Understanding and Predicting Monetary Policy Framework Choice

Sullivan, Megan

Heriot-Watt University

July 2023

Understanding and Predicting Monetary Policy Framework Choice*

Megan Sullivan†

Abstract

This paper investigates the determinants of countries' choice of monetary policy frameworks (MPF) for emerging and developing countries. Countries make different MPF choices and we think it is because they have different country-level characteristics (e.g. democratic strength and trade networks). By covering 87 countries from 1985-2017, we investigate the role these characteristics play in predicting MPF choice. A highlight of this paper is that it uses a tailored variable to measure the volume of trade with a network that pegs to an anchor currency. We find that a country is significantly more likely to choose an exchange rate MPF when the volume increases. The model used in this paper correctly predicts 74% of MPF choice when done via a cross-validation method. This paper enables policymakers to see which MPF countries similar to their own have chosen, and they can decide if it is suitable for them, too.

JEL Codes: E42, E52, E58, F40

1 Introduction

The evolution of exchange rate regimes (ERRs), and how countries choose such regimes, has been researched [see, for example, Juhn and Mauro (2002) and Levy Yeyati et al. (2010)]. Due to the rise in popularity of inflation targeting, the preconditions

*I am grateful to David Cobham for comments on previous versions of this paper and for his classification. I am also thankful to Mengdi Song for the helpful advice on the estimation and variable generation.

†Heriot-Watt University, mjs2000@hw.ac.uk

required for a country to become an inflation targeter has been explored (Batini and Laxton, 2006). However, determinants of monetary policy frameworks (MPFs), on the whole, have received little attention.[1]

There now exists a MPF classification which covers 186 countries to date.[2] This analysis uses the classification's definition for a MPF: "...[T]he objectives and the context that condition monetary policy decisions: primarily the objectives pursued by monetary authorities, but also the set of constraints and conventions within which their monetary policy decisions are taken" (Cobham, 2021, p. 1). There is one paper that explores the determinants of MPFs for advanced and emerging economies (Cobham and Song, 2020), using the aforementioned classification. However, developing countries have not so far been investigated from this perspective.

This analysis makes use of the relatively new MPF classification dataset, and applies the methodologies from Cobham and Song (2020) and Levy Yeyati et al. (2010) to emerging and developing countries. Levy Yeyati et al. (2010) investigates the determinants of exchange rate regimes and identifies three main approaches to account for how they are chosen (optimum currency areas (OCA), the financial view, and the political view). Their paper models these approaches separately before including all 3 approaches into one model.[3] Their results show that the signs on the estimated coefficients (for the full sample) in the full model do not differ by much from the signs on the estimated coefficients (for the full sample) in the separate models. They argue that the results of the full model are in-line with the findings they achieve in their separate models.[4] Furthermore, they use a Wald test to run three joint significance tests (on the variables within each theoretical model). The results show that the variables are jointly significant for each

[1]Prior to 2018 there did not exist such a detailed, multi-dimensional MPF classification

[2]Available on https://monetaryframeworks.org/classifications

[3]They mention the need for putting all three approaches into one model as correlations are likely to exist between the variables. Therefore, the results of their partial tests could be biased.

[4]This raises the following question: how different must the estimated coefficients be (in terms of both magnitude and statistical significance) before the results are no longer considered in-line with each other? Especially as bias is a bigger concern in logistical estimation. Unlike in a standard linear regression, the estimated coefficients in a logistic regression can be affected by bias even when the omitted variable is orthogonal to the independent variables (Mood (2010)).

theoretical approach.

This paper also separates the determinants of MPF choice into 3 similar theories. By using multinomial logit estimation this paper analyses the importance of a range of different factors on which countries' choices might depend. Thus, this work looks into what may have guided countries' past choices of MPFs for emerging and developing countries.

The results show that, unlike Levy Yeyati et al. (2010), the sign on the estimated coefficients differs on two occasions from the signs achieved when the theoretical approaches were modelled separately. This provides evidence in favour of the full model being used when analysing how variables affect the probability of MPF choice. In line with Levy Yeyati et al. (2010), the likelihood ratio tests show that the variables within each theoretical approach are jointly statistically significant. Thus, we find that each theoretical approach has empirical relevance.

The paper highlights a couple of key findings: Firstly, it identifies the extent to which a country trades with all the countries that use or peg to a given anchor currency and shows that, as this amount (as a proportion of GDP) increases (from 0 to maximum), the probability of a country opting for an exchange rate MPF (pegged to that currency) increases by approximately 56 percentage points. Secondly, a country that is medium sized is more likely than a large country to opt for both an inflation targeting MPF and an intensive degree of monetary control.

Lastly, the model is able to correctly predict 79% of countries' choices of MPF, when aggregated by target variable, and 84% of countries' choices of MPF, when aggregated by degree of monetary control. Furthermore, when the model is tested via a cross-validation method for MPF choice aggregated by target variable, the model correctly predicts 74% of MPF choice. This provides some evidence that the model used in this paper can be generalised to unseen data.

The rest of the paper is set out as follows: section 2 is on the theories (optimum currency areas, financial integration, and political/institutional strength), section 3 dis-

cusses the degree of monetary control, section 4 is data and methodology (data, descriptive statistics, and methodology), section 5 is results (by target variable aggregation, prediction accuracy for target variable aggregation, by degree of monetary control, and prediction accuracy for degree of monetary control), section 6 is endogeneity and robustness (reverse causality, omitted variable bias, and robustness checks), section 7 is policy implications and, finally, section 8 is conclusion.

2 The Theories

There are three main approaches to the (normative) choice of exchange rate regime and MPF that are prominent in the macroeconomic literature - optimum currency areas (OCA), financial integration, and the political economy. Levy Yeyati et al. (2010) empirically test the relevance of each of these approaches to the choice of exchange rate regimes. By finding variables that closely measure the factors identified within the three approaches, they find empirical support in favour of all of them.

Countries differ in multiple ways but key distinctions have been highlighted to exist between emerging/developing economies and advanced economies (see, for example, Mishkin (2004), Frankel (2010) and Cobham (2011)). These differences give insight into why choice of regime (be it monetary policy or exchange rate regime) is likely to differ. This paper combines the work of Cobham and Song (2020) and Levy Yeyati et al. (2010) and applies it to the determinants of MPFs in emerging and developing countries. Throughout this section the acronyms D, ER and IT are used. D is for discretion based MPFs - a country is classified as having a discretion MPF in the years where there are no announced, or even unannounced but observable, quantitative targets. In tables 1,2 and 3, D is used as the default category because it is the MPF that is most prevalent over time. ER is for exchange rate based monetary policy frameworks. Finally, IT is for inflation targeting based monetary policy frameworks.[5]

[5]These categories are explained in more depth in Section 4.

2.1 Optimum Currency Areas

Seminal work from Mundell (1961) and McKinnon (1963) on OCAs highlights the importance of a country's size and trade in the determinants of regime choice. Breedon et al. (2012) focuses on small rich countries but states that the smaller an economy, the more vulnerable they are to exchange rate volatility - larger countries are less vulnerable and therefore have inflation targeting as a more available option. In addition to size, as is typical in developing/emerging countries, their trade may be heavily concentrated within a currency bloc, or their income may be reliant on the exportation of a certain good which is denominated in one currency (e.g. fuel).[6] Frankel (2010) states that emerging/developing countries are typically more susceptible to volatility due to primary products (e.g. agriculture, forestry, and fishing) making up a greater share of their GDP. Lastly, the literature on the effects of trade openness on regime choice is mixed but the literature agrees that it is an important factor. Furthermore, there is literature on the relationship between inflation and trade openness. Lane (1997) finds that trade openness and inflation are negatively correlated (once controlling for country size)[7]. There are a variety of reasons as to why this negative correlation may exist, for example, strong foreign competition helps to limit the extent to which firms pass-on any price increases to their consumers (Bowdler and Nunziata (2006)). However, it is possible to have low inflation but not be an IT. For example, the trade openness might be helping to keep inflation low without the need for IT to be their choice of MPF. Thus, the relationship between trade openness and MPF choice is not obvious *a priori*.

This paper uses the following variables to empirically test the OCA hypothesis: economic size, which is split up into small, medium and large categories; anchor network, which is defined as the largest ratio of country's trade with each of the main anchor currencies to GDP, as per Cobham and Song (2020) who draw in turn on Meissner and

[6] Although this is a common argument for pegging such countries' exchange rates, oil price volatility is typically higher than exchange rate volatility. Thus, it is not obvious that pegging to the US Dollar significantly stabilises export proceeds.

[7] A seminal paper by Romer (1993) finds a robust negative correlation between openness and inflation

Oomes (2009); trade openness, the ratio of imports and exports to GDP; and fuel exports, which is measured as a percentage of merchandise exports.

Table 1: Predictions according to the Optimum Currency Area hypothesis[a]

	Sign Expectation[b]	
VARIABLE	**(ER*)**	**(IT*)**
Large	-ve	+ve
Medium	-ve	+ve
Anchor Network	+ve	?
Trade Openness	?	?
Fuel Exports	+ve	-ve

*Where D is the comparison/base category

[a]Controls for region, year, and state dependence/inertia

[b]This is the expectation relative to the default category of discretion

2.2 Financial Integration

Capital account openness is viewed as one way of measuring financial openness (Bekaert et al. (2006)). Chinn and Ito (2008) have created an index measuring capital account openness which has wide country coverage and offers a long time-series. Within macroeconomics, capital flows form part of the impossible trinity argument. This is the idea that countries get to choose only two out of the following three options: fixed exchange rate, free capital flow, and sovereign monetary policy. For example, a country with an open capital account cannot also both have control over monetary policy and target their exchange rate. Alexander et al. (1995) states that the opening of the capital account typically, but not always, accompanies the transition to indirect monetary policy instruments (typically interest rates). Inflation targeting relies on the use of such indirect instruments - operating via interest rates gives greater flexibility (both in terms of speed and size of response) to monetary policy.[8] In addition to this, shallow capital markets, particularly in emerging/developing countries, can be a common cause of fiscal dominance (Debelle et al. (1998)). Thus, countries with such capital markets may be less able to opt for an IT MPF which is incompatible with fiscal dominance. Therefore, *a priori*, this paper predicts that capital account openness will have a negative effect on ER MPF being picked but a positive effect on an IT MPF being chosen. As well as capital account openness there is financial market depth. Financial market depth is an important aspect of a country's financial development. Cobham (2011) explains that a well developed financial system has a deep and active bond market which involves non-bank private sector agents. This helps to separate monetary policy from fiscal policy by protecting against fiscal dominance - the government can borrow from these agents rather than the banking system. This kind of financial depth is necessary for a country to be able to pursue IT because fiscal dominance is incompatible with an IT MPF. Countries that lack this kind of infrastructure, consequently, are more limited in their choice of monetary policy framework. However,

[8]Please refer to Cobham (2023) for more information on what is meant by *effectiveness* of monetary instruments and how indirect instruments are more effective than direct instruments.

Cobham (2011) states that it is costly to develop one and Alexander et al. (1995) states that it is a complex process as it requires substantial infrastructure (e.g. electronic systems, an advanced legal and regulatory framework, and skilled human capital to operate the markets). Therefore, it is common for emerging/developing countries to lack such a system. Furthermore, as emerging/developing countries typically tend to have weaker financial institutions than advanced countries, their banking and financial systems are more vulnerable to high inflation and currency crises (Mishkin (2004)). Some developing countries' financial institutions borrow large amounts of money in foreign currency but lend mainly in domestic currency. This is because international investors typically tend to charge a high exchange rate risk premium on emerging market local currency debt, and this premium can be increased further when exchange rate volatility is high. Thus, depreciation of their currency tends to be more dangerous to their financial systems. Levy Yeyati et al. (2010) states that they expect there to exist a positive correlation between capital account openness and more flexible exchange rate regimes when currency mismatches are not as high. However, when there are large currency mismatches, there tends to be inconsistencies with the impossible trinity argument and the opposite result tends to be found. Therefore, the result on capital account openness should help to inform us if currency mismatch is a problem.[9]

This paper uses the following variables in order to empirically test the financial integration hypothesis: capital account openness and financial market depth.

[9]The data Levy Yeyati et al. (2010) use to measure currency mismatch is currently only available from 2001 and it is not available for all countries. As this would reduce the number of observations significantly, and an adequate substitute cannot be found, a variable measuring currency imbalances is not included. However, as a robustness check, we control for the Asian financial crisis as these countries had a high amount of dollarised liabilities.

Table 2: Predictions according to the Financial Integration hypothesis[a]

	Sign Expectation[b]	
VARIABLE	**(ER*)**	**(IT*)**
Capital Account Openness	-ve	+ve
Financial Market Depth	-ve	+ve

*Where D is the comparison/base category

[a]Controls for regions, year, and state dependence/inertia

[b]This is the expectation relative to the default category of discretion

2.3 Political/Institutional Strength

Institutional credibility and accountability is regularly cited as a must for a country to become an inflation targeter. On average, emerging/developing countries' monetary institutions tend to have lower credibility than monetary institutions in advanced countries, which is needed for more modern policy frameworks (e.g. inflation targeting). There is also the 'policy crutch' argument, mentioned in Levy Yeyati et al. (2010), which says that countries with a poor institutional record may adopt an exchange rate peg in an attempt to anchor inflation expectations. Furthermore, an independent central bank is useful for monetary policy, not just in harnessing credibility and accountability, but also because fiscal considerations will not then dictate monetary policy. Emerging/developing countries' central banks are often more susceptible to fiscal dominance as they tend to have weaker fiscal institutions than their advanced counterparts. However, there are different ways in which a central bank can be independent. For example, Mishkin (2004) states that it is important for a central bank to be independent in practice[10] - being just legally independent is not enough.[11]

In addition to central bank independence, there is the degree of autocracy/democracy of a country. Previous work finds that, relative to democracies, autocracies are more likely to maintain fixed exchange rate regimes and sometimes even undervalue their currency

[10]This is important for good monetary policy in general but particularly so for countries wishing to inflation target.

[11]The paper gives Argentina vs. Canada as an example. Argentina's central bank is legally independent but lacks the public and political support for independence. Canada's central bank, however, does not look independent from a legal standpoint but is in practice.

as part of a mercantilist policy (Steinberg and Malhotra (2014)). Furthermore, countries that are democracies are more conducive to IT because it requires public (and political) support (Mishkin (2004)). Cobham (2022) states that autocratic countries are unlikely to have independent central banks because this takes power away from the autocrats. Furthermore, these countries are unlikely to have transparent central banks as autocrats do not like to be held accountable and accountability depends on central bank transparency. Finally, the paper states that, for countries in the middle east and north Africa, IT is the MPF that is associated with the most democratic political arrangements, followed by loosely structured D.

This paper uses the following variables in order to empirically test the political/institutional strength hypothesis: a measure for democratic strength, which is measured on a scale from autocracy to democracy; and a measure for central bank independence.

Table 3: Predictions according to the Political/Institutional Strength hypothesis[a]

	Sign Expectation[b]	
VARIABLE	**(ER*)**	**(IT*)**
Democratic Strength	-ve	+ve
Central Bank Independence	-ve	+ve

*Where D is the comparison/base category

[a]Controls for regions, year, and state dependence/inertia
[b]This is the expectation relative to the default category of discretion

3 Degree of Monetary Control

The previous section is based on the MPF classification as aggregated by target variable. The classification also aggregates on degree of monetary control (DoC). It uses the following categories: intermediate, substantial, and intensive. The DoC increases as you move from left to right (e.g. intermediate-substantial-intensive).[12]

[12]The classification has fourth category, rudimentary, but this category is not present within the dataset this paper is using.

Therefore this paper also looks into how the above variables help determine the choice on DoC. Table 4 below shows the expected sign on the estimated coefficients.

Table 4: Degree of Monetary Control

	Sign Expectation	
VARIABLE	**(Subst*)**	**(Intens*)**
Large	+ve	-ve
Medium	+ve	-ve
Anchor Network	?	?
Trade Openness	?	?
Fuel Exports	?	?
Capital Account Openness	?	?
Financial Market Depth	+ve	+ve
Strength of Democracy	?	-ve
Central Bank Independence	+ve	+ve

*Where intermediate is the comparison/base category

Firstly, as larger countries are less vulnerable to shocks (e.g. exchange rate shocks (Breedon et al. (2012)), shocks to the market price of a good or a decrease in the exports of certain goods (e.g. tropical cash crops)[13](Frankema et al. (2022))) they may feel less of a need to opt for an intensive degree of monetary control, however, it is likely they will still opt for a serious degree of monetary control. Therefore, it is expected that the sign on the estimated coefficient for the large and medium variables will be positive for substantial degree of monetary control but negative for intensive degree of monetary control. A similar argument can be applied to medium-sized countries, and, thus, their expected signs are the same as the expected sign on the 'large' variable.

Secondly, as a country's trade increases with countries within a certain trade bloc, it is likely they will want more control over their exchange rate with that bloc. However, control over an exchange rate is possible within all 3 categories of DoC; the difference between each category is what instruments they have available to use in order to meet their objective. Therefore, the expected sign on the estimated coefficients is not obvious *a priori*.

[13]These examples are an issue in a country that is not very well diversified. Usman and Landry (2021) states that the continent, Africa, has 8 out of the 15 world's least economically diversified countries. It also stresses the importance of diversification for resilience.

Thirdly, and for similar reasons provided in the target variable section, the expected sign on the trade openness variable is uncertain. Although trade openness seems to be negatively correlated with inflation (Romer (1993)) this does not give any insight into DoC MPF choice.

Fourthly, as a country has a greater proportion of their GDP as fuel exports, they may want a greater degree of control over their exchange rate. However, similar to the reasoning given for the anchor network variable, this makes the expected sign uncertain for both substantial and intensive DoC, as control over an exchange rate is possible within all 3 categories of DoC.

According to Levy Yeyati et al. (2010), they argue that capital account openness is typically positively correlated with more flexible exchange rate regimes due to capital account openness reducing the effectiveness of pegs. However, as mentioned previously, Levy Yeyati et al. (2010) states that this relationship may be flipped if currency mismatch is large. Therefore, as it is possible to have intermediate, substantial, or intensive DoC whilst having a flexible ERR (e.g. discretion or inflation targeting) the estimated signs on the coefficients are uncertain.

Sixthly, greater financial market development enables higher monetary control, so the sign is expected to be positive for both substantial and intensive DoC.

Penultimately, it is expected that the more autocratic a country, the more likely they are to opt for control over their ER (Steinberg and Malhotra (2014)). Cobham (2022) states that autocrats do not like to cede power; it is highly possible that they would view autonomous markets as a lack of control. Thus, intensive DoC may be considered as giving too much power away to autonomous market forces. Therefore, the expected sign on intensive is negative but the expected sign on substantial is uncertain.

Lastly, countries with greater central bank independence typically tend to have a greater degree of monetary control as they can use indirect instruments to influence the interest rate - as opposed to using direct, non-monetary instruments. Furthermore, certain MPFs (e.g. IT) that are included in substantial and intensive DoC have central

bank independence as a pre-condition. Therefore, the expected sign on CBI is positive for both substantial and intensive.

4 Data and Methodology

4.1 Data

A panel dataset, from 1985 to 2017,[14] has been constructed using the variables shown in Appendix A. The dataset includes the emerging and developing countries from the following regions: Africa; Asia; Latin America and the Caribbean; Other Europe, Caucasus and Central Asia; and the Middle East.[15] Once accounting for data availability, and the 2 currency unions within Africa,[16] this results in 87 countries/currency areas. Furthermore, as policymakers typically observe and respond to past conditions as indicators of future condition, the explanatory variables need to be reflecting information about their past values. Therefore, the explanatory variables take on the average value of the the preceding 4 years.[17] Having the explanatory variables being an average of preceding years also helps to overcome endogeneity concerns, particularly in regards to reverse causality.[18]

[14]The MPF dataset is from 1974-2017 but, once accounting for data availability across all datasets, the first observation is in 1985. The CBI dataset stops at 2012 but we have extended 2012's value to 2017 as CBI does not typically change from year to year. The 1985 starting year is also beneficial as it leaves enough time for the fall out post-Bretton Woods to have died down.

[15]Please see Appendix C for a list of the countries, by region, that is used in this paper

[16]Central African Economic and Monetary Community and West African Economic and Monetary Union

[17]The average value for the preceding 2 and 3 years was also tried. 4 years has been chosen as it performed best when looking at information criteria.

[18]This is discussed in a lot more detail in Section 6.

4.2 Descriptive Statistics

Table 5: Descriptive Statistics

Variable	Obs[a]	Mean	Std. Dev.	Min	Max
Large	1393	.154	.361	0	1
Medium	1393	.168	.374	0	1
Small	1393	.678	.468	0	1
Anchor Network[b]	1393	.262	.176	.01	.996
Trade Openness	1393	.721	.359	.117	2.196
Financial Market Depth	1393	.163	.187	0	.818
Strength of Democracy	1393	2.661	6.342	-10	10
Capital Account Openness	1393	.064	1.42	-1.924	2.322
Central Bank Independence	1393	.532	.181	.132	.904
Fuel Exports	1393	20.632	29.715	0	138.571
Inertia	1393	.969	.173	0	1

[a]This is the total number of observations for both the aggregation by target variable dataset and the aggregation by degree of monetary control dataset. There are a few differences in the number of countries within each dataset. The former has 1,360 observations, covers 72 countries and it removes any country that has 5 or fewer observations. The latter has 1,249, covers 76 countries and it does not include any observations from OECCA region due to this region containing too little variation in the dependent variable to allow multinomial logit estimation to converge.

[b]Please refer to Appendix B on how this is calculated.

4.3 Methodology

The decision-makers (DM)[19] – the group/body of people who have the monetary policy decision making power within each country – face a choice between J alternative monetary policy frameworks. Alternative j provides them with utility U_{njt} (where j = 0,1 .... J)[20]. U_{njt} is the utility of country n from picking alternative j at time t. For example, a decision-maker would choose option i over option j, if and only if, $U_{nit} > U_{njt}$. Unfortunately, we are not able to directly observe/quantify U_{njt} - it is a latent variable. Therefore, it is necessary for it to be broken down as being composed of the following:

$$U_{njt} = V_{njt} + \epsilon_{njt} \forall j \tag{1}$$

where V_{njt} are the factors, which are observable, that affect the DM's utility - sometimes referred to as 'representative utility'. These factors are the independent variables/determinants of MPFs. ϵ_{njt} are the factors that affect utility that are not observable and, thus, these are treated as random. The multinomial logit estimation assumes that the log-odds of each MPF is linear in parameters:

$$V_{njt} = log(\pi_{njt}/\pi_{n0t}) = \beta' x_{njt} \tag{2}$$

where β is a column vector of the coefficients on the explanatory variables (the determinants of MPFs) and x_{njt} is a column vector of explanatory variables from country n at time t. π_{njt} is the probability of choosing alternative j and π_{n0t} is the probability of choosing D MPF.

Similar to the approach taken in Levy Yeyati et al. (2010), the multinomial logit estimation is used on each of the 3 theoretical approaches separately before bringing it

[19] In this case, there are 85 decision-makers (i.e. the person/group of people who choose the MPF)

[20] In terms of this dataset J=2 and the categories are the following for MPF by target: D, ER, and IT, where j=0 is the base category (D). For MPF by degree of monetary control: Intermediate, Substantial, and Intensive, where j=0 is the base category (Intermediate). t is in years from 1985 to 2017.

all together into one model.[21] The signs and coefficients will be compared and a likelihood ratio test will be used to jointly test the relative importance of each of the theoretical views.

Lastly, manipulating equation 2 enables us to achieve the individual probabilities rather than dealing in terms of log-odds.

$$\pi_{njt} = e^{\beta' x_{njt}} / \sum_{j=0}^{J} e^{\beta' x_{njt}} \tag{3}$$

Therefore, specifying values for variable x_1 - and keeping the other explanatory variables constant at their average value - results in the predictive probability of country n choosing choice j. The plots of these show the economic significance of each variable. [22] This approach has been used in Cobham and Song (2020) and has been applied mutatis mutandis to this paper.

Multinomial logit has been chosen over multinomial probit for two reasons: Firstly, previous literature has used multinomial logit so this paper has followed their approach. Secondly, multinomial logit is computationally less burdensome than multinomial probit. However, the former does assume independence of irrelevant alternatives (IIA), whereas the latter does not. Multinomial probit will be used as a robustness check to make sure choice of model does not greatly affect the results.

5 Results

5.1 By Target Variable Aggregation

Table 6 shows the estimates of the coefficients for the three subset models (columns (1) to (6), inclusive) - assembled according to the relevant theories - and the full model

[21] All models control for region and year but the regional results are only shown for the full model. They also control for inertia as it is expected that there exists some degree of path dependence when it comes to choosing a MPF.

[22] Please see Appendix D for why this is useful

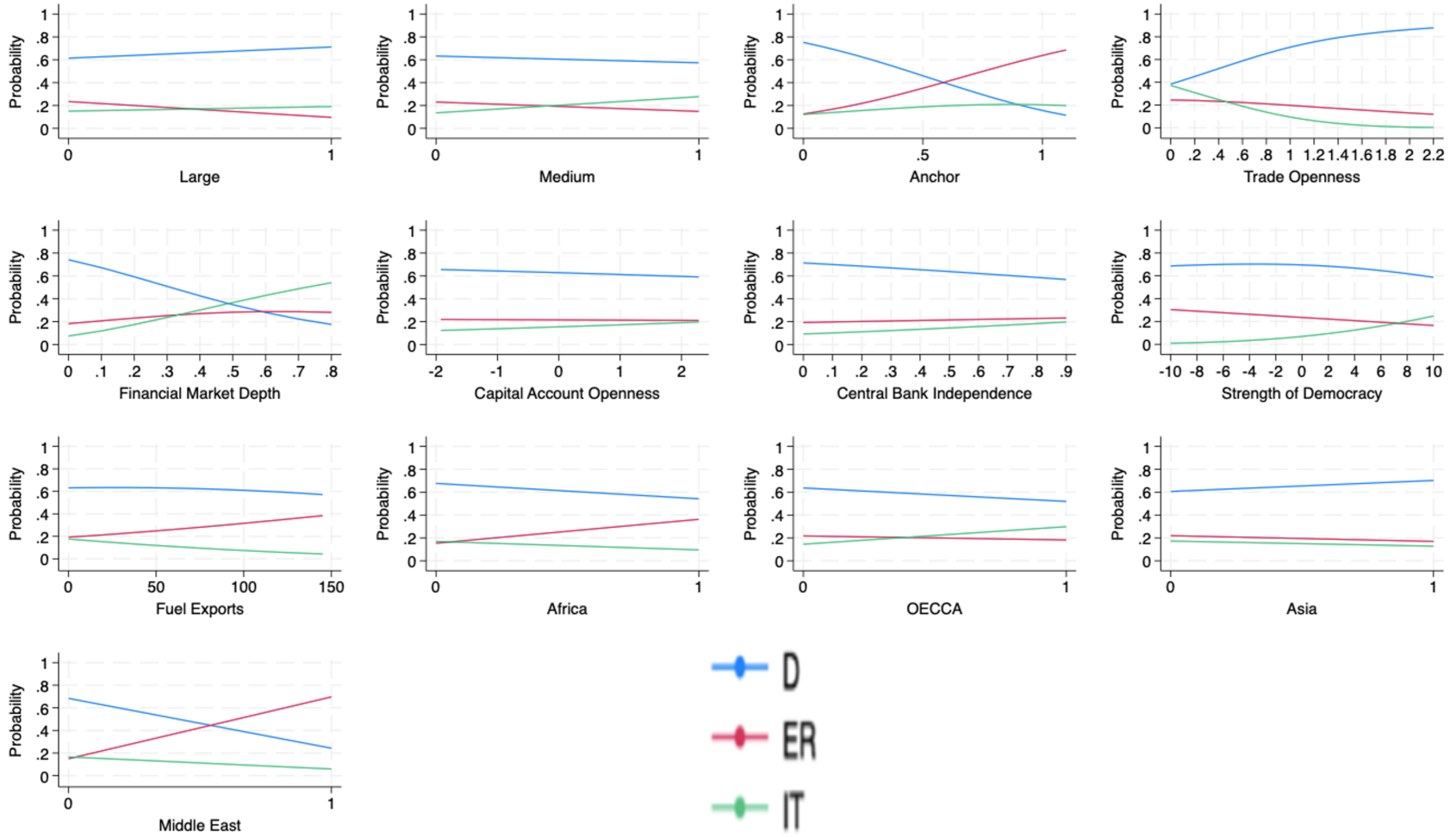
(columns (7) and (8)). In every model in Table 6, D is the base category. As the magnitudes of the coefficients are difficult to interpret and rely on being compared to D, Figure 1 shows the predictive margin plots. These are not only a great visual aid but help to assess the economic significance of each variable.

Table 6: Results - Aggregation by Target Variable

	OCA		Financial		Political/Institutional		Full	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	**ER**	**IT**	**ER**	**IT**	**ER**	**IT**	**ER**	**IT**
Large	-1.956***	1.456***					-1.800***	0.452
	(0.709)	(0.380)					(0.637)	(0.514)
Medium	-0.555*	2.600***					-0.822**	1.774***
	(0.286)	(0.371)					(0.326)	(0.544)
Anchor Network	4.230***	-0.0845					5.066***	2.601*
	(0.869)	(1.123)					(0.898)	(1.387)
Trade Openness	-0.240	-0.958*					-1.022*	-3.939***
	(0.523)	(0.574)					(0.527)	(0.927)
Fuel Exports	0.013***	-0.033***					0.010***	-0.017**
	(0.003)	(0.005)					(0.003)	(0.008)
Financial Market Depth			2.941***	5.577***			2.789***	7.888***
			(0.628)	(0.604)			(0.616)	(0.973)
Capital Account Openness			0.146**	0.027			-0.004	0.271*
			(0.057)	(0.089)			(0.071)	(0.145)
Democratic Strength					-0.090***	0.242***	-0.046**	0.247***
					(0.016)	(0.038)	(0.019)	(0.043)
Central Bank Independence					0.171	0.356	0.571	1.970**
					(0.682)	(0.583)	(1.007)	(0.810)
Africa	YES	YES	YES	YES	YES	YES	1.902***	-0.890*
							(0.373)	(0.553)
Asia	YES	YES	YES	YES	YES	YES	-0.604	-0.766
							(0.412)	(0.487)
OECCA	YES	YES	YES	YES	YES	YES	-0.200	2.110***
							(0.559)	(0.652)
Middle East	YES	YES	YES	YES	YES	YES	3.588***	-0.952
							(0.484)	(1.039)
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Controls for State Dependence	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360
Pseudo R2	0.356		0.300		0.306		0.434	
Log likelihood	-805.527		-874.222		-867.652		-708.197	
McFadden R2	0.38		0.33		0.33		0.46	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Base Category = D
OCA: $\chi^2 = 129.41$***
Financial Integration: $\chi^2 = 88.83$***
Political/Institutional Strength: $\chi^2 = 39.99$***

Figure 1: Plots of Predictive Margins - Target Variable[a]



[a]Please see Appendix E for this figure with confidence intervals.

When comparing the individual approaches (columns (1) to (6)) to the full model (columns (8) and (9)), there are two differences in estimated signs (the anchor network variable under IT and capital account openness under ER). Furthermore, even though the statistical significance of the variables across all models is fairly consistent, it is not exactly the same and, thus, this paper will focus on interpreting the results of the variables from the full model only (columns (7) and (8)).[23] The pseudo R2 and log likelihood statistics also recommend the full model. The results from the likelihood ratio test, as shown by the chi-squared results, show that the variables within each theoretical approach to choice of MPF (OCA, financial integration, and political/institutional strength) are each jointly statistically significant. Therefore, each approach is shown to have empirical relevance.

In column (7), the coefficient on a country being large in economic size, compared to a small economy, is negative and statistically significant. Meaning that large economies are significantly less likely to opt for an ER MPF over D. However, the reverse is true for countries choosing between IT and D (as shown in column (8)) and the coefficient is not statistically significant. The results are similar when a medium sized economy is compared to a small economy, with the only difference being the coefficient is now statistically significant for IT. This result agrees with the *a priori* sign expectations. These results can be explained by the theory that small economies are more vulnerable to shocks, particularly shocks to their exchange rate, and, thus, are more likely to target their exchange rate. As larger economies are less susceptible to exchange rate fluctuations, they can explore other MPFs, such as IT. From the predictive margins in Figure 1, we can see that the probability of a country picking IT increases by approximately 4 percentage points when a country goes from being small to large country. However, it increases by more when country goes from being small to medium sized (increases by approximately 14.1 percentage points). The probability of a medium sized country picking IT is approximately 28% whereas for large it is only 19%. As for countries picking

[23]There are increased bias concerns when using logistical estimation, compared to standard linear regression models, and, thus, it is more beneficial to analyse the determinants of MPFs using the whole model as this reduces the chance of bias.

ER, the probability falls by 14 percentage points when a country goes from being small to large. It falls by 8 percentage points when a country goes from being small to medium sized. This is an interesting findings as it suggests that large economies do not feel as much of a need to target inflation in comparison to their smaller counterparts.

The parameter on the variable measuring anchor network is positive for both ER and IT (over D). This agrees with the *a priori* sign expectation for ER. Theoretically, countries that have a large volume of trade, in proportion to their GDP, with countries that peg to one of the anchor currencies, are more likely to target their exchange rate and join the anchor network. Whilst this does not explain the estimated coefficient on IT, it is useful to look at the predictive margin results. As can be seen, as the anchor starts increasing from 0 to the maximum value, the probability of a country picking IT increases a little before falling. Furthermore, the estimated coefficient is not statistically significant at the 5% significance level, whereas the probability of a country choosing ER is statistically significant.

As a country becomes more open to trade, they are significantly less likely to choose both ER and IT (over D). Figure 1 shows that the probability of choosing IT falls by a greater amount than it does for ER (25 percentage points more).

The parameter on fuel exports is positive and statistically significant for ER and this agrees with the *a priori* sign expectations. As mentioned previously, countries that have a larger proportion of their exports being fuel based may think they can stabilise their revenue if they target their ER. For example, this is cited as the reason that middle eastern countries peg their exchange rate to the US Dollar (Khan (2009)). As for IT, this coefficient is negative and statistically significant.

As a country increases their financial market depth, they are significantly more likely to opt for both ER and IT (over D). For IT, this is supported by the theory - a deep financial market is necessary condition for countries to be able to adopt indirect instrument to target inflation. As for ER, this result may seem counter-intuitive and does not agree with the *a priori* sign expectation. For example, it could be argued that an ER

MPF does not require a well developed financial system and, thus, is the more common choice for countries without such a developed system. However, the coefficients in Table 6 are being compared to D. Therefore, it is imperative to also look at the relevant plot in Figure 1. From this we can see that as financial market depth increases, the probability of a country choosing ER increases slightly until about 0.6 when it starts to fall. IT, on the other hand, has approximately a 46 percentage point increase in the probability when financial depth goes from minimum to maximum.

For capital account openness, the parameter on ER is negative and not statistically significant. For IT, it is positive and statistically significant. This implies that, as capital account openness increases, emerging/developing countries are more likely to opt for independent monetary policy than targeting their exchange rate. This is in-line with Levy Yeyati et al. (2010) as they expect a positive correlation between capital account openness and a flexible ERR (to become an inflation targeter it is necessary to have a flexible ERR) when currency mismatch is not as large.[24]

As a country's democratic strength becomes more democratic, they are significantly less likely to opt for ER (over D). They are significantly more likely to choose IT (over D). Both findings concur with the *a priori* sign expectations. The results agree with the theory that more autocratic countries opt for targeting their exchange rate. From the plot in Figure 1 we can see that the probability of choosing IT increases by approximately 23 percentage points. The probabilities of choosing ER and D falls by approximately 13 and 10 percentage points, respectively.

The parameter on central bank independence is positive for both ER and IT (over D), however, it is only significant for IT. Whilst it may be expected that the coefficient on ER would be negative, as per the *a priori* sign expectation, the predictive margins plot show a relatively flat line for ER, which is an indication of low economic significance. However, for IT, as central bank independence increases, the probability of a country picking IT increases by approximately 11 percentage points.

[24]This result is reassuring as a variable measuring currency mismatch explicitly has not been included in the model.

As for the regions, we can see that the coefficient on countries within the Africa region, compared to Latin America and the Caribbean, is positive and statistically significant for ER but negative and not significant for IT (at the 5% significance level). This result is not surprising. Multiple countries within Africa are not very well diversified and have high levels of debt which makes them highly susceptible to external shocks, particularly shocks to their exchange rate. Furthermore, they may rely on their exchange rate to help control inflation. The coefficient on IT is negative but not statistically significant. From Figure 1 we can see that the probability of a country choosing an ER MPF increases by approximately 21 percentage points if they are a country within Africa. The line for IT is almost flat, suggesting low economic significance.

The countries within Asia are less likely to choose both ER and IT over D, compared to countries within Latin America and the Caribbean. This result is not statistically significant.

For countries part of OECCA, compared to those in Latin America and the Caribbean, they are less likely to opt for ER but statistically more likely to opt for IT. In the dataset, the data on these countries starts in the later years (2001-2017) when IT is more likely to appear as it had risen in popularity.

Lastly, countries within the Middle East are statistically more likely to opt for ER and less likely, but not significantly so, to opt for IT.

5.2 Prediction Accuracy for Target Variable Aggregation

Figure 2 shows the probability that each country's MPF (aggregated by target variable) is correctly chosen by the model. On average, the model has a prediction accuracy of 79%, which is 4 percentage points higher than the prediction accuracy of the model used in Cobham and Song (2020). Figure 2 shows that there is 1 country (Albania) for which the model never predicts the correct MPF. This is not too different to Cobham and Song (2020) as their model predicts 2 countries completely incorrectly. Looking further into Albania, there is data from 2001-2017 and their MPF choice is IT for whole time

period. There are two interesting things that stand out about Albania when compared to other IT countries.[25] Firstly, it has a democratic strength that is more volatile over-time. Secondly, its financial market depth score lowers slightly as time progresses whereas for the other IT countries their financial market depth values either stays the same or increases as time progresses. Therefore, these two facts could possibly explain why the model fails to ever predict Albania's choice of MPF correctly.

Figure 2: Prediction Accuracy per Country

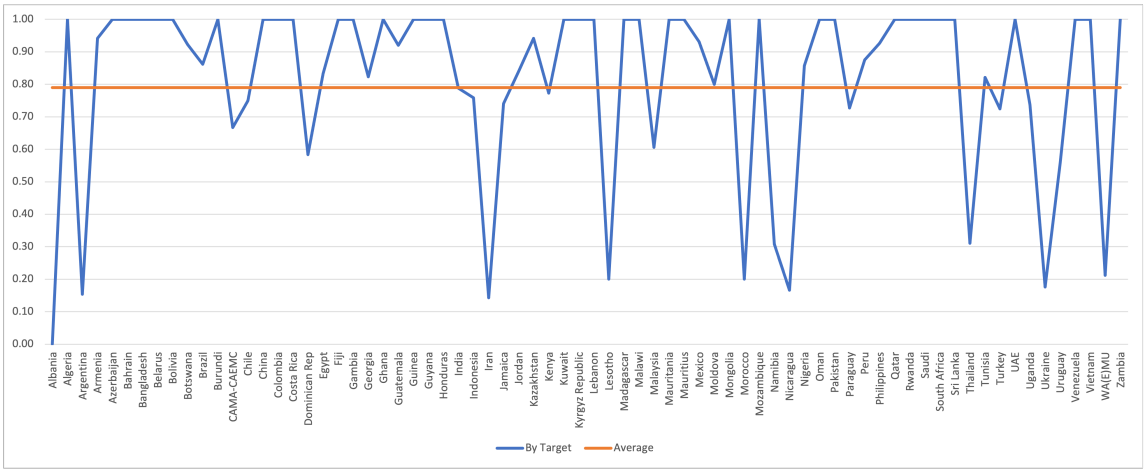
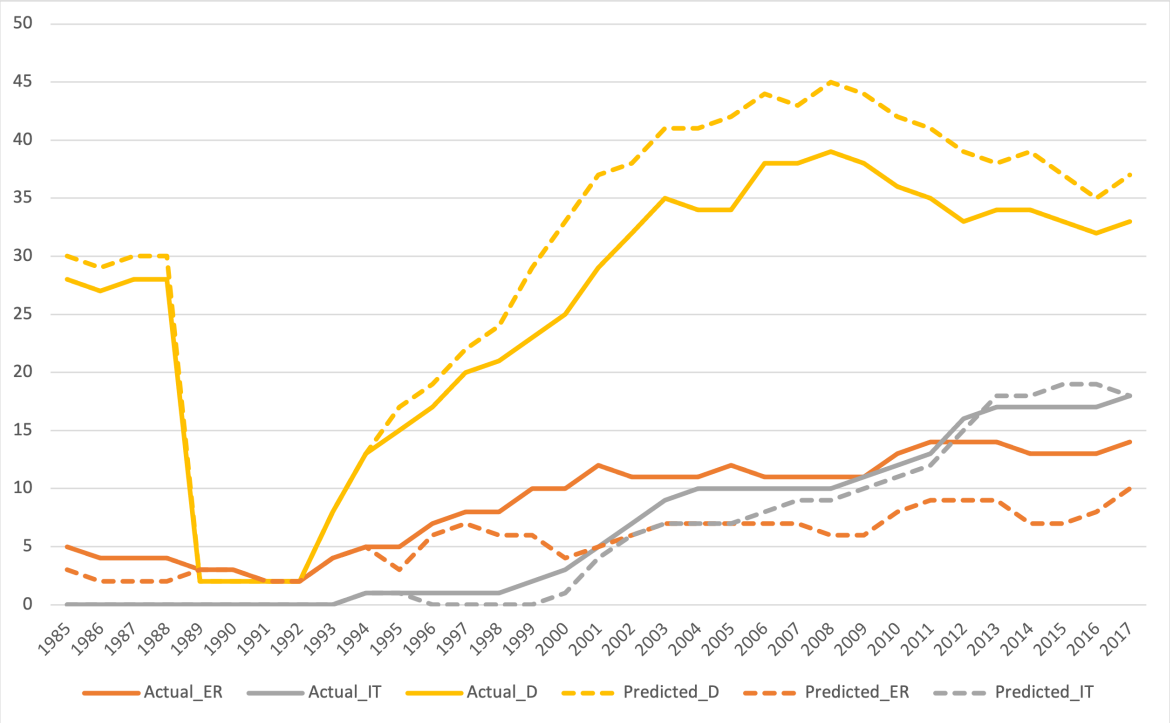


Figure 3 shows the frequency of each MPF for actual and predicted. It shows that the dotted lines (predicted MPF frequency) track the solid lines (actual MPF frequency) well and, in some places, are the same. The figure shows that the model tends to over-predict for D. This is likely because D contributes to the majority (62.46%) of the dataset. This model outperforms a 'simple' model - one which just predicts the most dominant category (i.e. D). It can also be seen that the total frequency of MPFs is not constant across the years. This is due to data availability and is particularly prominent in the early 1990s where the fuel export variable has missing data.

[25]It is important to note that the IT category has the smallest proportion of the dataset (15.72%).

Figure 3: Actual vs. Predicted frequency for each MPF by Target Variable Aggregation



5.3 By Degree of Monetary Control

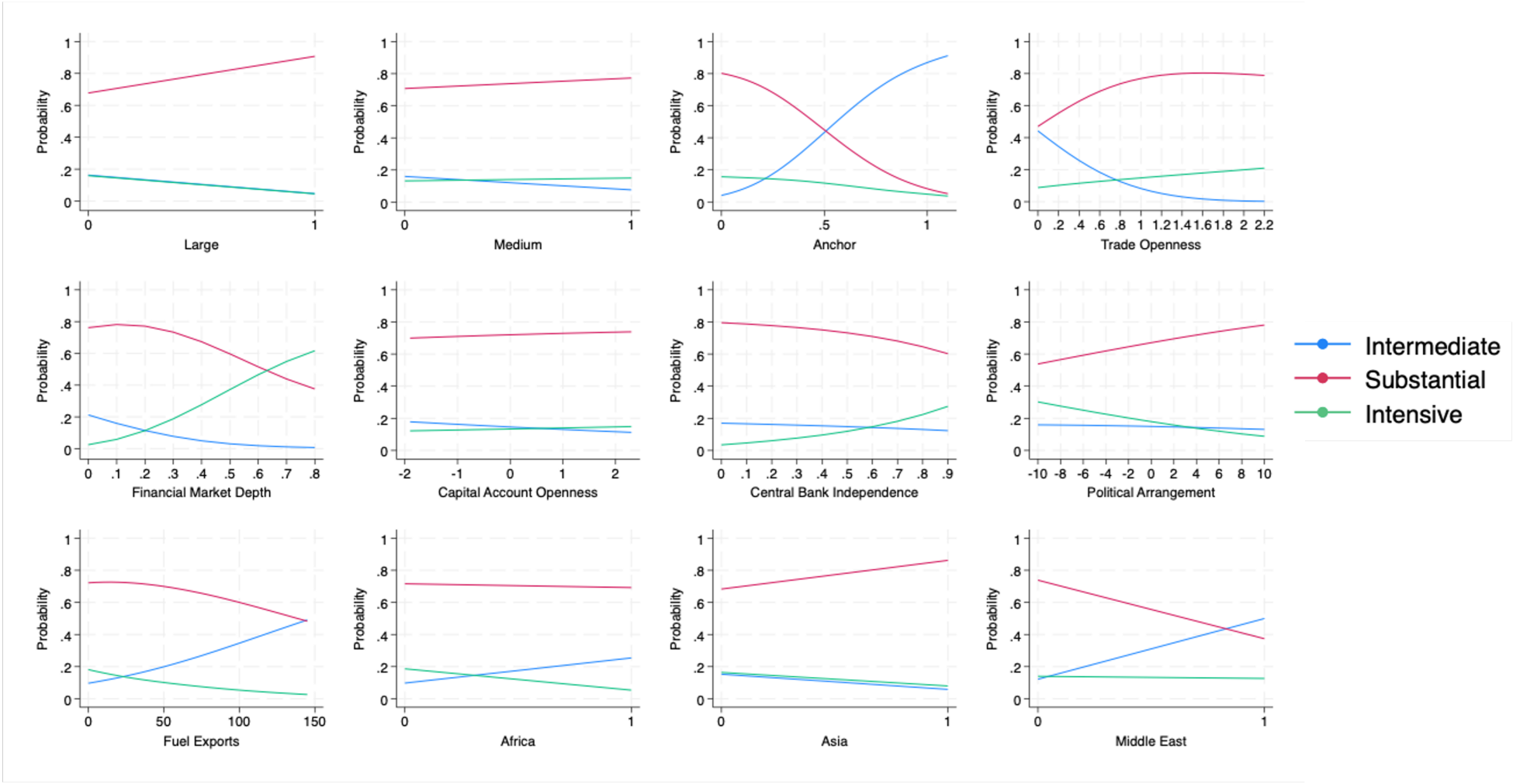
The above results are based on the MPF classification being aggregated on the target variable. The classification also aggregates on degree of monetary control and the estimation results are shown in Table 7. Furthermore, Figure 4 shows the predictive margin plots.

Table 7: Results - Aggregation by Degree of Monetary Control

	Full	
	(1)	(2)
VARIABLES	**Substantial**	**Intensive**
Large	2.181***	-1.602
	(0.643)	(1.883)
Medium	1.308***	1.590***
	(0.427)	(0.732)
Anchor Network	-10.790***	-11.640***
	(1.593)	(2.003)
Trade Openness	4.148***	4.969***
	(0.846)	(1.005)
Fuel Exports	-0.024***	-0.068***
	(0.004)	(0.017)
Financial Market Depth	5.374***	15.850***
	(1.632)	(2.275)
Capital Account Openness	0.198**	0.329**
	(0.093)	(0.162)
Democratic Strength	0.035	-0.165**
	(0.025)	(0.066)
Central Bank Independence	0.331	7.787***
	(1.015)	(2.487)
Africa	-1.806***	-4.981***
	(0.385)	(0.794)
Asia	1.696***	-0.971
	(0.492)	(0.871)
Middle East	-3.693***	-3.495***
	(0.725)	(1.067)
Year Fixed Effects	YES	YES
Controls for State Dependence	YES	YES
Observations	1,249	
Pseudo R2	0.518	
Log likelihood	-476.815	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Base Category = Intermediate

Figure 4: Plots of Predictive Margins - Degree of Monetary Control[a]



[a]Please see Appendix F for this figure with confidence intervals.

The estimated coefficient on the variable for both a large and medium sized economy is positive and statistically significant for substantial degree of control, which agrees with the *a priori* sign expectations. Therefore, both large and medium sized economies, when compared to small economies, are more likely to choose a substantial DoC, relative to an intermediate DoC. A large economy, compared to a small economy, however, is less likely to opt for an intensive DoC. On the otherhand, as visually shown in Figure 4, a medium sized economy has an increased likelihood of choosing an intensive DoC. However, the line is relatively flat which implies that small economies are nearly as likely to opt for an intensive DoC too. This is an interesting result and suggests that large economies, compared to small economies, feel less of a need to opt for the highest form of monetary control but still like to have a substantial DoC. As mentioned earlier, this is potentially due to larger economies being less vulnerable to external shocks.

The parameter on the variable measuring anchor network is negative and statistically significant for both substantial and intensive (over intermediate). This agrees with the *a priori* sign expectation for substantial. It can be argued that a country with a high anchor network would opt for either a full targeting or fixed ER MPF. Therefore, in terms of DoC this places them into either the intermediate or intensive category. As it is unlikely to put them into the substantial category, it is not surprising that their probability of choosing substantial falls considerably as the anchor network value goes from minimum to maximum (falls by approximately 75 percentage points). In comparison, the fall in the probability of picking intensive is much smaller (falls by approximately 15 percentage points).

As a country becomes more open to trade, they are significantly more likely to opt for both substantial and intensive degrees of monetary control (over intermediate).

As a country increases their percentage of fuel exports, relative to GDP, they are significantly less likely to opt for both substantial and intensive. This agrees with the *a priori* sign expectation that was presented for substantial.

The coefficient on financial market depth is positive and statistically significant in

both columns 1 and 2. Again, this agrees with the *a priori* sign expectation. Greater financial market depth is a necessary requirement to have higher DoC. Figure 4 shows that as financial market depth increases, the probability of a country having intensive DoC increases by approximately 59 percentage points.

As a country's capital account becomes more open, they are statistically more likely to opt for both substantial and intensive (over intermediate). This agrees with the substantial *a priori* sign expectation. However, as can be seen from Figure 4, the lines are not very steep which suggests capital account openness has low economic significance in choice of MPF when aggregated by DoC.

The more democratic a country becomes, the more likely they are to opt for a substantial DoC when compared to an intermediate DoC. The opposite is true for intensive DoC. The latter disagrees with the *a priori* sign expectation. However, this could potentially be explained by the following argument: countries that are more democratic are less likely to need to have full or narrow monetary policy target as they do not need to rely on them as a 'policy crutch'. For example, it is likely they are already trusted by their citizens and are accountable therefore they manage to anchor inflation expectations without needing to have a higher DoC. Finally, as can be see in Figure 4, there is a slight fall in the probability of picking an intermediate DoC as a country becomes more democratic.

As a country's central bank becomes more independent, they are more likely to opt for both substantial and intensive DoC, but it is only statistically significant for the latter. This agrees with the *a priori* sign expectation placed on substantial. The result shown in Figure 4 is interesting as it shows a fall in probability for both intermediate and substantial when central bank independence increases. This implies that a more independent central bank is more likely to favour IT.

A country that is within Africa, compared to being within Latin America & the Caribbean, is significantly less likely to have substantial and intensive DoC (when compared to intermediate). It could be potentially argued that to possess a high DoC requires

training and ability (e.g. people with PhDs making the monetary policy decisions), both of which may be much less common in countries within Africa than in Latin America & the Caribbean.

A country that is within Asia, compared to being within Latin America & the Caribbean, is significantly more likely to have a substantial DoC but less likely to have an intensive DoC.

Finally, a country that is within the Middle East, compared to being within Latin America and the Caribbean, is significantly less likely to have both substantial and intensive DoC. However, the flat green line as shown in Figure 4 implies that the probability of opting for intensive is similar between the two regions. Therefore, there may be some unobserved regional characteristics that both of these regions possess that impacts choice of MPF when aggregated by DoC.[26]

[26]A fully comprehensive model would include variables that reflect the characteristics of these regions so that the regional fixed effects were not necessary. However, this is beyond the scope of this research.

5.4 Prediction Accuracy for Degree of Monetary Control

Figure 5 shows the probability that each country's MPF (by DoC) is correctly chosen. On average, the model has a prediction accuracy of 84%. This is 5 percentage points higher than the model's prediction accuracy for MPF when aggregated by target variable. However, there are 3 countries (Comoros, Ecuador, and Lebanon) that the model never manages to correctly predict. Cobham and Song (2020) find that their DoC model, when compared to their target variable model, predicts fewer countries completely incorrectly. Unfortunately Albania is not included in the DoC model, due to not being able to include the OECCA countries. It would have been interesting to see if this model also predicts Albania completely incorrectly. Comoros and Ecuador both have only 4 data points and were excluded from the target variable model. Ideally, they would have been excluded from this model too but having to exclude OECCA countries already lowered the observations and lowering the number of observations further raises the standard errors due to multinomial logit estimation working best when there are more observations. Lebanon, however, was correctly predicted 20% of the time in the target variable MPF model. It has data from 2009-2017, inclusive, but has intensive DoC for all of the years - this makes up the smallest proportion of dataset for DoC (13.25%) whereas in the target variable dataset it goes into the ER MPF category which is the second biggest (21.82%). Therefore, it may be that this model struggles to predict Lebanon for DoC as it does not have as many observations to build a pattern on.

Figure 5: Prediction Accuracy per Country

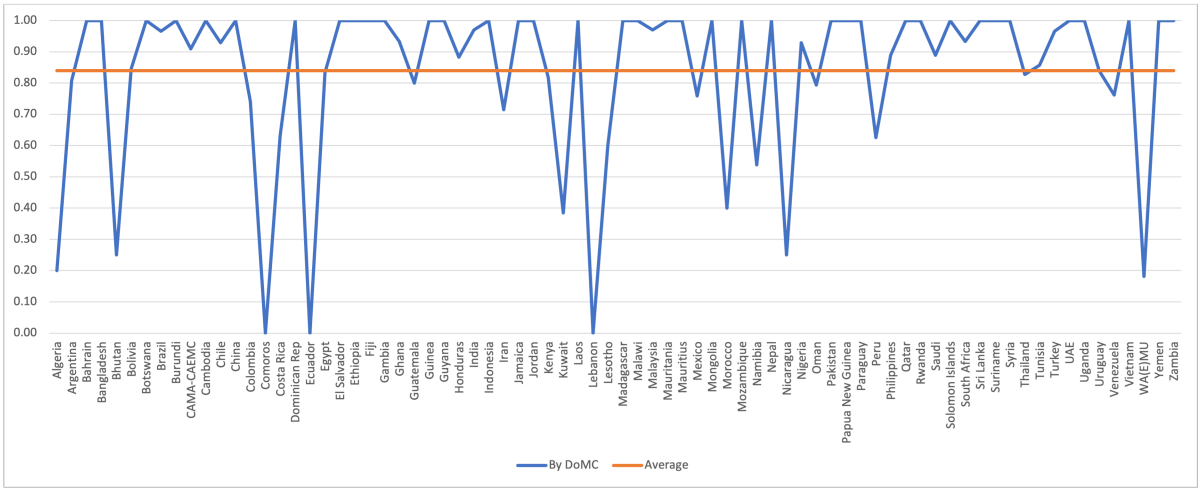
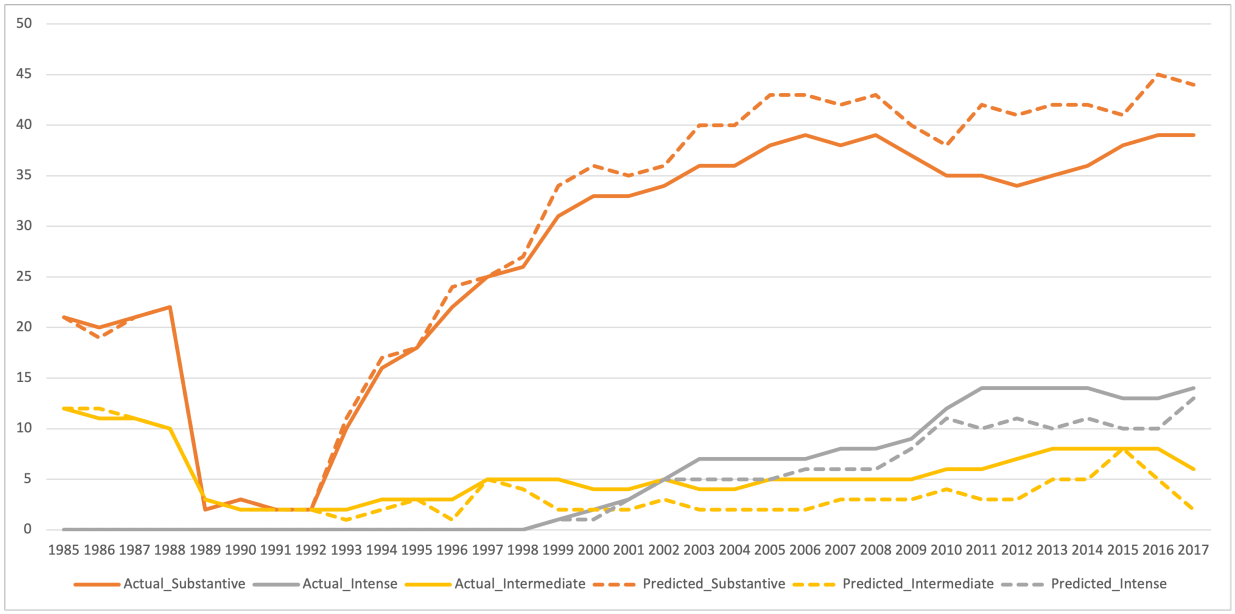


Figure 6 shows the frequency of each MPF (by DoC) for actual and predicted. Similar to that for target variable, it shows that the dotted lines (predicted MPF frequency) track the solid lines (actual MPF frequency) well and, in some places, are the same. In this model, the only category it over-predicts is substantial. Similar to the target variable model where D was the main classification to be over-predicted, and had the majority in the dataset, the substantial category has the majority in the DoC dataset (71.21%). Lastly, like before, if we were to assume a 'simple' model - which just always predicts the dominant category - this model would perform better.

Figure 6: Actual vs. Predicted frequency for each MPF by Degree of Control



6 Endogeneity & Robustness

This paper is primarily a predictive paper, rather than causal inference, however, this paper attempts to address any endogeneity concerns, too. The two channels that endogeneity could be present in this paper are via reverse causality and omitted variable bias.

6.1 Reverse Causality:

All explanatory variables, except region dummies and inertia, take the average value of the preceding 4 years. This has been done for two reasons: Firstly, it is unlikely that central banks/DM's make choices about their MPF as far as 4 years in advance, therefore helping to mitigate reverse causality concerns. Secondly, the previous literature argues that taking the average of the preceding 4 years helps to overcome reverse causality because MPF_t cannot be causing something in the past. However, despite this being used in previous literature, Bellemare et al. (2017) argue that lagging variables is not enough to overcome a reverse causality issue. They argue a reverse causality problem can simply be rewritten as an omitted variable problem. Therefore, section 5.5.2 tries to address any omitted variable concerns.

There are two main concerns raised in regards to reverse causality. The first is to do with financial market depth: countries are not developing their financial markets due to choosing a MPF other than IT, so deep financial markets are not needed. We do not think this is a valid concern for the following reasons:

1. Countries do not 'pick' D as their MPF, per se. It is a category where there is a lack of an objective or there are multiple, conflicting objectives; this is part of the reason why Cobham (2023) refers to it as a 'residual' category. Therefore, as a country would not want/choose to be categorised as D, they would not not develop their financial markets just to be classified as D.

2. D is a rather broad category[27] thus, in this paper, D can (and does) contain examples of countries who have a D MPF due to having effective instruments but unclear objectives and trade-offs. Therefore, in instances where the instrument is the interest rate, for this to be an effective instrument there must exist a developed financial system.

3. D is typically a transition category.[28]

4. Countries with an ER MPF do not need deep financial markets to operate that MPF but Mishkin (1999) states that it is potentially dangerous to have an ER regime without deep and liquid financial markets; well developed financial systems can help to absorb shocks as well as reduce the impact of any speculative attacks.[29] Therefore, it is unlikely that a country would not not develop their financial system just because they have chosen an ER MPF.

The second concern is the following: countries develop an independent central bank due to wanting to pick an IT MPF. Thus, the causal relationship between CBI and MPF is reversed. We do not think this is a valid concern for the following reasons:

1. The dependent variable is the MPF they *actually* have rather than the MPF they *wish* to have.[30]

2. CBI provides other benefits (e.g. enhanced credibility, lower and more stable inflation rates without targeting a specific inflation rate, and enables policymakers to make (policy) decisions that are free from political interference) and, thus, CBI is not just exclusive to an IT MPF. Therefore, even if a country wishes to have an IT MPF, they may be developing an independent central bank and have a D MPF.

[27]Especially in this paper since it is an aggregation of unstructured, loosely structured, and well structured discretion.

[28]Please refer to Cobham (2023) for more information.

[29]An example of this is *Black Wednesday* in 1992 when George Soros speculated against the British pound.

[30]It is possible that the MPF they *wish* to have is an important variable that we are missing so we discuss this more in section 5.5.2. More specifically, this particular issue is discussed at the bottom of p36.

3. If we look at the data, the average CBI value for D, ER, and IT is 0.51, 0.51, and 0.62, respectively. Whilst it is higher under IT, it is not significantly higher.

6.2 Omitted Variable Bias:

The results shown in Section 5 are for the specific model, however, other variables that theoretically seem important were included initially.

Firstly, Cobham and Song (2020) includes variables that measure past inflation. This is because countries that have suffered with high inflation in the past, may opt for an IT MPF as a way to keep inflation under control. Following this, this paper also tried including a measure for past inflation. Inflation data for emerging and developing countries is not as readily available as it is for developed countries; the inflation data series that are available are also prone to have a lot of missing values. This paper uses inflation data from the WDI series and creates a variable that is the average value of the preceding 5 years of inflation. Cobham and Song (2020) creates a past inflation variable that looks back further in time, however, due to poor data availability this would cause too few observations and questionable standard errors. As can be seen in Appendix G.1 past inflation in this model does not seem to play an important role in countries' MPF choice. When this is compared to Table 6, the signs are consistent except for two variables: Anchor under IT and Central Bank Independence under ER. Even though the sign has become negative, once a measure for inflation is included, in both instances they have remained statistically insignificant (at the 5% significance level). Therefore, as the past inflation variable is not statistically significant and significantly reduces the number of observations, this analysis omits including a variable that measures past inflation rates. However, it is important that the lack of significance can be theoretically explained because if the only reason for the lack of significance, is that the data is not good enough, this could mean a relevant variable has been omitted and, thus, bias has been introduced into the model. Therefore, a potential explanation for this finding is that emerging/developing countries are more concerned about exchange rate pass-through than inflation. Therefore, they focus on

their exchange rate, potentially in the hopes that this will lower/stabilise their inflation, rather than targeting inflation directly (see Frankel (2010),p.22, for more information). Furthermore, countries that have suffered from high past inflation (e.g. triple digits) and have managed to lower it (e.g. to double digits) may be content that their inflation is less severe, but also think that directly targeting inflation is too costly.

Secondly, the paper by Levy Yeyati et al. (2010) includes a variable to measure financial mismatch. There is potentially an endogeneity concern by not including such a variable in this analysis, especially as developing countries are much more likely to borrow in foreign currency. Therefore, as a proxy for currency mismatch, a dummy variable, that captures the countries and time period that were most affected by the Asian financial crisis, has been included. The literature suggests that these countries in particular had high amounts of dollarised liabilities. The results not only found this variable to statistically insignificant but the estimated coefficients on the capital account openness variable were -0.048 and 0.290, respectively. By comparing these to the estimated coefficients presented in columns (7) and (8) in Table 6, it can be seen that they hardly differ.

In addition to the above, when mentioning the key differences between developing/emerging countries and advanced countries, primary products making up a greater share of their GDP was mentioned. Therefore, it is possible that this information is needed to be included in the model as a variable. A variable that measures agriculture, forestry and fishing, value added, as a percentage of GDP, was included in the model. However, the variable was not statistically significant and the coefficients on the other variables were unchanged. Therefore, as this variable lowered the number of observations, it, too, was left out of the final model. It could also be argued that the effects of this are controlled for in the anchor network variable.

As mentioned above, it is possible that the MPF countries *wish* to have, rather than what they *actually* have, is an important variable that has been omitted from the model. Unfortunately, there is no way of measuring this. Therefore, year dummies were included to pick up any common global trends towards (or away from) a specific MPF. Given

the global nature of monetary policy discussion and the influence of international organisations, the assumption that global trends can influence the adoption of particular MPFs seems justified. Whilst this does not pick up any country-specific factors that drive adoption of a particular MPF, the paper's inclusion of other variables, such as democratic strength and CBI, should cover this.

Finally, even though this paper has heavily relied on the existing literature to ensure there are no important variables missing, there is always potential for omitted variables. Whilst country-level fixed effects cannot be included in this model due to the incidental parameters problem, this paper does include region-level fixed effects in the hopes that it controls for any remaining unobserved heterogeneity.

6.3 Robustness Checks:

In the analysis the 2 currency unions are included as 2 single units. Thus, as a robustness check, we include them as individual countries. The results are displayed in Appendix G.2. As can be seen, the results are in-line with those shown in columns (7) and (8) in Table 6. However, to ensure the slight differences in magnitudes are not a concern, it is important to compare the predictive plots. As can be seen by comparing Figure 1 to Appendix G.2, they are almost identical.

Secondly, instead of using a multinomial logit model, a multinomial probit model has also been used. This is because the former model operates under the rather strong assumption of IIA whereas the latter does not. Both the estimated coefficients and the plots of predictive margins, as shown in Appendix G.3, are very similar to those produced when using multinomial logit estimation. This suggests that any violations of the IIA, if there are any, are not significantly affecting the estimates.

Thirdly, the prediction accuracy results shown in sections 5.2 and 5.4 are more prone to suffer from over-fitting. For those predictions we did not use a separate training set and, instead, used the entire dataset to train the model. This means we have no way of knowing how well the model would generalise to new, unseen data because it

has been influenced by every data point available. Therefore, it is highly possible that the model has not just learnt the underlying patterns in the data but also any noise or random fluctuations. It was done this way so that the prediction accuracy results could be compared to previous work which also did not use a training set (e.g. Cobham and Song (2020)). However, to improve on previous practices, and as a robustness check, this paper implements a simpler method of a cross-validation process called the 'holdout' method on the dataset for MPFs aggregated by target variable. The 'holdout' method is a way of assessing the model's predictive performance on unseen data. We split the data into a training set (approximately 70% of the data) and a test set (the remaining 30%). The model is then trained on the training data and validated on the test set. This is a single split and the test set (i.e. the 'holdout' set) is not included in the model training. We perform the holdout method three times, with different random splits each time.[31] We then take an average of the prediction accuracy results. The average prediction accuracy from the holdout method is approximately 74%. This is slightly lower than the 79% prediction accuracy that was established when the model was fitted to the whole dataset, which suggests some element of overfitting. However, 74% still outperforms a simple model and therefore strengthens our argument that this paper provides insights into understanding what determines country choice of MPF in emerging and developing countries.

Therefore, as shown above, the model used in this paper is robust to a different treatment of the two currency unions, alternative model specifications, and the holdout method.

[31]We ensure that all the observations for each country are kept together (i.e. if Country A is in the training data, no observations for Country A will be in the holdout data.)

7 Policy Implications

This paper's focus on theoretically motivating and empirically testing the determinants of MPF choice in emerging and developing countries could be useful to policymakers. Firstly, and perhaps somewhat obviously, this paper shows that policymakers in emerging and developing countries have chosen differently in the past. This suggests that it is their differences that has made this happen. Secondly, whilst policymakers could look at economic performance research when trying to decide which MPF to choose (e.g. Cobham et al. (2022)), instead of and/or in addition to looking at that, they may wish to use this paper to see what countries similar to their own have chosen. They can then decide if they deem that MPF choice to be suitable for them, too.

8 Conclusion

This paper has investigated the determinants of MPFs in emerging and developing countries for both understanding and predictive purposes. This paper not only applies the work of Cobham and Song (2020) to developing countries but improves upon previous practices in the following ways: Firstly, it uses theory to understand the underlying motives for MPF choices, whereas Cobham and Song (2020) focuses much more on MPF trends over time. Secondly, it takes the issue of endogeneity much more seriously and explains how this paper attempts to overcome such issue. Thirdly, and finally, it uses a cross-validation method to see how well the model predicts new, unseen data. In previous work on MPF choice (e.g. Cobham and Song (2020)) they used the full dataset to both train the model and predict outcomes.

In addition to improving on previous practices, we draw on the work by Levy Yeyati et al. (2010) and split the determinants of MPF into the three prominent theories (OCA, financial, and political). Similar to Levy Yeyati et al. (2010), we use these three categories to have three separate models. We then also combine all the variables together into one, full model. The three prominent theories were particularly useful in helping us to decide which variables to include. This work finds the variables within each theory to be jointly statistically significant. The following comparisons can be made by comparing the individual models with the full model: there are sign differences on two variables, and the full model achieves both better log likelihood and pseudo R2 values. Therefore, for this reason, and because of the increased concern surrounding omitted variable bias in multinomial logit estimation, the paper focuses on the full model when analysing the determinants of MPFs.

There are many important findings in this paper, however, one of particular note is the significant role that the anchor network plays in determining MPF choice. This variable was created by adapting how it was used in Cobham and Song (2020), so that it is tailored to the emerging and developing countries used in this analysis. More specifically,

countries that have a large volume of trade, in proportion to their GDP, with countries that peg to one of the anchor currencies, are more likely to target their exchange rate and join the anchor network. Furthermore, countries are much more likely to have an intermediate DoC as the anchor network value rises.

Finally, the full model is found to be robust to the following: different treatments of the two currency unions, different model specifications, and loses little predictive power when a hold-out cross-validation method is used. More specifically, when the full dataset is used to train and predict the model, the model is able to correctly predict 79% of countries' choice of MPF (when the MPF classification is aggregated by target variable). However, the model correctly predicts 74% of countries' choice of MPF (when aggregated by target variable) when a hold-out cross-validation method is used. Not only is this prediction accuracy better than what a simple model would have achieved, the use of a cross-validation technique has not been used in the previous MPF literature. Therefore, the model used in this paper not only helps us to better understand MPF choice for emerging and developing countries but is able able to generalise to new, unseen data when used for predictive purposes. The latter may prove particularly useful for policy-makers.

A Variable List

Variable:	Description:	Source:
MPF	Monetary Policy Framework	Cobham (2021)
Economic Size	$\frac{1}{2}(\frac{GDP_i}{GDP_{all}}+\frac{Population_i}{Population_{all}})$ Where 'all' refers to the total of all countries in the dataset.	WDI Series
Large	$\frac{1}{2}(\frac{GDP_i}{GDP_{all}}+\frac{Population_i}{Population_{all}})>0.02$	
Medium	$0.02>\frac{1}{2}(\frac{GDP_i}{GDP_{all}}+\frac{Population_i}{Population_{all}})>0.01$	
Small	$0.01>\frac{1}{2}(\frac{GDP_i}{GDP_{all}}+\frac{Population_i}{Population_{all}})$	
Trade Openness	$\frac{import_{i,t}+export_{i,t}}{GDP_{i,t}}$	WDI Series
Anchor Network	Largest ratio of country's trade with each of the main anchor currencies to GDP.	-Direction of trade data (IMF) -Shambaugh Exchange Rate Regime Classification
Central Bank Independence	An index measure for central bank independence	Garriga (2016)
Financial Market Depth	An index measure of financial market depth.	Svirydzenka (2016)
Political Stance	An index measure, on a scale of -10 to 10, for autocracy/democracy.	Jaggers and Marshall (2009)
Capital Account Openness	An index measure for capital account openness	Chinn and Ito (2008)
Fuel Exports	Fuel exports as a % of merchandise exports	WDI Series
Africa Other Europe+Central Asia+Caucasus Latin America+Caribbean Middle East Asia	Region dummies	https://monetaryframeworks.org/countries/
State Dependence/Inertia	A dummy measuring inertia. 1 if $MPF_t=MPF_{t-1}$, 0 otherwise.	

B Anchor Network

Similar to that used in Cobham and Song (2020), the anchor network can be calculated using the following:

$$A_{k,i} = \Sigma_j[(import_{i,j,t} + export_{i,j,t}) \text{ x } (\text{D}(anchor_{j,t}=\text{k})/GDP_{i,t})]$$

Where,

$A_{k,i}$ is the anchor network of country i for anchor currency k.

$import_{i,j,t}$ is the trade volume/number of imports, from country j to country i, at time t.

$export_{i,j,t}$ is the trade volume/number of exports, from country i to country j, at time t.

Country j, are all the countries that anchor to the anchor currency, k.

Thus, D($anchor_{j,t}$=k), is a dummy variable that is 1 if they peg to the anchor currency and 0 otherwise[32].

Lastly, it is then all divided by the GDP of country i at time t and the highest value is used as shown below.

The difference between this and Cobham and Song (2020) is that here the anchor currencies, k, are the following: the US dollar, French franc, Indian rupee, and South African rand. The anchor network value is whichever one is biggest:

$$anchornetwork_{i,t} = max(A_{dollar,i}, A_{franc/euro,i}, A_{rupee,i}, A_{rand,i})$$

For example, when calculating a measure for anchor network effects for Botswana, it is the total of Botswana's imports and exports with all countries that peg to the South African Rand, including Botswana's trade with South Africa itself.

[32]This can be either a hard or a soft peg as shown in the Shambaugh Exchange Rate Regime classification https://iiep.gwu.edu/jay-c-shambaugh/data/

C Country List by Region

Africa	Asia	Middle East	Latin America + Caribbean	OECCA
Algeria	Bangladesh	Bahrain	Argentina	Albania
Botswana	Bhutan	Iran	Bolivia	Armenia
Burundi	Cambodia	Jordan	Brazil	Azerbaijan
CAMA-CAEMC	China	Kuwait	Chile	Belarus
Comoros	Fiji	Lebanon	Colombia	Georgia
Egypt	India	Oman	Costa Rica	Kazakhstan
Ethiopia	Indonesia	Qatar	Dominican Republic	Kyrgyz Republic
Gambia	Laos	Saudi	Ecuador	Moldova
Ghana	Malaysia	Syria	El Salvador	Ukraine
Guinea	Mongolia	Turkey	Guatemala	
Kenya	Nepal	UAE	Guyana	
Lesotho	Pakistan	Yemen	Honduras	
Madagascar	Papua New Guinea		Jamaica	
Malawi	Philippines		Mexico	
Mauritania	Solomon Islands		Nicaragua	
Mauritius	Sri Lanka		Paraguay	
Morocco	Thailand		Peru	
Mozambique	Vietnam		Suriname	
Namibia			Uruguay	
Nigeria			Venezuela	
Rwanda				
South Africa				
Tunisia				
Uganda				
WAEMU				
Zambia				

D Point Estimates vs. Predictive Probabilities

Suppose there are 3 options to choose from: A, B and C.

You may only choose one of the available options.

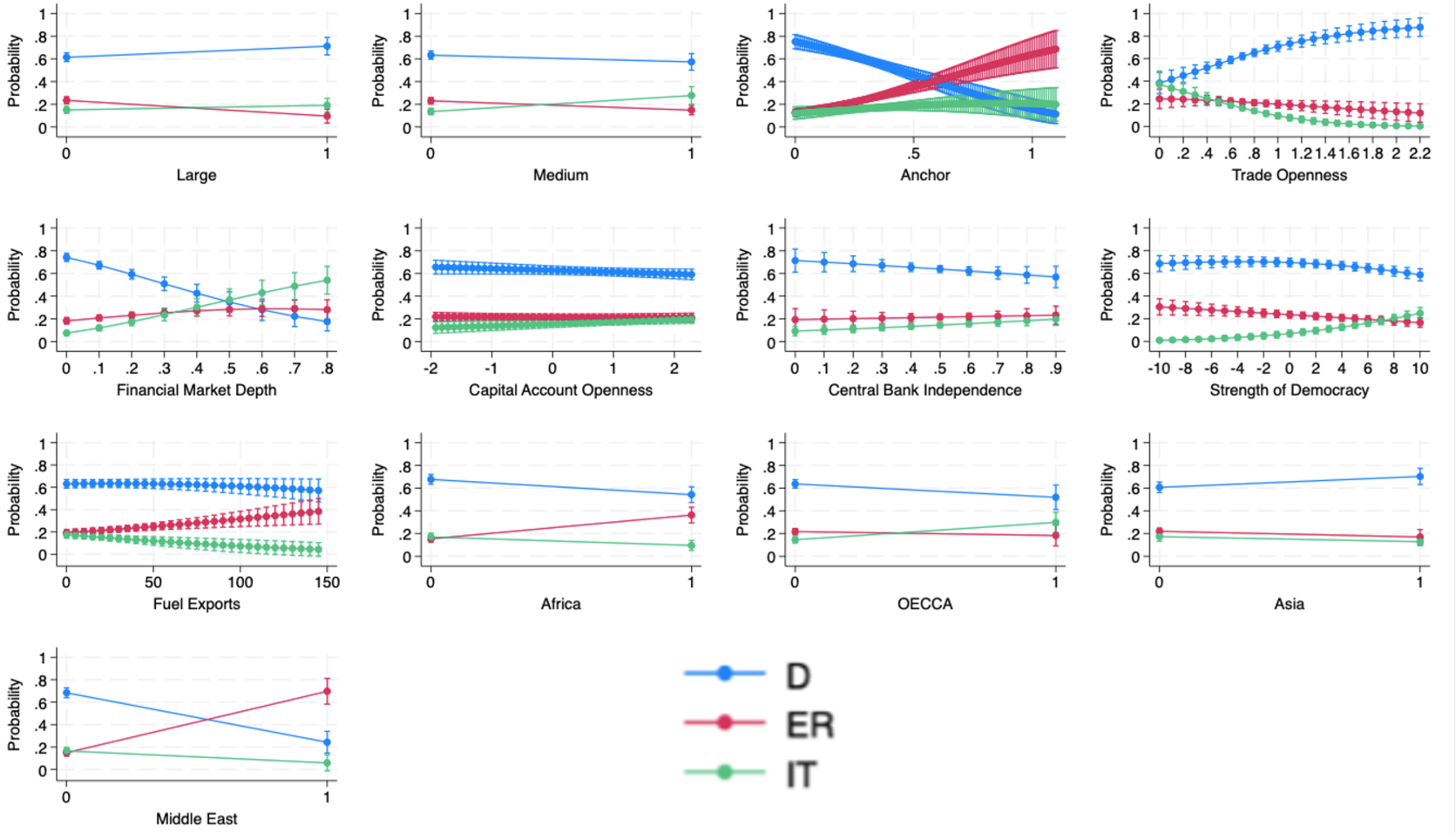
There is a variable, x, which is suspected to influence people's choice and, thus, this variable is included in the model. Multinomial logit estimation gets employed and A is the base category. The estimation results show that the coefficient on x for option B is negative and the coefficient on x for option C is negative.

This tell us the following:

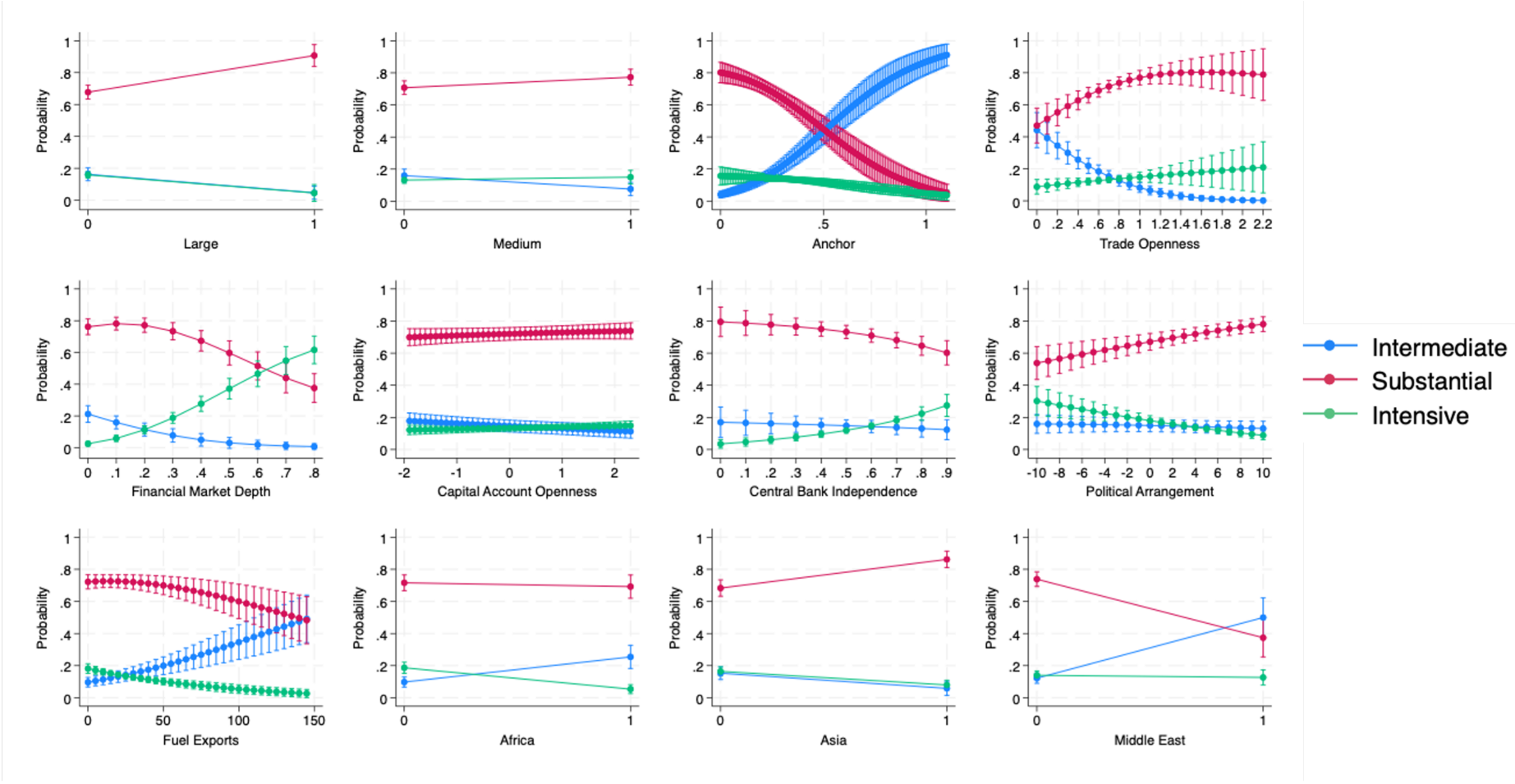
- As x increases, people are relatively more likely to choose A rather than B. They are also relatively more likely to choose A rather than C.

However, what the point estimates do not tell us is how people are likely to move between B and C as x increases. This movement could end up dominating and, as a result, it is possible for the predictive probability plot to go the opposite way to the sign displayed on the point estimate. Therefore, predictive probabilities are useful because they enable us to see how the probability of each outcome changes as x increases. As a result, the plot for predictive probabilities gives us a better insight into both the magnitude and economic significance of the impact of each variable.

E Predictive Plots with Confidence Intervals



F Predictive Plots with Confidence Intervals



G Endogeneity & Robustness

G.1 Inflation

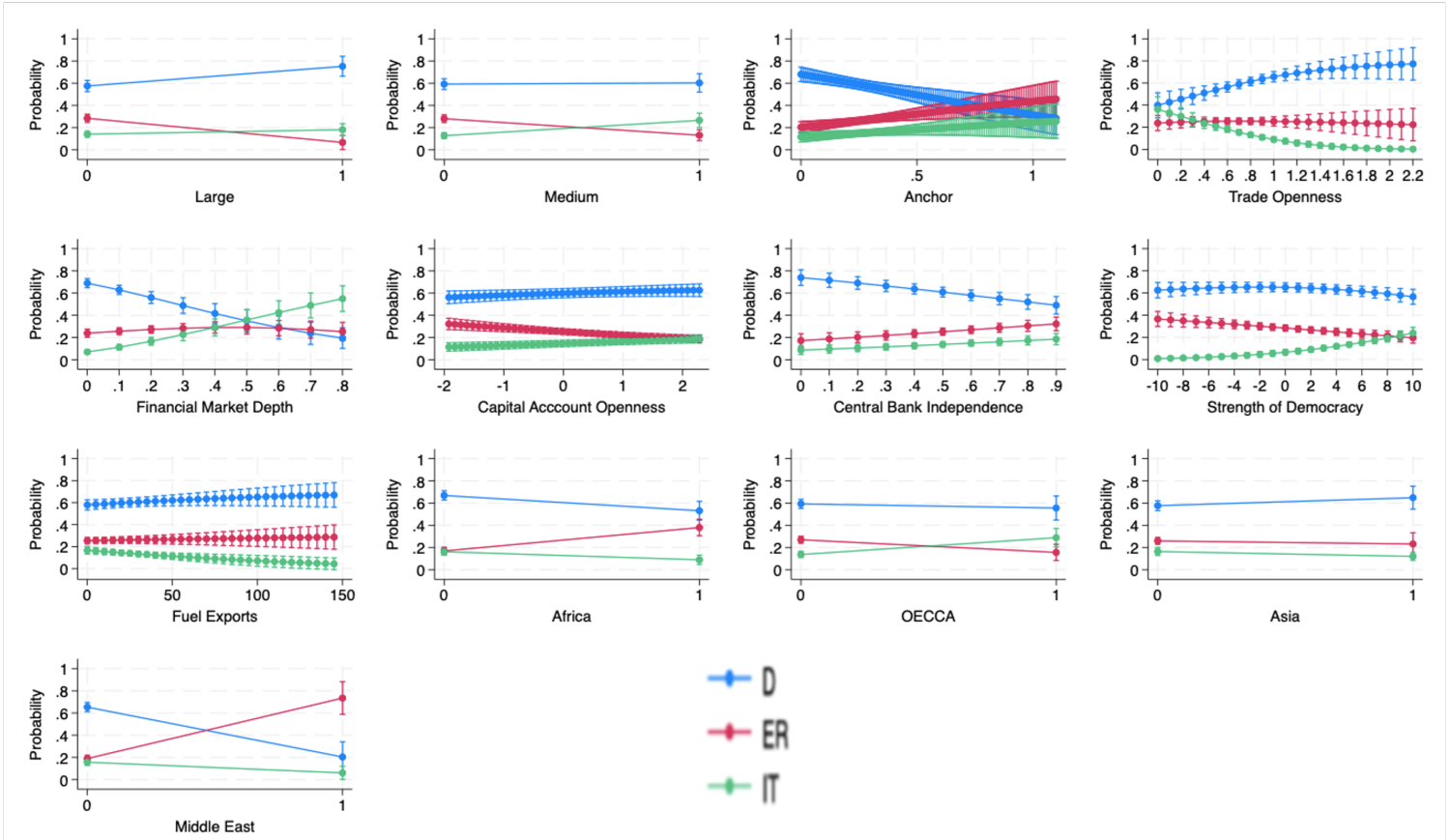
	(1)	(2)
VARIABLES	**ER**	**IT**
Large	-3.489***	2.097***
	(1.051)	(0.618)
Medium	-0.723*	4.446***
	(0.405)	(0.779)
Anchor	5.831***	-2.070
	(1.073)	(1.611)
Trade Openness	-1.223**	-1.586
	(0.570)	(1.076)
Financial Market Depth	3.300***	6.738***
	(0.689)	(1.115)
Strength of Democracy	-0.042	0.248***
	(0.028)	(0.056)
Capital Account Openness	-0.272**	0.085
	(0.111)	(0.135)
Central Bank Independence	-0.115	5.220***
	(0.926)	(1.192)
Fuel Exports	0.011***	-0.034**
	(0.003)	(0.015)
Past Inflation	-0.001	-0.001
	(0.008)	(0.061)
Region Fixed Effects	YES	YES
Year Fixed Effects	YES	YES
Controls for State Dependence	YES	YES
Observations	1,001	1,001

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Where D = Base Category

G.2 Unions included as single countries - Target Variable

	(1)	(2)
VARIABLES	**ER**	**IT**
Large	-2.597***	0.327
	(0.783)	(0.407)
Medium	-1.446***	1.651***
	(0.375)	(0.428)
Anchor	2.367***	2.507**
	(0.817)	(1.249)
Trade Openness	-0.336	-4.048***
	(0.441)	(0.868)
Financial Market Depth	1.929***	8.012***
	(0.687)	(0.811)
Strength of Democracy	-0.050***	0.250***
	(0.019)	(0.045)
Capital Account Openness	-0.273***	0.245**
	(0.072)	(0.106)
Central Bank Independence	1.632***	2.058***
	(0.603)	(0.758)
Fuel Exports	0.001	-0.018**
	(0.003)	(0.008)
Region Controls	YES	YES
Year Fixed Effects	YES	YES
Controls for State Dependence	YES	YES
Observations	1,438	1,438

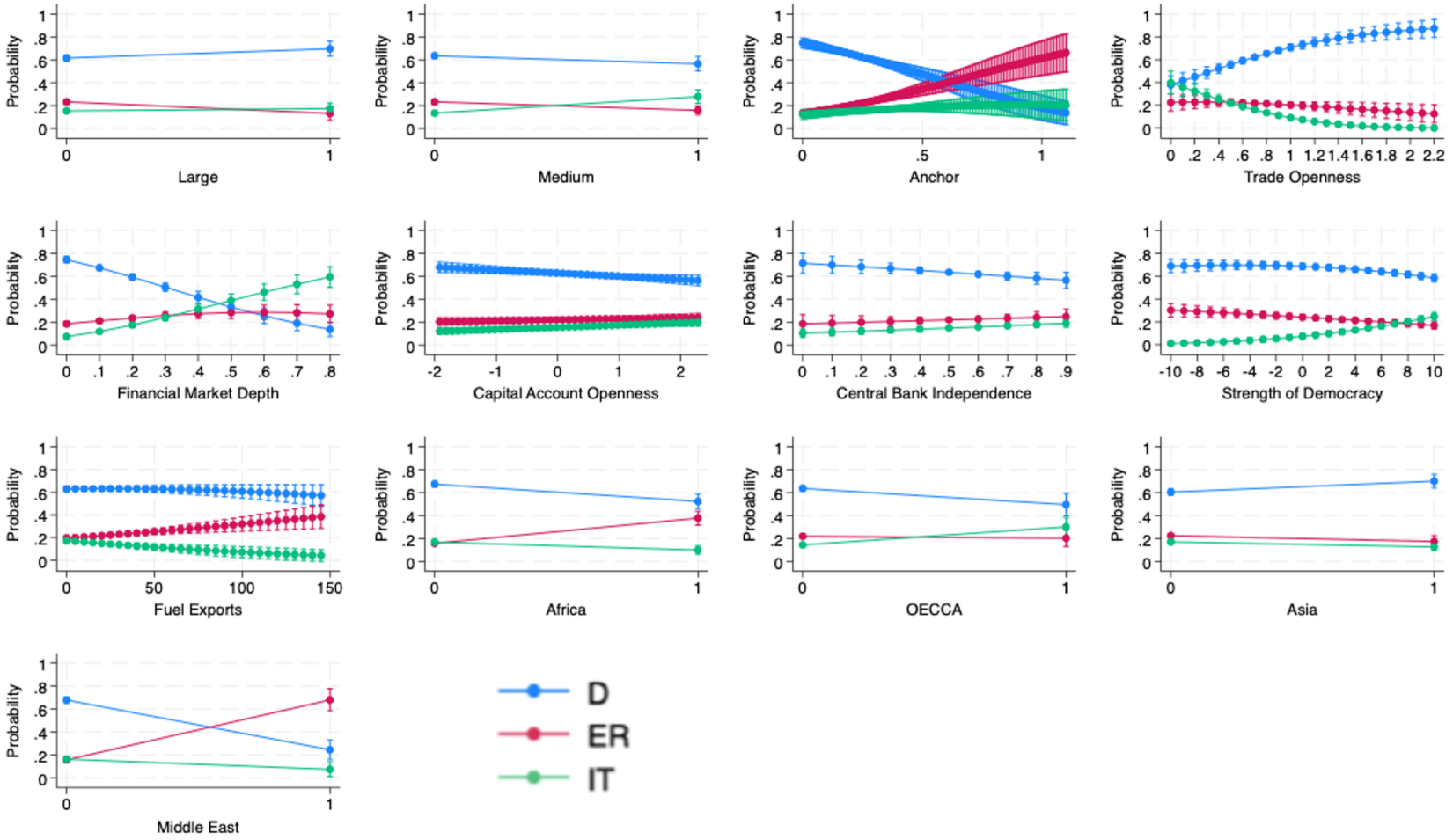
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Base Category = D


Probability
Large
Medium
Anchor
Trade Openness
Financial Market Depth
Capital Acccount Openness
Central Bank Independence
Strength of Democracy
Fuel Exports
Africa
OECCA
Asia
Middle East
D
ER
IT

G.3 Multinomial Probit

	(1)	(2)
VARIABLES	**ER**	**IT**
Large	-0.840**	0.120
	(0.341)	(0.308)
Medium	-0.432**	1.352***
	(0.220)	(0.306)
Anchor	3.410***	1.979**
	(0.591)	(0.890)
Trade Openness	-0.716**	-3.231***
	(0.339)	(0.576)
Financial Market Depth	2.282***	6.318***
	(0.445)	(0.640)
Strength of Democracy	-0.0261**	0.179***
	(0.0122)	(0.0286)
Capital Account Openness	0.0821*	0.235***
	(0.0497)	(0.0826)
Central Bank Independence	0.630	1.255**
	(0.603)	(0.502)
Fuel Exports	0.00657***	-0.0127**
	(0.00210)	(0.00513)
Africa	1.381***	-0.515
	(0.222)	(0.323)
OECCA	0.0907	1.618***
	(0.317)	(0.428)
Middle East	2.525***	-0.315
	(0.278)	(0.589)
Asia	-0.440*	-0.598**
	(0.234)	(0.298)
Controls for State Dependence	YES	YES
Observations	1,360	1,360

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Base Category = D


Probability
Large
Medium
Anchor
Trade Openness
Financial Market Depth
Capital Account Openness
Central Bank Independence
Strength of Democracy
Fuel Exports
Africa
OECCA
Asia
Middle East
D
ER
IT

References

Alexander, W., Baliño, T. and Enoch, C. (1995), 'The adoption of indirect instruments of monetary policy', *IMF Occasional Paper 126* .

Batini, N. and Laxton, D. (2006), Under What Conditions Can Inflation Targeting Be Adopted? The Experience of Emerging Markets, Working Papers Central Bank of Chile 406, Central Bank of Chile.

Bekaert, G., Harvey, C. and Lundblad, R. (2006), 'Growth volatility and financial liberalization', *Journal of International Money and Finance, 25, 370-403* .

Bellemare, M., Masaki, T. and Pepinksy, T. (2017), 'Lagged explanatory variables and the estimation of causal effect', *The journal of politics, 79(3)* .

Bowdler, C. and Nunziata, L. (2006), 'Trade openness and inflation episodes in the oecd', *Journal of Money, Credit and Banking, 8(2), 553-563* .

Breedon, F., Pétursson, T. and Rose, A. (2012), 'Exchange rate policy in small rich economies', *Open Economies Review, 23(3), 421-445* .

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

Cobham, D. (2011), Monetary policy architecture, financial institutions and financial markets in the middle east and north africa: An overview, *in* D. Cobham and G. Dibeh, eds, 'Money in the Middle East and North Africa: Monetary policy frameworks and strategies.', London: Routledge.

Cobham, D. (2021), 'A comprehensive classification of monetary policy frameworks in advanced and emerging economies', *Oxford Economic Papers* **73(1)**, 2–26.

Cobham, D. (2022), 'Monetary policy frameworks in the middle east and north africa:

How do they compare with other groupings?', *Scottish Journal of Political Economy, 69(1), 108-130* .

Cobham, D. (2023), 'A partial disaggregation of the loosely structured discretion category in the comprehensive monetary policy frameworks classification', *Available at SSRN: https://ssrn.com/abstract=4467150 or http://dx.doi.org/10.2139/ssrn.4467150* .

Cobham, D., Macmillan, P., Mason, C. and Song, M. (2022), 'Economic performance under different monetary policy frameworks', *Journal of Policy Modeling, 44(2), 431-449* .

Cobham, D. and Song, M. (2020), 'How do countries choose their monetary policy frameworks?', *Journal of Policy Modeling* **42(6)**, 1187–1207.

Debelle, G., Masson, P., Savastano, M. and Sharma, S. (1998), 'Inflation targeting as a framework for monetary policy', *IMF - Economic Issues No.50* .

Frankel, J. (2010), Monetary policy in emerging markets, *in* B. M. Friedman and M. Woodford, eds, 'Handbook of Monetary Economics', Elsevier, Oxford, chapter 25, pp. 1439–1520.

Frankema, E., Hillbom, E., Kufakurinani, U. and zu Selhausen, F. M. (2022), 'The history of african development. an online textbook for a new generation of african students and teachers.', *African Economic History Network* .

Garriga, A. (2016), 'Central bank independence in the world: a new dataset', *International Interactions* **42(5)**, 849–868.

Jaggers, K. and Marshall, M. G. (2009), ''polity iv project: Dataset users manual', . *Center for Systemic Peace* .

URL: *http://www.systemicpeace.org/polityproject.html*

Juhn, G. and Mauro, P. (2002), 'Long-run determinants of exchange rate regimes: A simple sensitivity analysis', *IMF Working Papers, No. 02/104* .

Khan, M. S. (2009), 'Middle east and oil exporters', *The Euro at Ten: The Next Global Currency, 139-154* .

Lane, P. (1997), 'Inflation in open economies', *Journal of International Economics, 327-347* .

Levy Yeyati, E., Sturzenegger, F. and Reggio, I. (2010), 'On the endogeneity of exchange rate regimes.', *European Economic Review* **54(5)**, 659–677.

McKinnon, R. (1963), 'Optimum currency areas', *American Economic Review, 53, 717-725* .

Meissner, C. M. and Oomes, N. (2009), 'Why do countries peg the way they peg? the determinants of anchor currency choice.', *Journal of International Money and Finance* **28(3)**, 522–547.

Mishkin, F. (2004), 'Can inflation targetting work in emerging market countries?', *NBER Working Paper, 10646* .

Mishkin, F. S. (1999), 'International experiences with different monetary policy regimes', *Journal of Monetary Economics, 43(3), 579-605* .

Mood, C. (2010), 'Logistic regression: Why we cannot do what we think we can do, and what we can do about it.', *European Sociological Review, 26(1), 67-82.* .

Mundell, R. (1961), 'Theory of optimum currency areas', *American Economic Review, 51(4),657-665* .

Romer, D. (1993), 'Openness and inflation: Theory and evidence', *Quarterly Journal of Economics, 108, 869-903* .

Shambaugh, J. (2019), 'Shambaugh exchange rate regime classification'.
URL: *https://iiep.gwu.edu/jay-c-shambaugh/data/*

Steinberg, D. and Malhotra, K. (2014), 'The effect of authoritarian regime type on exchange rate policy', *World politics, 66(3), 491-529* .

Svirydzenka, K. (2016), 'Introducing a new broad-based index of financial development.', *IMF Working Papers, No. 16/5* .

Usman, Z. and Landry, D. (2021), 'Economic diversification in africa and why it matters', *Carnegie Endowment for International Peace* .