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A NEW MEASURE OF AGGREGATE TRADE RESTRICTIONS: CYCLICAL DRIVERS AND MACRO EFFECTS

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This paper presents a new measure of aggregate trade restrictions (MATR) using data from the International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions. MATR is strongly correlated with existing measures of trade restrictiveness but is more comprehensive in terms of country and time coverage. It is available for an unbalanced sample of up to 157 countries during 1949-2019. We use MATR to re-examine how trade restrictiveness varies with the business cycle, and how the macroeconomy looks in the aftermath of changes in trade restrictiveness. For the sample as a whole, MATR is typically a-cyclical but this average finding is heterogeneous across income groups: aggregate trade restrictions are a-cyclical in advanced economies but are counter-cyclical in emerging market and developing economies, especially in response to increases in unemployment. As to macroeconomic effects, increases in MATR are robustly associated with declines in GDP and in labour productivity (as well as being adverse for a range of other macroeconomic indicators).

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1 Introduction

Trade policies are an important instrument in economic policy toolkits, and accordingly have received considerable scrutiny in the empirical economics literature which uses available measures to gauge their economic impact. Yet, it remains difficult to measure *quantitatively* the extent of trade restrictiveness across a large set of countries over a long period of time. While there is a plethora of trade policy indicators, most of them – except for tariff data – are available only with limited time and country coverage (see Estefania-Flores *et al*, 2022, for a discussion).

To address this limitation, we present a new way to quantify policy towards international trade at the aggregate level. Our measure of aggregate trade restrictions (hereafter 'MATR') is based on data from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (hereafter 'AREAER'). The measure is constructed through an in-depth process that combines information in the AREAER online database (available from 1999 onwards) with narrative accounts of how restrictive official government policy is towards the cross-border flow of goods and services, obtainable in printed versions of the AREAER country-year specific reports (from 1949 onwards). We show that our indicator is strongly correlated with existing measures of trade restrictiveness but more comprehensive in terms of country and time coverage: it is available for an unbalanced sample of up to 157 countries over the period from 1949 to 2019 (and of course is updatable as more data become available).

The aggregate level of the data makes it particularly useful to assess the macro-economic dimension of restrictions, including the co-movement of restrictiveness with the business cycle. There is a long-standing literature examining how specific trade policy measures (tariffs, quotas and temporary trade barriers) respond to fluctuations in economic activity. While this literature provides convincing evidence that trade policy tended to be counter-cyclical – that is, rising during periods of economic downturn – before the Second World War[1], the evidence using post-war data is less clear cut. For example, using a large panel of data, Rose (2013) showed that trade protectionism does not systematically increase during economic downturns. In contrast, Knetter and Prusa (2003) found that real exchange appreciations increase anti-dumping filings in Australia, Canada, the EU and the USA between 1980 and 1998. Bown and Crowley (2013) estimated the impact of macroeconomic fluctuations on import protection policies for five industrialised economies – the United States,

[1] For example, Hansen (1990), using American pre-Second World War data, found that tariffs have been higher during recessions than expansions. Gallarotti (1985) provided similar evidence using pre-First World War data for Germany, the UK and the US. Bohara and Kaempfer (1991) used long-time series data for the US and showed that tariff increases in the short term following positive (negative) shocks to unemployment (GDP growth).

European Union, Australia, Canada and South Korea. They found evidence of strongly countercyclical trade policy in the two decades leading up to the Great Recession, as countries resorted to new temporary trade barriers (TTBs) in response to increases in unemployment rates and real exchange rate appreciations. Similarly, Furceri *et al* (2023) used high-frequency TTB sectoral data covering 1220 sectors in 25 countries during 1989-2019, and found that retaliation through trade barriers increases in periods of high unemployment. High-frequency and granular data may make it easier to identify cyclical responses of trade policy.

Our new measure of aggregate trade restrictiveness affords us the opportunity to re-examine the connection between trade policy and the business cycle. We present results on how MATR varies with the business cycle, and whether cyclicality varies over time and across countries. Our results suggest that, on average, MATR appears to be largely a-cyclical in the sample as a whole, but this result is heterogeneous across countries: MATR tends to be a-cyclical in advanced economies (AEs) but counter-cyclical in emerging market and developing economies (EMDEs), especially in response to unemployment.

2 MATR data

The MATR is built on data from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER). The measure combines information in the AREAER online dataset (available from 1999) with the narrative accounts of policies across countries related to the international flow of goods and services. The latter was compiled from the printed version of the IMF's AREAER country-specific reports from 1949 onwards. The in-depth details on the measure, including underlying method for compiling narrative accounts, is described in Estefania Flores *et al* (2022).

MATR is based on the IMF's AREAER binary variables on: (i) exchange measures; (ii) arrangements for payments and receipts; (iii) imports and imports payments; (iv) exports and exports proceeds; and (v) payment and proceeds from individual transfers and current transfers. Each of these categories include sub-categories[2]. The simplest version of the MATR is the unweighted sum of 22 variables

[2] The AREAER draws together information from a number of sources, including official IMF staff visits to its member country. The individual country chapters include information related to restrictions on current international payments and transfers and multiple currency practices subject to the IMF's jurisdiction, in accordance with Article VIII of the IMF's Articles of Agreement, or maintained under Article XIV. The report also provides information on the structure and determination of exchange rates, monetary frameworks, arrangements for payments and receipts, procedures for resident and nonresident accounts, the operation of foreign exchange markets, controls on international trade and capital transactions, and measures implemented in the financial sector, including prudential measures. In addition, it lists exchange measures imposed by member countries for security reasons, including those reported to the IMF in compliance with IMF Executive Board decisions.

(Table 1). The underlying components of MATR (the 'fundamentals') give granular measures of different facets of policy by using information on tariffs, non-tariff barriers, and restrictions on requiring, obtaining, and using foreign exchange for current transactions.

The MATR, has several desirable properties: (i) it is based on sensible, plausible policy inputs from a transparent, accessible, reliable source; (ii) each of the underlying fundamentals is quantitative, based on clear criteria, and the fundamentals include a host of non-tariff barriers as well as tariffs; (iii) normalisation issues are avoided since the measure is an aggregate of binary components. The MATR is available for a large, unbalanced panel of most economies from 1949 through 2019, and it is regularly updated.[3,4] The coverage increases from about 30 economies in 1949 to more than 100 countries in 1973, and over 150 countries by 2000, as shown in Figure 1.

The MATR is an intrinsically aggregate measure rather than a weighted average of disaggregated microdata (in contrast to the aggregate tariff); it does not have sectoral variation, ie it is inherently macroeconomic or aggregate in nature. Moreover, it codes the *existence* of restrictions, not their intensity or efficacy. That said, and as shown in Table 2, MATR is strongly correlated with existing measures that capture the intensity of trade restrictions[5].

<u>Evolution of MATR</u>

Figures 2-4 examine some of the time-series characteristics of the MATR. Figure 2 shows the development of MATR for AEs and EMDEs. Both groups started in comparable situations, began to

[3] Cerdeiro and Nam (2018) deplored the fact that measures of trade policy rarely extend far back in time.
[4] MATR is also essentially unaffected by missing granular data since the latter can be filled in using *AREAER* entries on annual changes to fundamentals.
[5] We consider five alternative measures to the MATR: (1) Novy's (2012) trade costs is a measure used by the UN's ESCAP in conjunction with the World Bank, with export weights. The measure is constructed using macro-economic data based on micro-theory. It accounts for all costs involved in trading goods internationally relative to domestically, including transport costs, tariffs or import and export procedures. The current measure covers 180 countries from 1995 to 2020. (2) The World Economic Forum's 2016 Index of Trade Enablement evaluates countries' capacity to facilitate the flow of goods in terms of domestic and foreign market access; border administration; transport and digital infrastructure; transport services; and operating environment. The index is available for 136 economies for 2016. (3) the Trade Restrictiveness Index (TRI) produced by the World Bank (2009), using the methodology of Kee *et al* (2009), calculated the uniform tariff that would maintain the level of imports in a country. The index is calculated annually and is available for 167 countries for 2009. (4) Quinn's measure of Current Account Financial Openness measures how well governments liberalize the proceeds from goods and services trade in compliance with their IMF Article VIII obligations. The index is available for 88 countries from 1973 to 2014. (5) The World Bank's Ad Valorem Equivalent (AVE) of Non-Tariff Measures (NTMs) is the uniform tariff that will result in the same trade impacts on the import of a product due to the presence of the NTMs. The database covers 40 importing countries, and 151 exporting countries and presents a cross-section at sectoral level (42 sectors) and is also available bilaterally. The information to construct the measures is compiled during the years 2012 to 2016 and presents two alternative measures.

liberalise in the early 1970s, and have stalled their liberalisation progress since the early 2000s; overall, the degree of liberalisation is more pronounced in AEs than in EMDEs.

Figures 3-4 plot the evolution of trade restrictions across regions over time[6]. The overall picture is aligned with common perceptions: (i) Europe is the least restrictive, followed by the Americas and Asia-Pacific; Africa and MENA regions remain fairly restrictive; (ii) In line with their liberalisation efforts in the 1980s and 1990s, Asia shows sharp drop in trade restrictions during those periods; and (iii) trade liberalisation efforts have slowed down or stalled across all regions in the last decade. Delving deeper across components, the trend of the overall indicator has been mirrored by similar patterns in a number of the key components which display a period of significant liberalisation, and then a stall in the more recent period. The fundamentals that mirror this overall picture include: import and export restrictions; payment restrictions; and to a lesser degree, exchange measures.

The country dimension (Figure 5) shows that, although countries by-and-large have liberalised over the past decades, there is a not-insignificant group of countries that have become more restrictive over time. On the one hand, large economies in Asia (eg Korea, Vietnam, Indonesia, Australia) have liberalised considerably. On the other hand, smaller economies (eg Nepal, Bhutan, Kiribati) have become more trade restrictive. In Africa, larger economies such as Kenya have liberalised substantially, while South Africa has become more restrictive. One of the key exceptions is Europe where, with rare exceptions, most countries have liberalised over time.

3 Is MATR counter-cyclical?

As a first cut, Figure 6 plots the relationship between de-trended growth and the detrended MATR. The relationship in the scatterplot with all the countries bunched together suggests a very tenuous negative relationship – that is, lower growth is associated with slightly higher trade protectionism: MATR appears in the plots to be mildly counter-cyclical. However, when grouped by income levels, the scatterplots suggest mild pro-cyclicality for AEs and mild counter-cyclicality for EMDEs. In other words, the overall aggregate trend seems to be driven by the EMDE sample. The pro-cyclicality of AEs and the counter-cyclicality of EMDEs are more pronounced in the scatterplots of the detrended unemployment rate versus MATR (Figure 7)[7].

[6] The MATR may not capture high-frequency movements in some aspects of trade policy, as noted previously.

[7] An interesting issue is whether the fact that MATR measures the existence of restrictions recorded in the AREAER, rather than the intensity, makes it impossible for the indicator to display cyclical variation. As a matter of logic of course, countries could impose or remove restrictions in response to variations in the cyclical position of an economy, so cyclical variation of MATR is not ruled out *a priori*.

To check whether this evidence holds up when subjected to a more formal analysis, we estimate the following specification:

1) $$MATR_t^c = \alpha_i + \gamma_t + \beta y_t^c + \varepsilon_t$$

where $MATR_t^c$ and y_t^c denote the cyclical component of MATR and GDP (unemployment), respectively. Following Rose (2013), we use five alternative methods to detrend output (unemployment): Baxter-King; Christiano-Fitzgerald; Hodrik-Prescott; first-differencing; and linear in time. α_i and γ_t, are country- and time-fixed effects, respectively. The coefficient β denotes the degree of cyclicality. A negative (positive) value of β for the cyclical output regression suggests that MATR is counter-(pro-)cyclical. The opposite holds for the regression using cyclical unemployment. A coefficient of β equal to zero suggests that MATR is a-cyclical. Equation (1) is estimated using OLS for an unbalanced panel of 155 countries over 1949-2019[8]. The data sources and countries are reported in Appendix Tables A1 and A2. Standard errors are clustered at the country-level.

Table 3 presents the results obtained estimating equation (1) using cyclical output as the main regressor. Each of the five column reports the results for a particular detrending method. The results confirm the graphical evidence from Figure 6 and suggest that MATR is typical a-cyclical. Out of the five filtering methods, in only one (difference of log GDP) is the coefficient β negative and statistically significant[9]. We check whether these results are robust to alternative specifications (such as alternatively dropping country- and time-fixed effects, dropping the years of the global financial crisis and removing outliers). The results typically confirm that MATR is a-cyclical (Table 4). Notably, even in the regression with log differences, the coefficient becomes statistically insignificantly different from zero once outliers are removed. Additional results (not reported) obtained by including the control variables used by Rose (2013) – total population, current account, trade, exchange rate changes – are similar to, and not statistically different from, the baseline. Finally, we repeated the analysis using the level of MATR instead of its cyclical component and we obtained similar results[10].

It is possible that while protectionism is not used in response to 'average' business cyclical fluctuations, countries decide to enact protectionist measures in the face of recessions. To check for

[8] We exclude two countries (Cambodia and Iraq) from the MATR original database because they contained large gaps in their sample so we could not apply filtering techniques in those two cases. We also excluded them from linear and first-differencing exercises to maximise comparability among the different techniques.

[9] The fact that MATR responds in a counter-cyclical fashion to GDP shows that, at least on one detrending method, the MATR measure is not a-cyclical.

[10] We report transparently all the results on cyclicality of MATR and make a judgment about the overall tenor of the results. We do not dismiss, however, that some of the detrending methods generate counter-cyclicality of MATR.

this possibility, we re-estimated Equation (1) by replacing cyclical output with alternative measures of crises and recessions: (i) a recession dummy for when the country experiences a year of negative growth; (ii) troughs in the business cycle identified using the Harding-Pagan dating algorithm; (iii) peak-to-troughs changes identified using the Harding-Pagan dating algorithm; and (iv) financial crises identified in Laeven and Valencia (2018). The results in Table 5 generally fail to uncover evidence of a systematic response of MATR to recessions.

Another possibility is that the cyclicality of MATR has changed over time, notably as a result of WTO accession. To check this possibility, we modified equation (1) as follows:

2) $$MATR_t^c = \alpha_i + \gamma_t + \beta^{post} D_{it} y_t^c + \beta^{pre}(1 - D_{it}) y_t^c + \varepsilon_t$$

where D_{it} is a dummy which takes the value 1 as from when the country joined the WTO, and zero otherwise.[11] β^{post} and β^{pre} denote the responses pre- and post-WTO accession, respectively. Results from estimating Equation (2) are reported in Table 6. The coefficients of interest remain not statistically different from zero in most of the cases and provide only tenuous evidence that the degree of counter-cyclicality changed after the country joined the WTO[12].

Next, we check whether the degree of counter-cyclicality varies between AEs and EMDEs. For this purpose, we estimate a specification similar to (2) but using a non-time varying dummy to classify countries as AEs or EMDEs. The results in Table 7 confirm the heterogeneity evident in the scatter plot in Figure 6. While the coefficient for AEs is not statistically significant, the coefficient for EMDEs is negative and statistically different from zero in three of the five filtering methods used. The evidence in favour of the conclusion that MATR is counter-cyclical in EMDEs is strengthened when we use the unemployment rate rather than output as the key regressor (Table 8). The greater evidence of counter-cyclicality in EMDEs may reflect weaker safety nets in this group of countries. That being said, this result should be treated with some caution given the limited availability and quality of unemployment rates in EMDEs.

[11] More specifically, our dummy takes a value of one as from when countries acceded to the GATT if the country had been GATT members at the time of the creation of the WTO and WTO accession for the others (those that joined the WTO without having been GATT members before.

[12] Our WTO dummy variable measures GATT accession for countries that had been GATT members at the time of the creation of the WTO and WTO accession of the others (those that joined the WTO without having been GATT members before).

4 The macroeconomy in the aftermath of trade restrictions

We now examine the period after changes in MATR to see if the dynamics of aggregate output are impacted by changes in our index. We use the local projection method of Jordà (2005) which does not impose the dynamic restrictions embedded in vector autoregression specifications and is well-suited to estimating nonlinearities in the dynamic response. Our baseline regression is:

$$y_{i,t+k} = \alpha_i^k + \gamma_t^k + \beta^k \Delta R_{i,t} + \sum_{j=0}^{2} \vartheta_j^k \Delta R_{i,t-j} + \sum_{j=0}^{2} \theta_j^k y_{i,t-j} + \varepsilon_t^k, \quad (3)$$

where:

- i denotes the economy and t denotes the year,
- k denotes the horizon being considered (in years after the change in trade barriers),
- y is the log of output,
- $\{\alpha\}$ are country fixed effects, included to account for differences in countries' average economic performance,
- $\{\gamma\}$ are time fixed effects, included to control for economic developments facing all countries in a given year, and
- ΔR denotes the change in MATR, increasing with restrictions,
- $\{\vartheta\}$ and $\{\theta\}$ are nuisance coefficients, and
- $\{\varepsilon\}$ are residuals that represent all other output determinants.

For the main results, we use the aggregate MATR index, denoted *R,* though separate (largely similar) results for sub-indices and alternative aggregations of the fundamentals are available as robustness checks. The coefficient β^k denotes the 'impact' of changes in MATR on output at horizon *k*. In the baseline we do not take a stance on the drivers of MATR; that is, we do not distinguish between changes considered exogenous to economic activity in the short-to-medium run, and endogenous changes. The latter might occur as part of broader reform packages or because of a cyclical motivation to push output to trend in recessions.

We estimate (3) for an unbalanced sample of 157 countries over 1949-2019 using ordinary least squares for k = 0,…,5. Impulse response functions are computed using the estimated β^k and confidence bands are obtained using Driscoll-Kraay (1998) standard errors to account for cross-sectional and time dependence in the error term ε_t^k.

Table 9 presents the results. The coefficients of interest are presented in Figure 8, the evolution of (log) output following a one-standard deviation in MATR (equivalent to a 0.82 unit change in the index). Time is on the x-axis; the solid line portrays the average estimated response and the shaded area denotes the 90 percent confidence interval. The results suggest that the one-standard-deviation increase in MATR (comparable to that of Thailand in 2000) is associated with an immediate reduction in output by 0.2 percent, and by 0.7 percent five years after. This effect is highly significant in both statistical and economic terms. To put it in perspective, it is almost twice the medium-term output effect of a one-standard deviation increase in tariff rates estimated in Furceri *et al* (2021). It is also economically plausible, close in magnitude to simulation results from a sectoral, computable, general equilibrium model (Caliendo *et al*, 2017) based on the same magnitude of the change in trade restrictions.

To check the robustness of these associations, we perform a number of sensitivity tests. First, we divide our observations into those from advanced and emerging economies: changes in MATR portend statistically significant changes in output in both AEs and EMDEs, albeit larger in the second group. To get a sense of the components of MATR driving these results, we re-ran the regressions on different components of trade restrictions: invisibles, exports, imports, payments and exchange measures. The results in AEs seem to be driven mainly by export and import restrictions, while those for EMDEs seem to be driven mainly by restrictions related to invisibles, exports, imports, and payments (all statistically significant).

We also explored (results available on request) some mediating channels for the output effects by re-estimating (3) using as alternative dependent variables: (i) labour productivity; (ii) employment; (iii) inequality; (iv) the trade balance; (v) investment; (vi) consumption; (vii) exports and (viii) imports. The results suggest that one key channel behind the output impact is a statistically and economically significant decrease in labour productivity, which declines by about 1.5 percent five years after an increase in MATR. This result is in line with the perspective that protectionism leads to a meaningful reduction in the efficiency with which labour is used. An increase in trade barriers is also associated with lower investment, consistent with the idea that firms face less competition and have therefore less incentive to invest. Unsurprisingly, both imports and exports fall with an increase in protectionism, as does consumption, by around 1 percent after five years.[13]

There is an interesting question whether some components of MATR are more salient in terms of their macroeconomic effects than others. To address this question, we repeated the analysis to consider separately the five main components of MATR: (i) exchange measures; (ii) payment restrictions; (iii) import restrictions; (iv) export restrictions; and (v) payment for invisibles. The results suggest that increases in any component are associated with a decline in output. Moreover, the effects are not statistically different across components.

Another issue is whether the impact of large and plausibly exogenous changes in MATR differ from our baseline OLS findings. We follow Romer and Romer (2010) and search for exogenous MATR shocks where the narratives do not suggest a policy intention of returning output growth to trend. The first step in identifying such episodes is to look for large changes in MATR. In line with the literature on stock market (Henry 2007) and capital account liberalisations (Furceri and Loungani 2018; Furceri *et al*, 2019), we identify large changes as episodes in which changes in MATR exceed their average by at least two standard deviations using all observations (in practice, where MATR changes by more than 1.64). This criterion identifies 385 episodes, and is useful because it excludes minor changes in MATR where it would be challenging to scrutinise the narrative records. As a second step, we restrict our selection further by excluding episodes that are preceded or followed by economic or financial crises in a one-year interval. This narrows the set of episodes further, to 162 cases. While closer to being exogenous, these major MATR changes that are time-contiguous to economic crises still could be driven by a desire by policy makers to bring growth to trend. On these 162 episodes, we next perform extensive search of narrative records, and exclude episodes where an element of counter-acting shocks or closing the output gap was present in the narratives. This approach narrows the number of episodes further, to 58 episodes: 7 increases in restrictions and 51 liberalisations. Looking closely, most of these episodes are associated with ideological and/or political changes, while others occurred as part of major trade agreements among countries to strengthen economic and political linkages. Even this relatively small set of episodes could still be part of broader reform packages aimed at improving long-term output. To address this issue, we further restrict the set of episodes to exclude those occurring during an IMF stabilisation programme and those associated with other major changes in product, domestic and external finance, and labour market reforms. The results obtained by re-

[13] Our results are consistent with a common analytical approach in undergraduate macro textbooks which emphasises that trade protectionism leads to a real exchange rate appreciation which depresses net exports and output.

estimating (3) with our set of exogenous changes in MATR (or indeed with any of the intermediate steps) confirm that MATR increases have statistically-significant negative effects on output (and that this correlation is unlikely to be driven by reverse causation).

5 Conclusion

In this paper, we present a new measure of aggregate trade restrictions. While MATR is strongly correlated with existing measures of trade restrictiveness, its main advantage is its vastly expanded country and time coverage. MATR is also well suited for use in macroeconomic applications, as explored more fully in Estefania-Flores *et al* (2022).

We examined in depth an often-debated issue in the trade literature: whether protectionism is counter-cyclical, using our specific measure: MATR. Our results confirm previous evidence that, on average in the post-WWII period, countries have not modified their aggregate degree of protectionism (measured by MATR) in response to the business cycle. At the same time, our results underscore an important heterogeneity: aggregate trade restrictions are a-cyclical in AEs but continue to be used counter-cyclically in EMDEs. More work is needed to understand the factors behind this heterogeneity, though weaker safety nets in EMDEs seems a plausible reason.

As pointed out by Goldberg and Pavenick (2016):

> *"Measurement of trade policy is perhaps one of the toughest issues faced in the evaluation of trade policy, especially in cases where non-tariff barriers are the primary trade policy instrument … Even when trade restriction measures are available, as is the case with import tariffs, the available information comes at a highly disaggregate level. Economic analysis of these restrictions' effects often requires the researcher to aggregate the information to a higher level (e.g., the industry, region or country) … to map it to the level at which economic outcomes of interest are measured."*

Our paper provides a measure that complements existing measures of aggregate trade restrictiveness and should be helpful for many macroeconomic applications. In this connection, our central finding is that trade restrictions, as measured by MATR, are associated with large and persistent declines in GDP, whose impacts are almost twice as large as those we identified previously for the macroeconomic effects of tariffs using a similar methodology. Broader measures of trade restrictiveness that encompass nontariff barriers are detrimental to macroeconomic performance, and should therefore not be used to improve such performance. This result is completely consistent with basic macroeconomic theory and the overwhelming opinion of the economics profession. It needs however to be better appreciated in the political sphere.

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Table 1: MATR components

II. Exchange measures	II.A. Restrictions and/or multiple currency practices
	II.B. Exchange measures imposed for security reasons
IV. Restrictions to payments	IV.A. Prescription of currency requirements
	IV.B. Payments arrangements
	IV.C. Administration of control
	IV.D. Payment arrears
	IV.F. Controls on exports and imports of banknotes
VII. Import Restrictions	VII.A. Foreign exchange budget
	VII.B. Financing requirements for imports
	VII.C. Documentation requirements for release of forex for imports
	VII.D. Import licenses and other nontariff measures
	VII.E. Import taxes and/or tariffs
	VII.F. State Import Monopoly
VIII. Export Restrictions	VIII.A. Repatriation requirements
	VIII.B. Financing requirements
	VIII.C. Documentation requirements
	VIII.D. Export licenses
	VIII.E. Export taxes
IX. Payments and X. Proceeds for Invisibles Restrictions	IX.A. Payments for Invisibles, Transfers & Current Transfers
	X.A. Repatriation requirements on Proceeds
	X.A.1. Surrender Requirements on Proceeds
	X.B. Restrictions on use of funds

Table 2: **Correlation of MATR with trade costs, trade enablement, TRI, Current Account Fin openness measure**

Variables	(1)	(2)	(3)	(4)	(5)
(1) Trade Costs Novy (export-weighted)	0.192*				
(2) Trade Enablement, WEF		-0.695*			
(3) TRI, WB 2009			0.278*		
(4) Curr. Acc. Fin'l Openness, Quinn				-0.850*	
(5) Ad Valorem Equivalent (AVE) of NTMs					0.32*

Note: MATR correlations against four ad-hoc trade restriction existing measures: Novy's (2012) measure of trade costs; The World Economic Forum's 2016 Enabling Trade Index; Quinn's measure of current account financial openness; Trade Restriction Index (TRI) produced by the World Bank (2009), using methodology from Kee *et al* (2009); AVE of non-tariff measures (NTMs) by importing countries by the World Bank. The index is disaggregated at the sectoral level and provides two different measures: technology and non-technology. We first use the mean of all the sectors by countries and then the mean of the two measures, since both are included in MATR. AVE index is a cross-section calculated using 2012-2016 information, thus we restrict MATR to this range of years to calculate the correlation.

Table 3: Detrended measures of GDP growth and detrended MATR

VARIABLES	(1) Detrended MATR (Hodrick-Prescott)	(2) Detrended MATR (Baxter-King)	(3) Detrended MATR (Christiano-Fitzgerald)	(4) Difference of MATR	(5) Detrended MATR (Linear in Time)
Detrended Log of Real GDP (Hodrick-Prescott)	-0.309				
	(0.222)				
Detrended Log of Real GDP (Baxter-King)		-0.374			
		(0.238)			
Detrended Log of Real GDP (Christiano-Fitzgerald)			-0.335		
			(0.235)		
Difference of Log of Real GDP				-0.376**	
				(0.190)	
Detrended Log of Real GDP (Linear in Time)					0.341
					(0.403)
Constant	0.000429***	-0.00222***	-0.00137***	-0.0549***	0.00813***
	(3.67e-05)	(2.79e-05)	(1.35e-05)	(0.00705)	(0.00184)
Observations	7,835	6,905	6,905	7,680	7,835
R-squared	0.021	0.028	0.026	0.052	0.080

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Table above shows the coefficients for our baseline specification $MATR_t^c = \alpha_i + \gamma_t + \beta y_t^c + \varepsilon_t$ for an unbalanced sample of 155 countries from 1949 to 2019. $MATR_t^c$ dependent variable is MATR index de-trended using five different techniques. y_t^c independent variable in each regression is de-trended GDP using the same technique as MATR. α_i and γ_t, are country- and time-fixed effects, respectively. Standard errors are clustered at the country-level.

Table 4: Detrended measures of GDP growth and detrended MATR; robustness checks

VARIABLES	(1) Detrended MATR (Hodrick-Prescott) **Baseline**	(2) Only Country FE	(3) Only time FE	(4) Using lagged GDP	(5) Dropping 2009 & 2010	(6) Excluding Outliers
Detrended Log of Real GDP (Hodrick-Prescott)	-0.309	-0.353	-0.309	0.180	-0.304	-0.191
	(0.222)	(0.217)	(0.222)	(0.196)	(0.230)	(0.152)
Detrended Log of Real GDP (Baxter-King)	-0.374	-0.400*	-0.377	0.223	-0.362	-0.286*
	(0.238)	(0.233)	(0.238)	(0.211)	(0.251)	(0.161)
Detrended Log of Real GDP (Christiano-Fitzgerald)	-0.335	-0.380	-0.336	0.310	-0.326	-0.320*
	(0.235)	(0.232)	(0.235)	(0.241)	(0.248)	(0.172)
Difference of Log of Real GDP	-0.376**	-0.196	-0.324*	-0.0453	-0.354*	-0.0562
	(0.190)	(0.189)	(0.181)	(0.192)	(0.198)	(0.115)
Detrended Log of Real GDP (Linear in Time)	0.341	0.508	0.300	0.366	0.344	0.545
	(0.403)	(0.391)	(0.381)	(0.393)	(0.401)	(0.381)

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: Column (1) in the Table above shows the coefficients for our baseline specification $MATR_t^c = \alpha_i + \gamma_t + \beta y_t^c + \varepsilon_t$ for an unbalanced sample of 155 countries from 1949 to 2019. $MATR_t^c$ dependent variable is MATR index de-trended using five different techniques. y_t^c independent variable in each regression is de-trended GDP using the same technique as MATR. α_i and γ_t, are country- and time-fixed effects, respectively. Standard errors are clustered at the country-level. Column (2) shows the coefficients for the baseline specification when only including country fixed effects (α_i). Column (3) shows the coefficients for the baseline specification when only including time fixed effects (γ_t). Column (4) shows the coefficients for the baseline specification using one lag of the independent variable (y_{t-1}^c). Column (5) shows the coefficients for the baseline specification when dropping Global Financial Crisis years from the sample (2009 and 2010). Column (6) shows the coefficients for the baseline specification excluding those countries whose residuals from baseline specification are more than 2.5 standard deviations from zero.

Table 5: Recessions and detrended MATR

VARIABLES	(1) Detrended MATR (Hodrick-Prescott)	(2) Detrended MATR (Hodrick-Prescott)	(3) Detrended MATR (Hodrick-Prescott)	(4) Detrended MATR (Hodrick-Prescott)
Recessions (Periods of negative Real GDP Growth)	0.0401*			
	(0.0216)			
Hardling Pagan Algorithm – Trough		0.0206		
		(0.0199)		
Hardling Pagan Algorithm – Peak to trough – Slowdown			0.0124	
			(0.0150)	
Fin. Crisis Dummy (Laeven and Valencia, 2018)				0.0226
				(0.0327)
Constant	-0.00640**	-0.00109	-0.00375	-0.000172
	(0.00304)	(0.00169)	(0.00363)	(0.00188)
Observations	6,921	7,989	6,921	6,202
R-squared	0.024	0.020	0.023	0.015

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Table above shows the coefficients for our the specification $MATR_t^c = \alpha_i + \gamma_t + \beta Rec_t^c + \varepsilon_t$ for an unbalanced sample of 155 countries from 1949 to 2019. $MATR_t^c$ dependent variable is MATR index de-trended using five different techniques. Rec_t^c independent variable in each regression is a dummy equal to 1 when there is a recession for a certain year and country. α_i and γ_t, are country- and time-fixed effects, respectively. Standard errors are clustered at the country-level.

Table 6: Detrended MATR and detrended GDP growth: before and after joining the World Trade Organization

VARIABLES	(1) Detrended MATR (Hodrick-Prescott)	(2) Detrended MATR (Baxter-King)	(3) Detrended MATR (Christiano-Fitzgerald)	(4) Difference of MATR	(5) Detrended MATR (Linear in Time)
Detrended Log of Real GDP (Hodrick-Prescott)*Before joining WTO	-0.125 (0.219)				
Detrended Log of Real GDP (Hodrick-Prescott)*After joining WTO	-0.932 (0.619)				
Detrended Log of Real GDP (Baxter-King)*Before joining WTO		-0.170 (0.236)			
Detrended Log of Real GDP (Baxter-King)*After joining WTO		-1.074* (0.612)			
Detrended Log of Real GDP (Christiano-Fitzgerald)*Before joining WTO			-0.120 (0.227)		
Detrended Log of Real GDP (Christiano-Fitzgerald)*After joining WTO			-1.145* (0.650)		
Difference of Log of Real GDP*Before joining WTO				-0.161 (0.211)	
Difference of Log of Real GDP*After joining WTO				-1.092*** (0.349)	
Detrended Log of Real GDP (Linear in Time)*Before joining WTO					0.434 (0.578)
Detrended Log of Real GDP (Linear in Time)*After joining WTO					0.0962 (0.667)
Constant	0.000713*** (0.000129)	-0.00182*** (0.000122)	-0.00108*** (8.35e-05)	-0.0470*** (0.00713)	0.00880 (0.00732)
Observations	7,367	6,490	6,490	7,222	7,367
R-squared	0.022	0.029	0.027	0.055	0.085

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Table above shows the coefficients for the specification $MATR_t^c = \alpha_i + \gamma_t + \beta^{post} D_{it} y_t^c + \beta^{pre}(1 - D_{it}) y_t^c + \varepsilon_t$ for an unbalanced sample of 155 countries from 1949 to 2019. where D_{it} is a dummy which takes value 1 when the country joined the WTO, and zero otherwise. β^{post} and β^{pre} denote the response for pre- and post-WTO accession, respectively. α_i and γ_t, are country- and time-fixed effects, respectively. Standard errors are clustered at the country-level.

Table 7: Detrended MATR and detrended GDP growth: advanced economies vs emerging and developing economies

VARIABLES	(1) Detrended MATR (Hodrick-Prescott)	(2) Detrended MATR (Hodrick-Prescott)	(3) Detrended MATR (Hodrick-Prescott)	(4) Detrended MATR (Hodrick-Prescott)	(5) Detrended MATR (Hodrick-Prescott)
Detrended Log of Real GDP (Hodrick-Prescott)*AE	1.112				
	(0.846)				
Detrended Log of Real GDP (Hodrick-Prescott)*EMDE	-0.403*				
	(0.230)				
Detrended Log of Real GDP (Baxter-King)*AE		1.242			
		(0.836)			
Detrended Log of Real GDP (Baxter-King)*EMDE		-0.360			
		(0.232)			
Detrended Log of Real GDP (Christiano-Fitzgerald)*AE			1.163		
			(0.890)		
Detrended Log of Real GDP (Christiano-Fitzgerald)*EMDE			-0.348		
			(0.246)		
Difference of Log of Real GDP*AE				0.151	
				(0.327)	
Difference of Log of Real GDP*EMDE				-0.283**	
				(0.112)	
Detrended Log of Real GDP (Linear in Time)*AE					0.00869
					(0.00775)
Detrended Log of Real GDP (Linear in Time)*EMDE					-0.0110*
					(0.00585)
Constant	0.000507***	1.81e-05	5.01e-05	0.00727*	0.000415***
	(5.82e-05)	(4.37e-05)	(3.26e-05)	(0.00412)	(3.19e-05)
Observations	7,835	7,198	7,198	7,789	7,835
R-squared	0.022	0.023	0.023	0.022	0.021

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Table above shows the coefficients for the specification $MATR_t^c = \alpha_i + \gamma_t + \beta^{AE} D_{it} y_t^c + \beta^{EMDE}(1 - D_{it}) y_t^c + \varepsilon_t$ for an unbalanced sample of 155 countries from 1949 to 2019. where D_{it} is a dummy which takes value 1 when the is an advanced economy and zero otherwise. β^{AE} and β^{EMDE} denote the response for advanced and emerging and developing economies, respectively. α_i and γ_t, are country- and time-fixed effects, respectively. Standard errors are clustered at the country-level.

Table 8: Detrended MATR and detrended unemployment rate: advanced economies vs emerging and developing economies

VARIABLES	(1) Detrended MATR (Hodrick-Prescott)	(2) Detrended MATR (Hodrick-Prescott)	(3) Detrended MATR (Hodrick-Prescott)	(4) Detrended MATR (Hodrick-Prescott)	(5) Detrended MATR (Hodrick-Prescott)
Detrended Unemployment Rate (Hodrick-Prescott)*AE	0.00148				
	(0.0240)				
Detrended Unemployment Rate (Hodrick-Prescott)*EMDE	0.0444***				
	(0.0142)				
Detrended Unemployment Rate (Baxter-King)*AE		-0.00276			
		(0.0217)			
Detrended Unemployment Rate (Baxter-King)*EMDE		0.0473***			
		(0.0175)			
Detrended Unemployment Rate (Christiano-Fitzgerald)*AE			0.00116		
			(0.0225)		
Detrended Unemployment Rate (Christiano-Fitzgerald)*EMDE			0.0490**		
			(0.0191)		
Difference of Unemployment Rate*AE				-0.0143	
				(0.0134)	
Difference of Unemployment Rate*EMDE				0.0136	
				(0.0103)	
Detrended Unemployment Rate (Linear in Time)*AE					-0.00142
					(0.00296)
Detrended Unemployment Rate (Linear in Time)*EMDE					0.00659***
					(0.00193)
Constant	-0.000833***	0.00132***	0.00123***	0.000796**	-0.000945***
	(2.03e-06)	(0.000270)	(0.000193)	(0.000374)	(3.39e-05)
Observations	3,357	2,808	2,808	3,269	3,357
R-squared	0.034	0.041	0.040	0.031	0.031

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

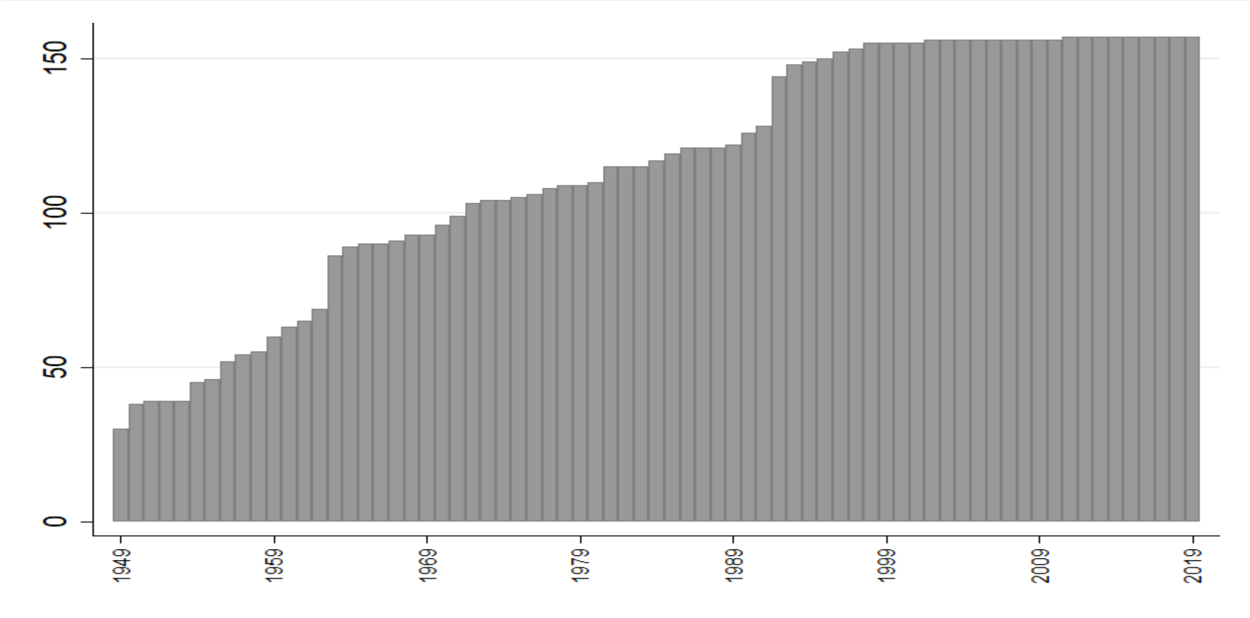
Note: Table above shows the coefficients for the specification $MATR_t^c = \alpha_i + \gamma_t + \beta^{AE} D_{it} u_t^c + \beta^{EMDE}(1 - D_{it}) u_t^c + \varepsilon_t$. u_t^c is the unemployment rate for each country and year. D_{it} is a dummy which takes value 1 when the is an advanced economy and zero otherwise. β^{AE} and β^{EMDE} denote the response for advanced and emerging and developing economies, respectively. α_i and γ_t, are country- and time-fixed effects, respectively. Standard errors are clustered at the country-level.

Table 9: Response of GDP to changes in MATR

Horizon	0	1	2	3	4	5
MATR	-0.26***	-0.61***	-0.71***	-0.87***	-0.98***	-0.91***
	(0.08)	(0.12)	(0.15)	(0.18)	(0.20)	(0.20)
MATR (t-1)	-0.26***	-0.38***	-0.52***	-0.65***	-0.61***	-0.66***
	(0.06)	(0.11)	(0.14)	(0.16)	(0.16)	(0.18)
MATR (t-2)	-0.06	-0.22*	-0.35**	-0.30**	-0.36**	-0.39**
	(0.07)	(0.11)	(0.13)	(0.14)	(0.18)	(0.18)
Log GDP (t-1)	0.19***	0.23***	0.28***	0.28***	0.23**	0.23**
	(0.04)	(0.06)	(0.07)	(0.07)	(0.09)	(0.09)
Log GDP (t-2)	0.02	0.06	0.03	-0.02	-0.01	-0.01
	(0.03)	(0.03)	(0.05)	(0.06)	(0.07)	(0.09)
Constant	4.41***	7.47***	12.53***	18.38***	23.73***	27.50***
	(0.23)	(0.37)	(0.45)	(0.68)	(0.78)	(1.02)
Observations	7,281	7,124	6,967	6,810	6,653	6,496
Number of countries	157	157	157	157	157	156
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.09	0.10	0.10	0.10	0.09	0.10

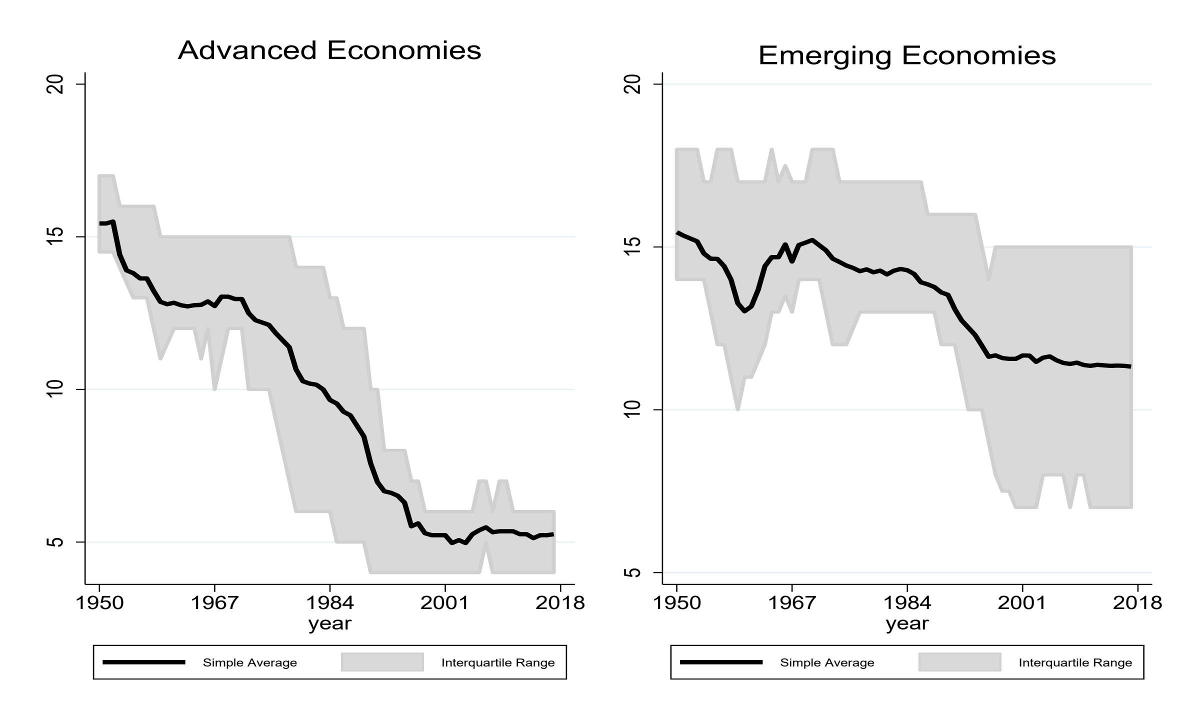
Note: The Table reports the effect of a unitary change increase in MATR. Dependent variable is used as the log of GDP. Standard errors are in parentheses. Significance is reported as: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 1: MATR country coverage over time



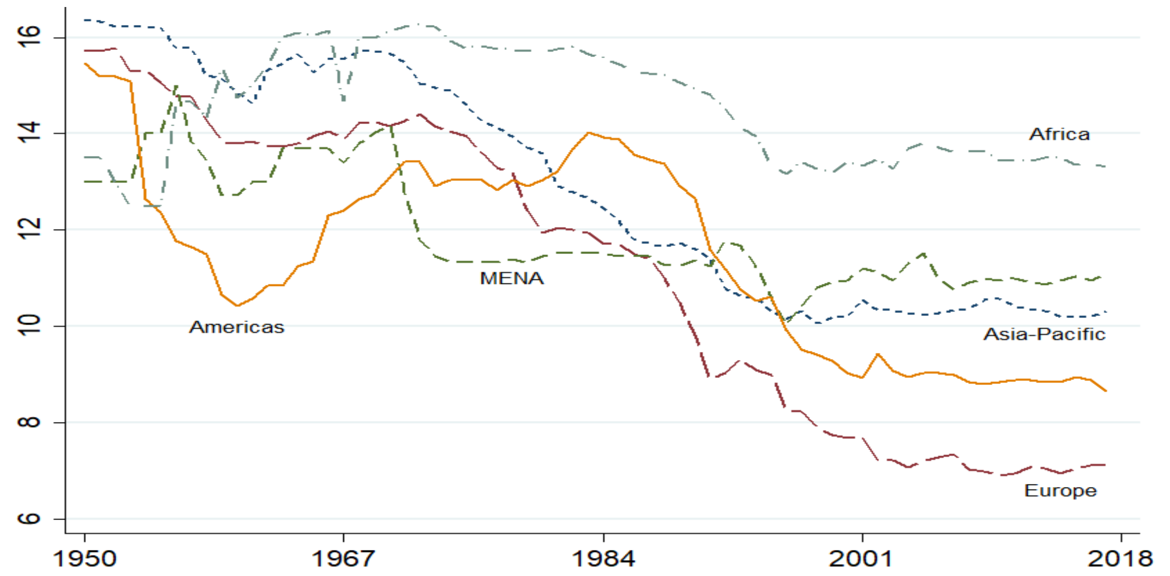
Note: Figure above plots the number of countries with available MATR data for each year.

Figure 2: Evolution of MATR over time, by income groups



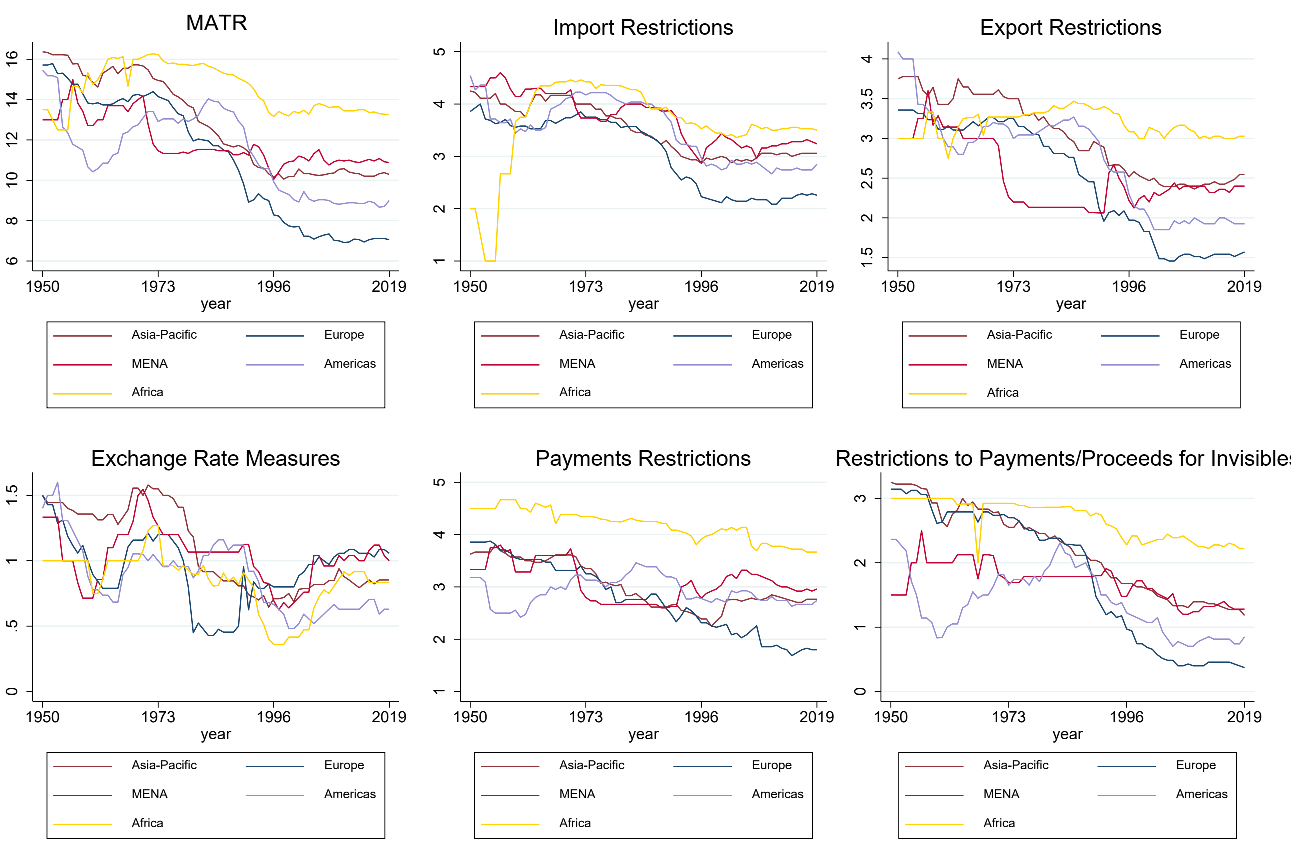
Note: Year-specific simple average and interquartile range of MATR for advanced and emerging economies, classified following the IMF *World Economic Outlook*.

Figure 3: Evolution of MATR over time, by region



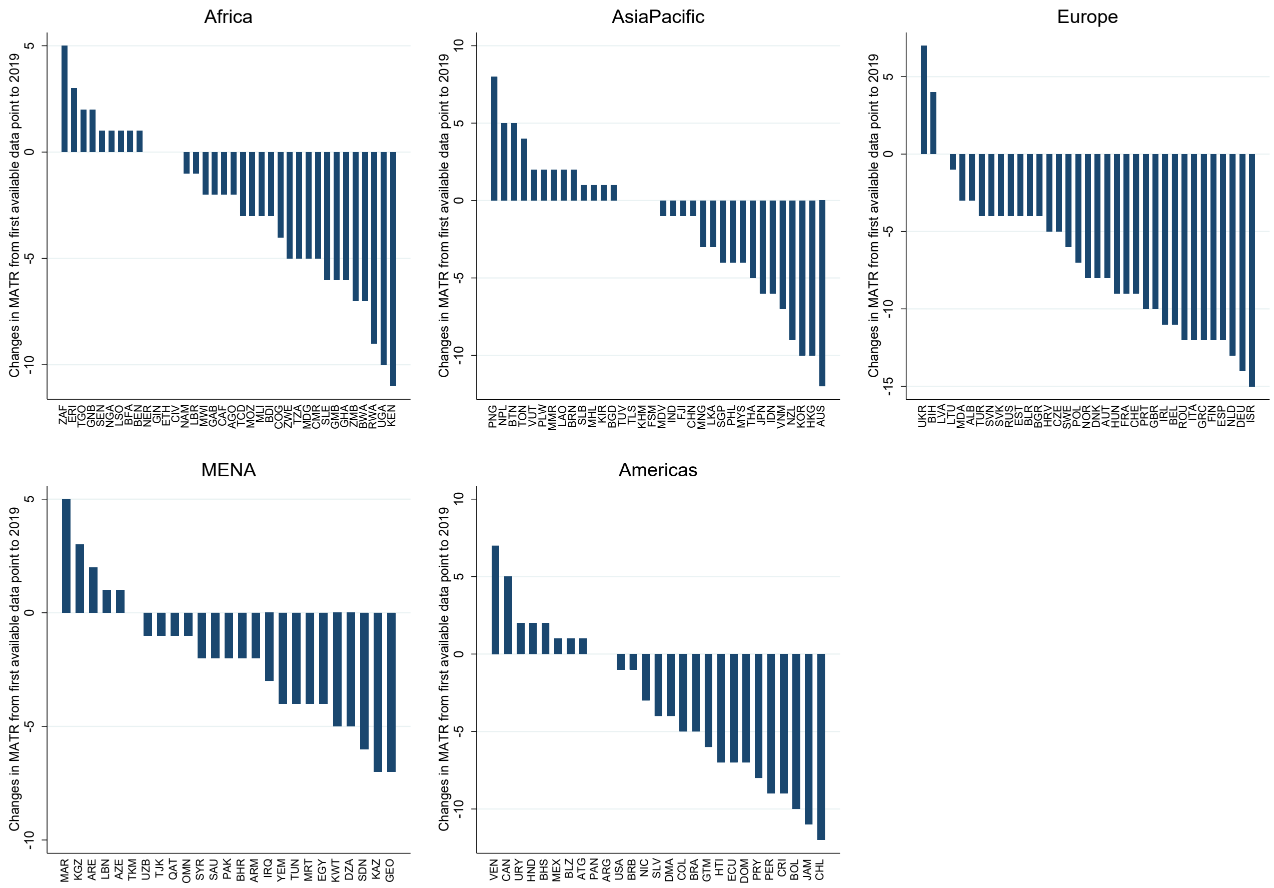
Note: MATR simple average by region, classified following the IMF *World Economic Outlook*.

Figure 4: Evolution of MATR and subcomponents by region



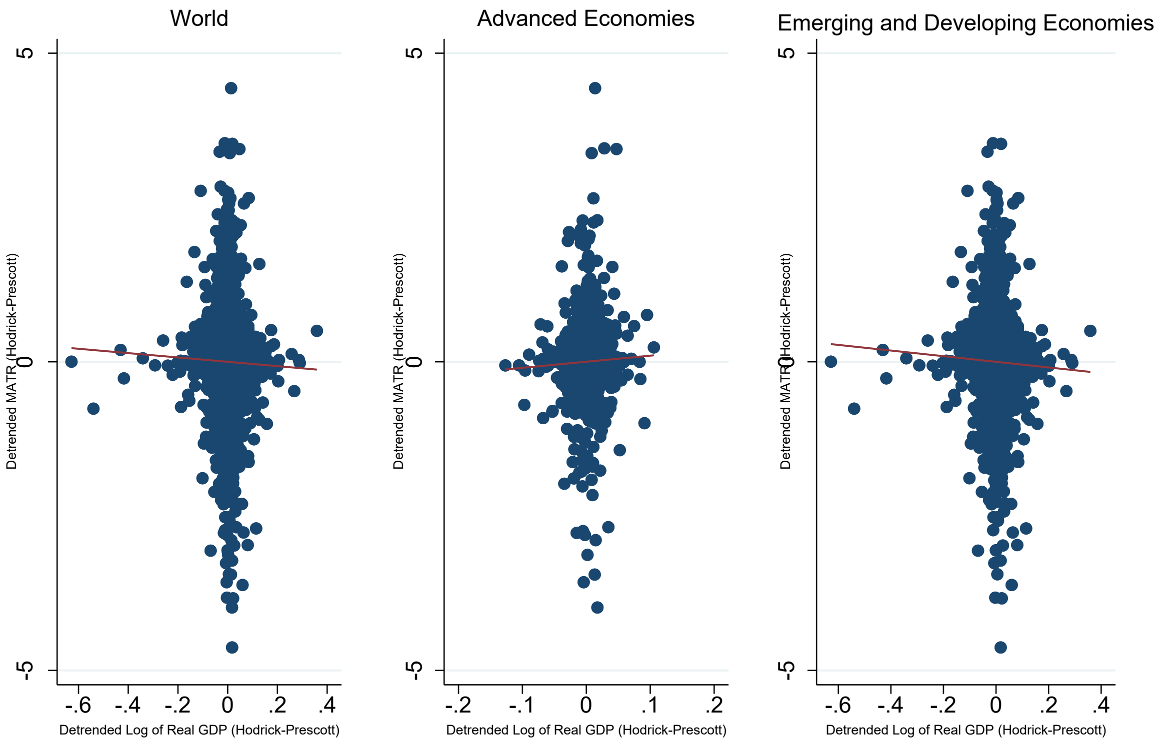
Note: MATR subcomponents simple average by region, classified following the IMF *World Economic Outlook*.

Figure 5: Largest changes in MATR by country and region



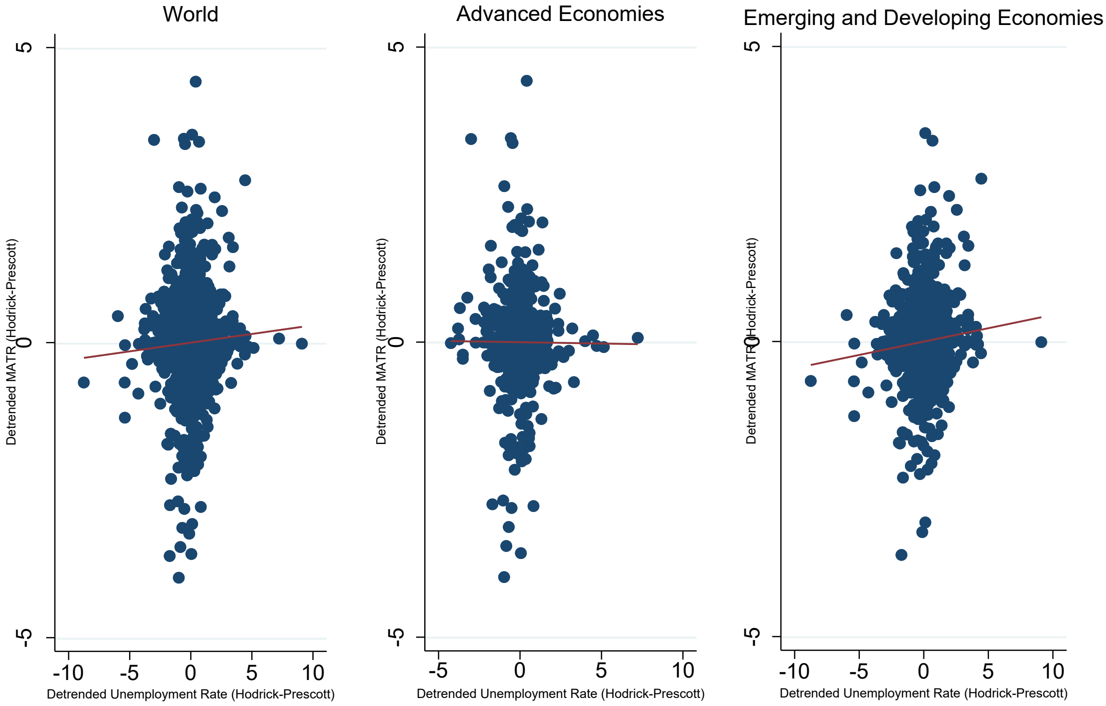
Note: MATR largest changes by country and region, classified following the IMF *World Economic Outlook*.

Figure 6: Detrended MATR and detrended GDP



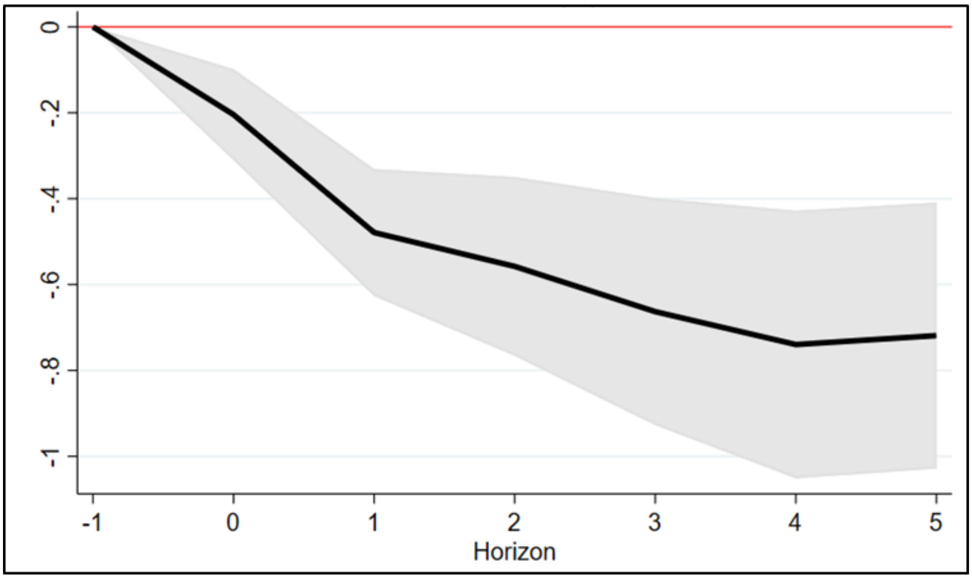
Note: Figure shows the relationship of log of real GDP and MATR, both detrended using Hodrick-Prescott filter.

Figure 7: Detrended MATR and detrended unemployment



Note: Figure shows the relationship of unemployment rate and MATR, both detrended using Hodrick-Prescott filter.

Figure 8: Response of (log) GDP to Changes in MATR (%)



Note: Cumulative IRFs after one standard deviation increase in MATR; shaded area is 90% confidence interval; Driscoll-Kraay standard errors.

Appendix

Table A1: Countries with MATR data

Advanced economies

AUS	DNK	HKG	LVA	SVN
AUT	ESP	IRL	NLD	SWE
BEL	EST	ISR	NOR	USA
CAN	FIN	ITA	NZL	
CHE	FRA	JPN	PRT	
CZE	GBR	KOR	SGP	
DEU	GRC	LTU	SVK	

Emerging market and developing economies

AGO	BOL	ECU	IDN	MEX	PER	TCD	VUT
ALB	BRA	EGY	IND	MHL	PHL	TGO	YEM
ARE	BRB	ERI	JAM	MLI	PLW	THA	ZAF
ARG	BRN	ETH	KAZ	MMR	PNG	TJK	ZMB
ARM	BTN	FJI	KEN	MNG	POL	TKM	ZWE
ATG	BWA	FSM	KGZ	MOZ	PRY	TLS	
AZE	CAF	GAB	KIR	MRT	QAT	TON	
BDI	CHL	GEO	KWT	MWI	ROU	TUN	
BEN	CHN	GHA	LAO	MYS	RUS	TUR	
BFA	CIV	GIN	LBN	NAM	RWA	TUV	
BGD	CMR	GMB	LBR	NER	SAU	TZA	
BGR	COG	GNB	LKA	NGA	SDN	UGA	
BHR	COL	GTM	LSO	NIC	SEN	UKR	
BHS	CRI	HND	MAR	NPL	SLB	URY	
BIH	DMA	HRV	MDA	OMN	SLE	UZB	
BLR	DOM	HTI	MDG	PAK	SLV	VEN	
BLZ	DZA	HUN	MDV	PAN	SYR	VNM	

Table A2: Variables and sources

Variable	Source
Real GDP Growth	Penn World Table
Unemployment Rate	World Economic Outlook (WEO)
Financial Crisis	Laeven and Valencia (2018)
MATR	Estefania-Flores *et al* (2022)
WTO dummy	CEPII
Trade Costs (export-weighted)	Novy (2012)
Trade Enablement,	The World Economic Forum's 2016 Enabling Trade Index
Curr. Acc. Fin'l Openness	Quinn (2003)
Ad Valorem Equivalent (AVE) of NTMs	World Bank
Trade Restriction Index (TRI)	Kee *et al* (2009)

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