
TA_{ijt}	134,140	0.27	0.44	0	1
$GATT/WTO_{ijt}$	134,140	0.83	0.38	0	1

References

Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review, 93*, 170–192.

Baier, S. L., & Bergstrand, J. H. (2007). "Do free trade agreements actually increase members' international trade?". *Journal International Economics, 71*, 72–95.

Baldwin, R., & Taglioni, D. (2007). Trade effects of the euro: A comparison of estimators. *Journal of Economic Integration, 22*, 790–818.

Blanchard, O., Ostry, J. D., Ghosh, A. R., & Chamon, M. (2016). Capital flows: Expansionary or contractionary? *American Economic Review, 106*(5), 565–569.

Chinn, M., & Ito, H. (2008). A new measure of financial openness. *Journal of Comparative Policy Analysis, 10-3*, 309–322.

Edison, H. J., Klein, M. W., Ricci, L., & Slok, T. (2004). Capital account liberalization and economic performance: survey and synthesis. *International Monetary Staff Paper* 02/120.

Eichengreen, Barry J. (2001). Capital account liberalization: What do the cross-country studies tell us? *World Bank Economic Review, 15*, 341–366.

Estefania-Flores, J., Furceri, D., Hannan, S. A., Ostry, J. D., & Rose, A. K. (2022). *A measurement of aggregate trade restrictions and their economic effects.* International Monetary Fund.

Furceri, D., & Loungani, P. (2018). Capital account liberalization and inequality. *Journal of Development Economics, 130*, 127–144.

Furceri, D., Loungani, P., & Ostry, J. (2019). The aggregate and distributional effects of financial globalization: Evidence from macro and sectoral data. *Journal of Money, Credit and Banking, 51*(issue S1), 163–198.

Ghosh, Atish R., Ostry, Jonathan D., & Qureshi, Mahvash S. (2018). *Taming the tide of capital flows: A policy guide.* MIT Press.

Head, K., & Mayer, T. (2014). Gravity equations: Workhorse, toolkit, and cookbook. In G. Gopinath, E. Helpman, & K. Rogoff (Vol. Eds.), *Handbook of international economics: Vol. 4*, (pp. 131–195). Elsevier.

Heid, B., Larch, M., & Yotov, Y. V. (2021). Estimating the effects of non-discriminatory trade policies within structural gravity models. *Canadian Journal of Economics/Revue Canadienne d'Economique, 54*, 376–409.

Kose, A. M., Prasad, E., Rogoff, K., & Wei, S.-J. (2009). Financial globalization: A reappraisal. *IMF Staff Papers, 56*, 8–62. https://doi.org/10.1057/imfsp.2008.36

Lai, K., Wang, T., & Xu, D. (2021). Capital controls and international trade: An industry financial vulnerability perspective. *Journal of International Money and Finance, 116*, Article 102399. https://doi.org/10.1016/j.jimonfin.2021.102399

Ostry, J. D., Ghosh, A. R., & Qureshi, M. S. (Eds.). (2015). *Capital controls*. Edward Elgar.

Ostry, J. D., Berg, A., & Kothari, S. (2021). Growth-equity tradeoffs in structural reform. *Scottish Journal of Political Economy, 68*(2), 209–237.

Ostry, J. D. (2022). The IMF's journey on capital controls: What is the destination? *Oxford Review of Economic Policy, 39*(2), 325–332.

Prasad, E., K. Rogoff, S.-J. Wei, M.A. Kose. (2003). Effects of financial globalization on developing countries: Some empirical evidence. IMF Occasional Paper No. 220.

Santos Silva, J., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics, 88*(4), 641–658.

Tamirisa, N. (1999). Exchange and capital controls as barriers to trade. *IMF Staff Papers, 46*(1), 69–88.

Wei, S.-J., & Zhang, Z. (2007). Collateral damage: Exchange controls and international trade. *Journal of International Money and Finance, 26*(5), 841–863.

Yotov, Y. V. (2022). On the role of domestic trade flows for estimating the gravity model of trade. *Contemporary Economic Policy* (forthcoming).

Yotov, Y. V., Piermartini, R., Monteiro, J., & Larch, M. (2016). *An advanced guide to trade policy analysis.* Geneva: World Trade Organization.

Younas, J. (2011). De facto financial openness and capital mobility. *Economics Letters, 112*(1), 60–62.