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Are Trade Restrictions Counter-Cyclical? Evidence from a New Aggregate Measure

Julia Estefania-Flores, Davide Furceri, Swarnali A. Hannan,

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Abstract

We present a new Measure of Aggregate Trade Restrictions (MATR) using data from *the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions*. MATR is strongly correlated with existing measures of trade restrictiveness but more comprehensive in terms of country and time coverage. Our measure is available for an unbalanced sample of up to 157 countries during 1949-2019. We use our new MATR to re-examine how trade restrictiveness varies with the business cycle. Our results confirm that trade restrictions are typically a-cyclical but there is an important difference across income groups: aggregate trade restrictions are a-cyclical in advanced economies but are counter-cyclical in EMDEs, especially in response to increases in unemployment.

JEL Classification Numbers: F13; F15.

Keywords: empirical; protectionism; tariffs; non-tariff barriers; cycle.

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1. Introduction

Trade policies remain an important instrument in the policy toolkit of economies today, and accordingly have received considerable scrutiny in the empirical economics literature, which aims to use available measures of trade restrictiveness to gauge their economic impact. Yet, it is inherently difficult to *quantitatively* measure 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 these measures—except for tariff data—are available only with limited time and country coverage (see Estefania-Flores et al. 2022 for a discussion).

To address these limitations, 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 and assiduous process that combines information in the AREAER online database (available from 1999 onwards) with the 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 trade restrictions, including the co-movement of trade 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 has 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, Rose (2013) uses a large panel of data (over 180 countries and 40 years) of trade protectionism measures and business cycle indicators and shows that trade protectionism does not systematically increase during economic downturns. In contrast, Knetter and Prusa (2003) find that real exchange appreciation increases anti-dumping filings in Australia, Canada, the EU and the USA between 1980 and 1998. Bown and Crowley (2013) estimate the impact of macroeconomic fluctuations on import protection policies over 1988:Q1–2010:Q4 for five industrialized economies—the United States, European Union, Australia, Canada and South Korea. They find evidence of a strong countercyclical trade policy response in the pre-Great Recession period of 1988:Q1–2008:Q3 during which increases in domestic unemployment rates, real appreciations in bilateral exchange rates, and declines in GDP growth rates of trading partners led to substantial increases in new temporary trade barriers (TTBs). Similarly, Furceri et al. (2023) use high-frequency TTB sectoral data, covering 1220 sectors in 25 countries during the period 1989-2019, and find that retaliation through trade barriers tends to increase during periods of higher unemployment.

Our new measure of aggregate trade restrictiveness affords us an opportunity to re-examine the connection between trade policy and the business cycle. In the next section of this paper, we present results on how MATR varies with the business cycle, and whether the degree of pro-cyclicality or counter- cyclicality of MATR varies during upturns and downturns, over time and across countries. Our results suggest that, on average, countries have not modified their

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

aggregate degree of protectionism in response to the business cycle. At the same time, they also reveal an important heterogeneity: aggregate trade restrictions are a-cyclical in AEs but continue to be used counter-cyclical in EMDEs, specially in response to increases in unemployment.

2. MATR data

Construction of MATR

The Measure of Aggregate Trade Restrictions (henceforth "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 et al. (2021).

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

[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.

unweighted sum of 22 variables (Table 1). Thus, intuitively, the underlying components of the MATR (the "fundamentals") give granular measures of different facets of trade protectionism by using information on tariffs, non-tariff barriers, and restrictions on requiring, obtaining, and using foreign exchange for current transactions.

Our measure, the MATR, has several desirable properties: (i) it is based on sensible, plausible, trade 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) normalization 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 (as, for example, in the case of the aggregate tariff); it does not have sectoral variation, i.e., 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]

[3] Cerdeiro and Nam (2018) deplore 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

Evolution of MATR

Figures 2-4 examine some of the time-series characteristics of the MATR. Figure 2 shows the development of MATR for advanced economies (AEs) and emerging market and developing economies (EMDEs). Both groups started in comparable situations, began to liberalize in the early 1970s, and have stalled their liberalization progress since the early 2000s; overall, the degree of liberalization is more pronounced in AEs than in EMDEs.

Figures 3-4 plot the evolution of trade restrictions across regions over time. In addition, one can also plot the underlying components to get a sense of the drivers of the aggregate restrictiveness. The overall picture is aligned with common perceptions: (i) Europe is the least restrictive, followed by Americas and Asia-Pacific. On the other hand, Africa and MENA regions remain fairly restrictive; (ii) In line with their liberalization efforts in the 1980s and 1990s, Asia shows sharp drop in trade restrictions during those periods; and (iii) trade liberalization 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 liberalization,

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), calculates 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.

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 liberalized 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 (e.g., Korea, Vietnam, Indonesia, Australia) have liberalized considerably. On the other hand, smaller economies (e.g., Nepal, Bhutan, Kiribati) have become more trade restrictive. In Africa, larger economies such as Kenya have liberalized substantially, while South Africa has become more restrictive. One of the key exceptions is Europe where, with rare exceptions, most countries have liberalized 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 only partially associated with higher trade protectionism. In other words, protectionism is mildly counter-cyclic. 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). Overall, these simple scatterplots suggest that MATR is pro-cyclical, on average for the entire sample, but slightly counter-cyclical for EMDEs.

To check whether this evidence holds up when subjected to a more formal analysis, we follow Rose (2013) and Vegh and Vuletin (2015) and estimate the following specification:

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

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, the same sample coverage as Estefania-Flores et al. (2022).[6] 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 the respective detrending method used. The results confirm the graphical evidence portrayed in Figure 6 and suggest that MATR is typical a-cyclical. Out of the five filtering methods, in only one (difference of log GDP and MATR) is the coefficient β negative and statistically significant. 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 from

[6] 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 maximize comparability among the different techniques.

these exercises 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.

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 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 reported in Table 5 show that MATR does not change in response to recessions.

Another possibility is that the degree of counter-cyclicality has changed over time and declined as countries which joined the WTO. Indeed, as argued by Rose (2013), it is possible that "*the existence of a multilateral institution dedicated to liberalizing trade and helping it flow as freely as possible might also affect the cyclicality of protectionism*". To check this possibility, we modified equation (1) as follows:

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

where D_{it} is a dummy which takes the 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. The results obtained estimating Equation (2) are reported in Table 6. The coefficients of interest continue to remain not statistically different from zero in most of the cases and provide only tenuous evidence that the degree of counter-cyclicality has increased after the country joined the WTO.

Next, we check whether the degree of counter-cyclicality varies between AEs and EMDEs. For this purpose, we estimate a specification similar to Equation (2) but using a non-time varying dummy to classify countries as AEs or EMDEs. The results reported in Table 7 confirm the heterogeneity noticed in the scatter plot in Figure 7. 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. In other words, while protectionism is a-cyclical in AEs, it is counter-cyclical in EMDEs.

Finally, we repeat the analysis for the entire sample and for the two income groups using the cyclical unemployment rate as the key regressor (Table 8 and 9). The picture that emerges from this set of results confirms the counter-cyclicality of MATR in EMDEs (Table 9), which, in turn, affect the results for the entire sample (Table 8). That said, this result should be treated with some caution given the limited availability and quality of unemployment rates in EMDEs.[7]

[7] We also checked the sensitivity of the results for cyclical output using the same estimation sample used of the unemployment rate and the results are similar to those obtained in Table 3 and 7. Finally, the results for unemployment are robust to the alternative specifications used for output.

5. Summary and Conclusion

In this paper, we present a new Measure of Aggregate Trade Restrictions. While MATR is strongly correlated with existing measures of trade restrictiveness, the main advantage of MATR is its vastly expanded country and time coverage. MATR is also well suited for use in macroeconomic applications, for example related to the effects of aggregate restrictions on the macro-economy (see Estefania-Flores et al. 2022), and to generate timely assessments of the aggregate stance of trade protectionism.

In this paper, we present one of such application, and examine an often-debated issue in the trade literature: whether protectionism is counter-cyclical. Our results confirm previous evidence that, on average in the post-WWII period, countries have not modified their aggregate degree of protectionism 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. We leave this for further research.

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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

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Baxter-King)	Detrended MATR (Christiano-Fitzgerald)	Difference of MATR	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*** (3.67e-05)	-0.00222*** (2.79e-05)	-0.00137*** (1.35e-05)	-0.0549*** (0.00705)	0.00813*** (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

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Detrended MATR (Hodrick-Prescott) **Baseline**	Only Country FE	Only time FE	Using lagged GDP	Dropping 2009 & 2010	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

	(1)	(2)	(3)	(4)
VARIABLES	Detrended MATR (Hodrick-Prescott)	Detrende d MATR (Hodrick -Prescott)	Detrende d MATR (Hodrick -Prescott)	Detrende d 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

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Baxter-King)	Detrended MATR (Christiano-Fitzgerald)	Difference of MATR	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***	-0.00182***	-0.00108***	-0.0470***	0.00880
	(0.000129)	(0.000122)	(8.35e-05)	(0.00713)	(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

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Hodrick-Prescott)	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 measures of unemployment rate and detrended MATR

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Baxter-King)	Detrended MATR (Christiano-Fitzgerald)	Difference of MATR	Detrended MATR (Linear in Time)
Detrended Employment Rate (Hodrick-Prescott)	0.0141				
	(0.0137)				
Detrended Employment Rate (Baxter-King)		0.0131			
		(0.0143)			
Detrended Employment Rate (Christiano-Fitzgerald)			0.0142		
			(0.0143)		
Difference of Employment Rate				0.00145	
				(0.0129)	
Detrended Employment Rate (Linear in Time)					0.0131
					(0.0396)
Constant	0.000626***	-0.00262***	-0.00168***	-0.0739***	0.0720***
	(4.86e-05)	(0.000130)	(8.35e-05)	(0.00141)	(0.0137)
Observations	7,519	6,589	6,589	7,364	7,519
R-squared	0.020	0.027	0.025	0.052	0.094

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

Table 9. Detrended MATR and detrended unemployment rate: advanced economies vs emerging and developing economies

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Hodrick-Prescott)	Detrended MATR (Hodrick-Prescott)
Detrended Unemployment Rate (Hodrick-Prescott)*AE	0.00148				

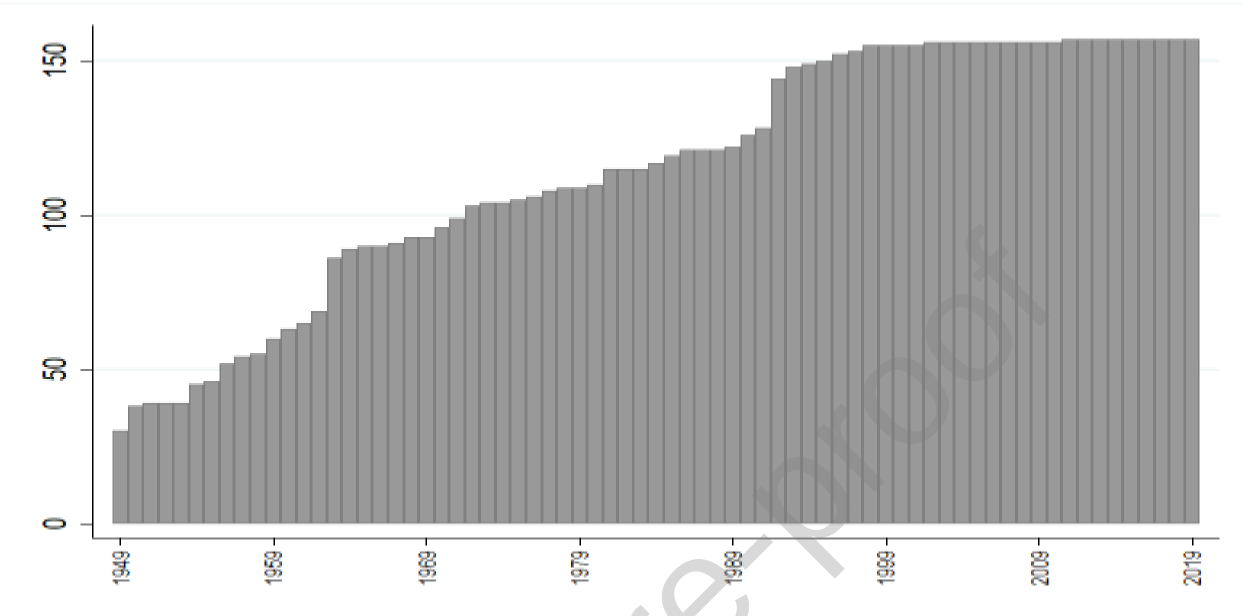
	(0.0240)				
Detrended Unemployment Rate (Hodrick-Prescott)*EMDE	0.0444***				
	(0.0142)				
Detrended Unemployment Rate (Baxter-King)*AE		-0.00276			
		(0.0217)			
Detrended Unemployment Rate (Baxter-King)*EMDE		0.0473***			
		(0.0175)			
Detrended Unemployment Rate (Christiano-Fitzgerald)*AE			0.00116		
			(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.

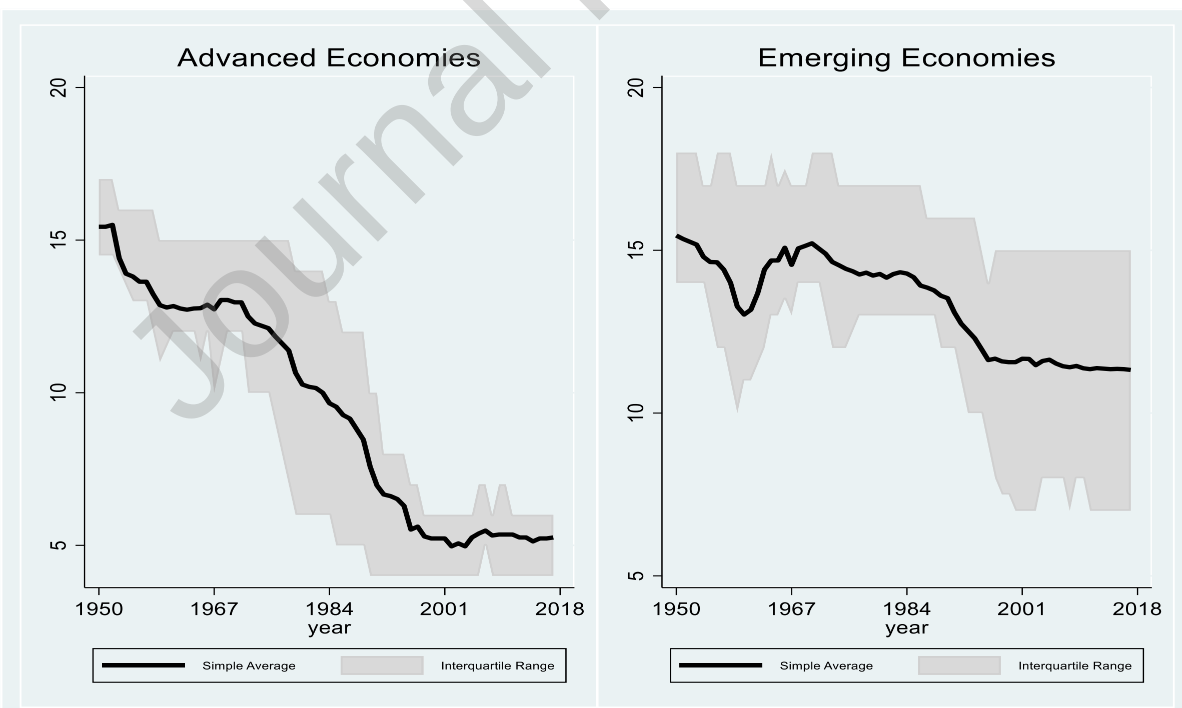
Figures

Figure 1. MATR country coverage over time



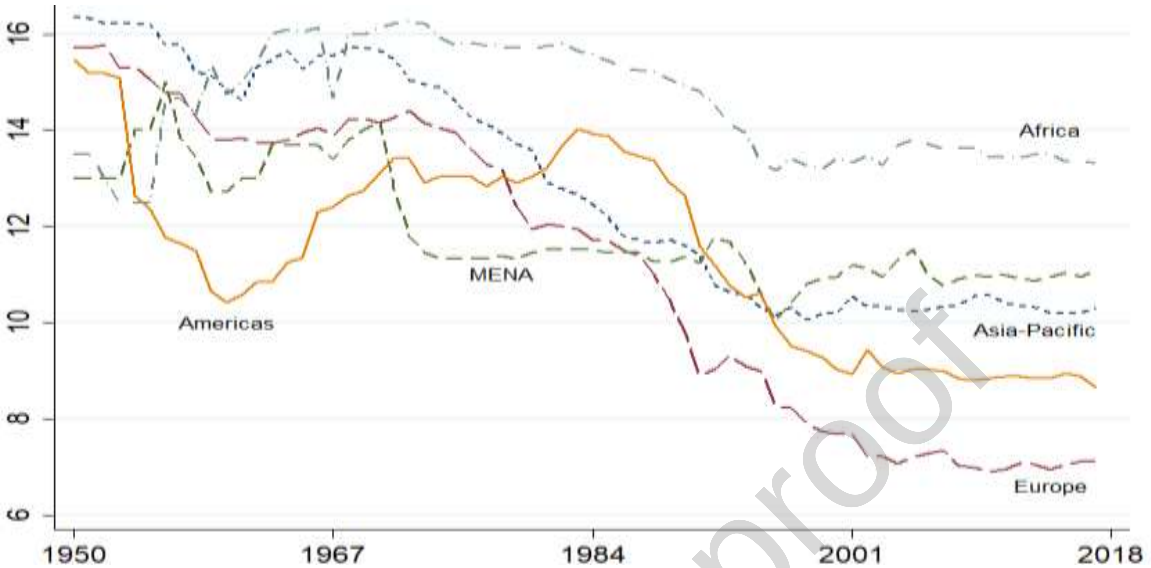
Note: Figure above plots the number of countries with available MATR data for each year.

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



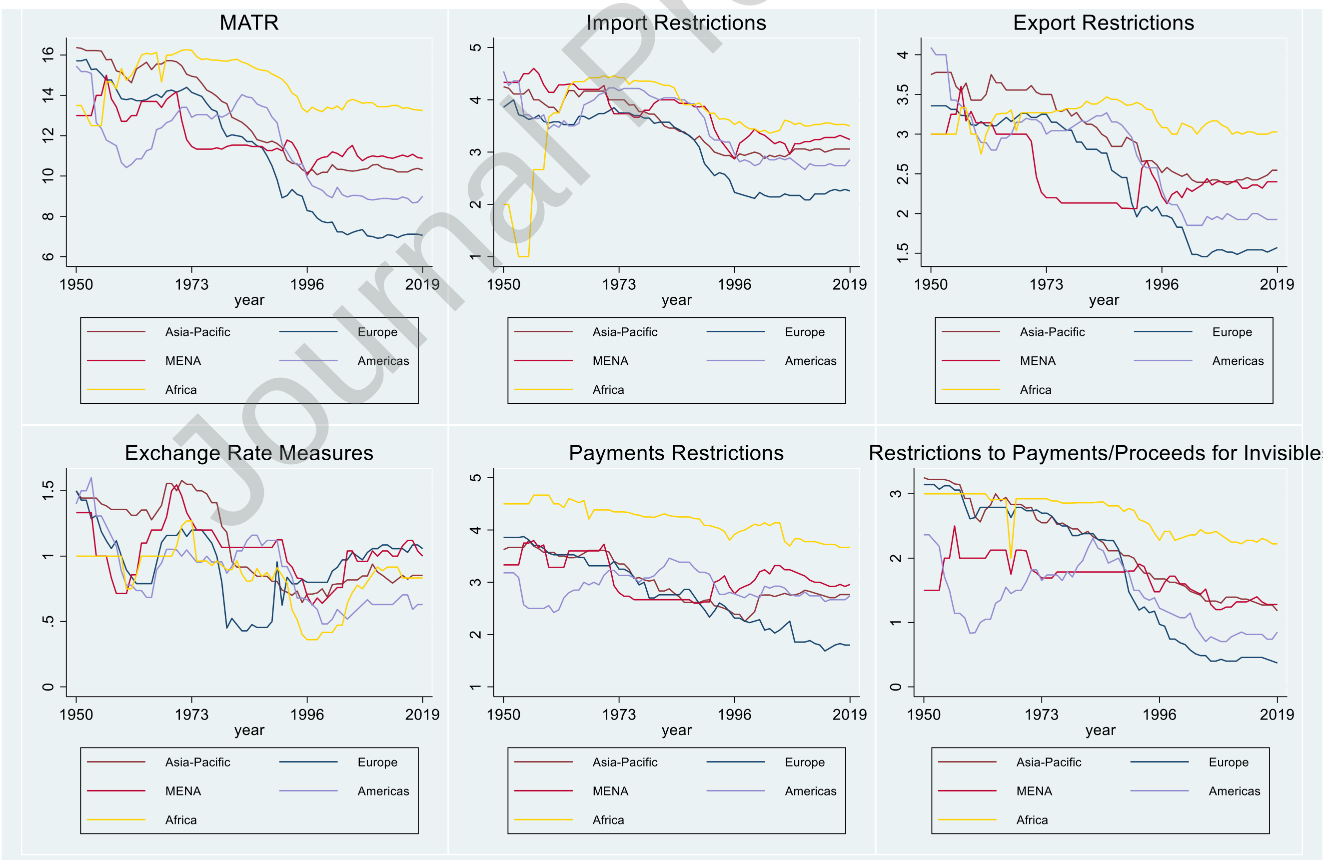
Note: Year-specific simple average and interquartile range of MATR for Advanced and Emerging Economies, classified following the IMF World Economic Outlook.

Figure 3. Evolution of MATR over time, by region



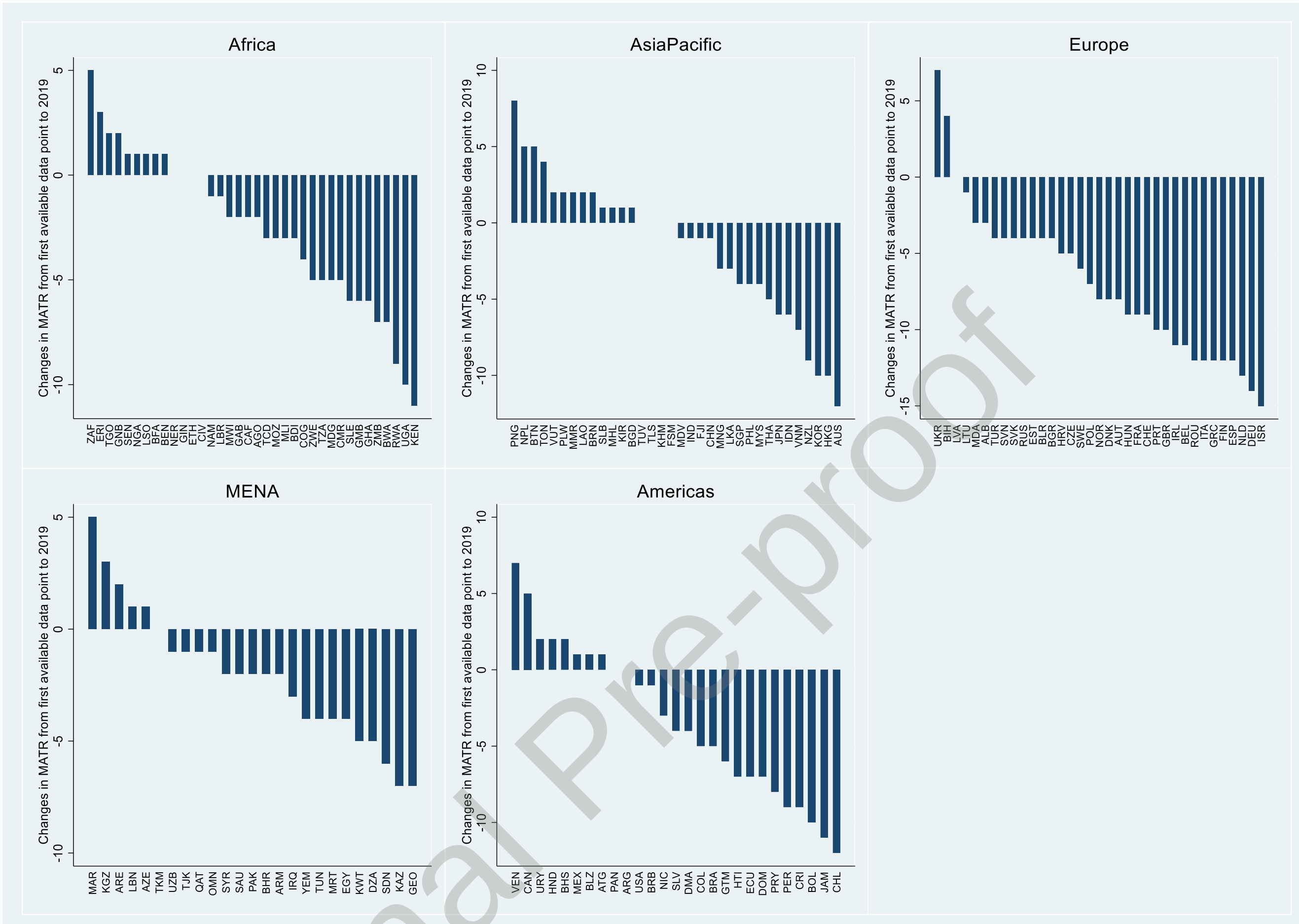
Note: MATR simple average by region, classified following the IMF World Economic Outlook.

Figure 4. Evolution of MATR and subcomponents by region



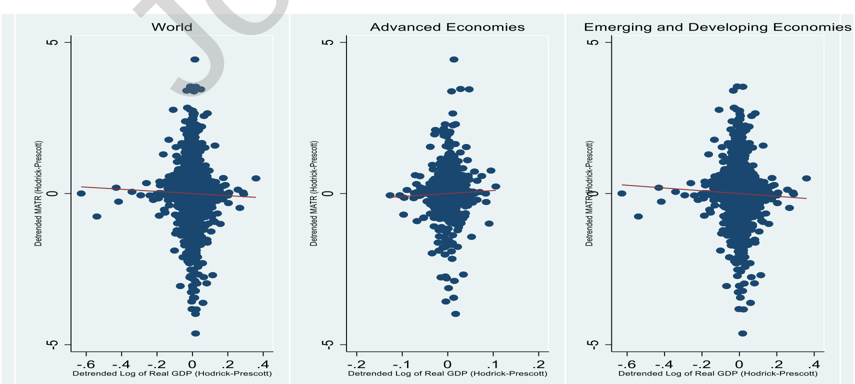
Note: MATR subcomponents simple average by region, classified following the IMF World Economic Outlook.

Figure 5. Largest changes in MATR by country and region



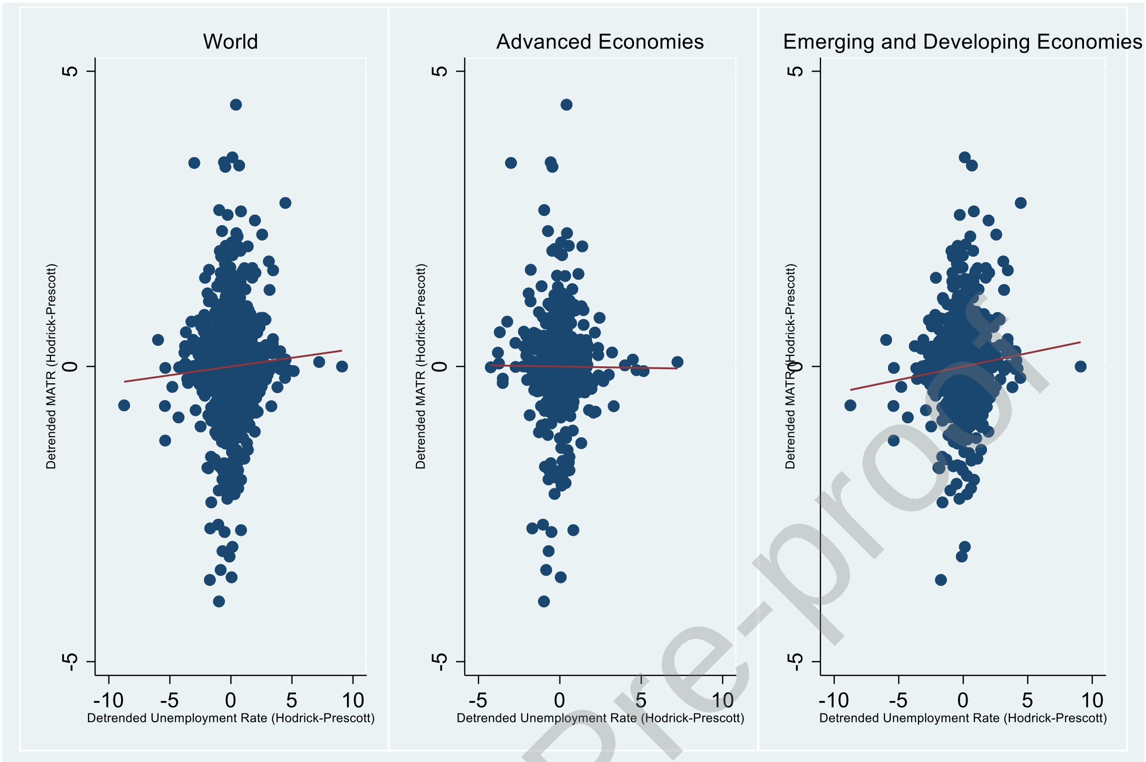
Note: MATR largest changes by country and region, classified following the IMF World Economic Outlook.

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.

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)