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Abstract

This paper investigates the determinants of countries' choices of monetary policy framework (MPF). It uses a brief narrative focused on groupings of countries making similar choices to motivate an econometric analysis which also draws on previous work on the determinants of exchange rate regimes. That analysis brings in other more standard factors, as well as the trade networks of potential anchor currency blocs and the financial markets depth that are emphasised in the narrative. The model turns out to be able to predict three quarters of countries' choices of MPF, and there is no obvious systematic pattern in the errors.

JEL: E42, E52, E61, F40

Keywords: monetary policy frameworks, inflation targets, exchange rate targets, discretion, trade networks, financial market depth

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1 Introduction

There is a small but interesting literature on the determinants of countries' choices of exchange rate regime (notably Juhn and Mauro, 2002; Meissner and Oomes, 2009; Levy Yeyati, Sturzenegger and Reggio, 2010), but very little detailed work on countries' choices of monetary policy framework (MPF), where the latter includes both domestic (monetary targets, inflation targets and so on) as well as external (exchange rate) regimes. This paper sets out to remedy this lacuna. We provide a brief narrative overview of countries' evolving choices of MPF, which is followed by a detailed econometric analysis in which countries' choices depend on a range of standard factors as well as the trade networks of potential anchor currencies and the financial market depth emphasised in the narrative. We discuss our findings in some detail, and provide robustness tests. Our models are able to explain three quarters of countries' choices of MPF, and there is no obvious systematic pattern in the prediction errors: that suggests that changes in fashion such as the rise in popularity of inflation targeting are of limited importance.

For policymakers interested in choosing a monetary policy framework there is also a long-established normative literature on the pros and cons of fixed versus flexible exchange rates (e.g. Ghosh et al., 2002), and a smaller literature on, for example, the preconditions for adopting inflation targeting (e.g Batini and Laxton, 2007). Our positive analysis turns attention more to the factors that may have guided policymakers' past choices, which may also be helpful to policymakers involved in current choices. Our model brings together domestic and external considerations of MPF choices and factors overlooked in previous studies.

2 Monetary policy frameworks and the trends over time in countries' choices

In this section we first briefly discuss the classification of MPFs in Cobham (2018) and then draw on the Individual Country Details available at www.monetaryframeworks.org to identify some features of the changes in the distribution of MPFs across countries over time.

The classification covers both internal – e.g. money, inflation – and external, that is exchange rate, targets, together with the absence of formal targets under the heading of 'discretion'; and it considers the extent to which any targets are actually attained (de facto) as well as their (de jure) announcement. A framework is defined as a combination "of the objectives of the monetary authorities (including their understanding of the trade-offs between those objectives) and the set of constraints and conventions – the former more binding, the latter more matters of established usage – within which specific (conjunctural) monetary policy decisions are made" (Cobham, 2018, p5). Distinctions are made between 'loose' and 'full' targeting, between converging and stationary targets, between exchange rate 'fixing' and exchange rate 'targeting', between different types of currency board, and between 'unstructured', 'loosely structured' and 'well structured' discretion. This all leads to a full 'menu' of 32 different frameworks, but these are then aggregated along two different dimensions, by target variable and by degree of monetary control, as set out in Table 1. The classification has been implemented over 1974-2014 for 26 'advanced' countries plus the Euro Area, and 33 'emerging' economies, and the results can be found on the website. The main overall trends that come out are, first, that countries have moved over time away from monetary and to a lesser extent exchange rate targeting, and towards inflation targeting; second, that countries have moved over time towards frameworks that offer greater degrees of overall monetary control; and third, that these broad trends apply more strongly for advanced but are also present among emerging countries.

Table 1 Two aggregations of monetary policy frameworks

by target variable:	**frameworks**
direct controls	multiple direct controls (command economy)
exchange rate fixing	pure and augmented exchange rate fix, pure currency board
exchange rate targeting	augmented currency board; full and loose, stationary and converging, exchange rate targeting
monetary targeting	full and loose, stationary and converging, monetary targeting
inflation targeting	full and loose, stationary and converging, inflation targeting
mixed targeting	all combinations of monetary, exchange rate and inflation targeting
unstructured discretion	unstructured discretion
loosely structured discretion	loosely structured discretion
well structured discretion	well structured discretion
no national framework	membership of currency union, use of another sovereign's currency
by degree of monetary control:	
rudimentary	multiple direct controls, pure exchange rate fix
intermediate	augmented exchange rate fix, pure currency board, unstructured discretion
substantial	augmented currency board, all loose targeting, all converging targeting, all mixed targeting, loosely structured discretion
intensive	full exchange rate/monetary/inflation targeting, well structured discretion

For further details and precise definitions see tables 1-4 of Cobham (2018) and www.monetaryframeworks.org.

In what follows we focus on individual countries' choices. We do not present a full narrative, because that would require the use of a wide range of sources for each individual country. But we can use the Individual Country Details available on the website (derived primarily from close reading of successive IMF Article IV consultation reports and related materials) to identify common patterns for different groups of countries, in order to shed some light on the determinants of countries' choices which we can use in the following section in the econometric analysis, when we bring in a range of additional determinants. Here we consider the advanced countries first, and then the emerging economies. We emphasise the development of financial

infrastructure and markets, as well as the actual choices of MPFs, since these are covered in the individual country details.

For the narrative that follows, one of the most obvious determinants of MPF choices is country size, which we categorise as follows: we find the ratio for each country of its GDP and of its population to the total GDP/population of the 59 countries covered, and then take the average of those two ratios for each country.[1] On that basis we identify as 'large' (average ratio >5%) the US, the Euro Area, Japan, China and India; as 'medium' (average > 2%) France, Germany, Italy, the UK, Brazil, Indonesia, Mexico and Russia; as 'small' (average > 1%) Spain, Australia, Canada, Pakistan, South Korea and Turkey; and all the other countries in the sample as 'very small'. See Table A1 in the Appendix (which shows what countries are classified as advanced and which as emerging, and indicates when a country moves between different categories over time).

A second important determinant is the extent to which countries' trade is concentrated on the currency bloc constituted by a potential anchor country together with the other countries that peg to that anchor. Drawing upon Meissner and Oomes (2009), we define a country's 'anchor network' as the ratio to its GDP of its trade with its highest potential anchor currency bloc (see section 3 for further details). Table A2 in the Appendix shows the magnitude of this anchor network variable and the currency concerned for selected years through the sample. For example, Austria's trade is concentrated initially on the DM and later on the Euro, while Greece's trade with these (or other) potential anchors is much lower throughout. We now consider various groupings of countries and their monetary policy frameworks.

[1] [1] If we were considering only advanced countries, which all have relatively similar GDP per capita, it would not be necessary to consider population as well, but when our sample includes the US and China and India, the average of the GDP and population ratios provides a more useful measure of size.

Among the advanced countries there are a number which have used exchange rate targets for long periods, all very small countries: Austria, Belgium (plus Luxembourg), Ireland, Netherlands and (initially less firmly) Portugal which fixed their exchange rates within the European Monetary System from the 1980s to the start of European Monetary Union (EMU) in 1999; Denmark, which still fixes its exchange rate to the euro; and Hong Kong which has operated a currency board on the US dollar since 1984. In all these cases it seems likely that the vulnerability to swings in financial markets implied by their size led them to favour a hard exchange rate peg to a solid anchor, and most of them had a high concentration of trade with one particular currency bloc. They also experienced improvements over time in financial infrastructure, financial markets and capital openness which would have made them more exposed to financial volatility but also improved the tools available to control their vulnerability.

A second group of advanced countries each tried a variety of different frameworks before settling on inflation targeting: one medium-sized country, the UK; small countries including Australia, Canada, New Zealand, South Korea and Spain (pre-EMU); and very small countries including Finland (pre-EMU), Norway and Sweden, but also Switzerland (whose 'loose' inflation targeting has been accompanied by some exchange rate targeting in recent years), and also Singapore (whose inflation targeting is implemented through controlled exchange rate variations). In the small and medium countries, exchange rate targeting under Bretton Woods and for a few years after was replaced by monetary targeting, but without success, followed by periods of discretion, before the adoption of inflation targeting; it seems likely that these countries felt, after the evident failure of earlier frameworks, that they needed the detailed

'intensive' control offered by IT.[2] The very small countries tried exchange rate targeting for longer and moved directly or via shorter periods of discretion to inflation targeting. Relative to the very small countries that pegged their currencies within the EMS, it seems likely that these countries may have found exchange rate targeting less satisfactory because their trade was less concentrated on any single potential anchor currency, see Table A2. While the UK started from a position of greater financial development than the others, all these countries experienced improvements in their financial arrangements over the period, which made them more exposed to financial volatility but also helped to make IT viable.[3]

A third group consists of medium-sized countries which used a variety of frameworks including mixed targets in the period before EMU: France, Germany and Italy. It seems likely that these countries were large enough for their trade to be diversified in ways that made pure exchange rate targeting unsuitable, but not large enough to be protected from the effects of swings in financial markets, so that they felt the need to explicitly target more than one variable, particularly in the run-up to EMU where the Maastricht Treaty set out multiple criteria for admission. They each tried monetary targets, with varying degrees of success, but over time their exchange rate targets became more important. Financial developments played their usual role.

Fourthly, we can identify three large countries/currency areas which used either loosely structured discretion or loose inflation targeting over long periods: the USA, the Euro Area (from 1999) and Japan. These are countries/areas whose size meant that there was no feasible exchange rate anchor, but for the same reason they were less vulnerable to swings in financial

[2] The UK is bigger than the other countries here, but it has also been more open to financial volatility, particularly exchange rate swings, because of the size of its financial sector.

[3] The development of bond markets enables monetary policy to be isolated from fiscal policy, while the development of interbank money markets is necessary for the central bank's policy interest rate to be transmitted effectively through to the banks' customers and the wider economy. See, for example, Alexander et al. (1995), Laurens et al. (2005).

markets. The first two, and the third in the later part of the period, also had highly sophisticated financial markets and infrastructure which offered greater monetary control. Those two factors may have meant that they felt less need for the intensive monetary control offered by full inflation targeting.

Among the emerging economies, we can identify a first group of countries which have used exchange rate fixing and exchange rate targeting on a continuing basis: Jordan and Morocco; Egypt in the 1990s; Argentina in the 1990s (in the form of a currency board); and Malaysia and Venezuela in the early part of the period. All of these were very small countries with relatively underdeveloped financial systems, for which a hard peg offered more stability than any other arrangement, even though in most cases their trade was less concentrated on their anchor currencies than it was for the very small countries pegging within the EMS (Table A2).

A second group of countries used exchange rate fixing and targeting on the way to joining EMU: Cyprus, Estonia, Latvia, Lithuania, Malta and Slovenia; and Bulgaria (in the form of a currency board) which has not yet been admitted to EMU. These countries were small, with limited financial markets and vulnerable to financial volatility, they needed to stabilise their exchange rates and their inflation rates in order to be allowed to enter EMU under the Maastricht criteria, and hard pegs offered some obvious stability. Slovakia, on the other hand, used exchange rate targets but in conjunction with inflation targets in the crucial qualification period, and Greece (the only advanced country not mentioned above, a country which was less open and less integrated in its trade with the rest of the EU, and also less financially developed) used exchange rate and monetary targets in the same way.

A third group have favoured loosely structured discretion over targets: the large countries China and India; medium-sized Russia, and Brazil up to 1998; small Pakistan; and very small Malaysia 1985-97, Argentina post-2001, Croatia, and Venezuela up to 2009. For the first two of these, large size and initially less openness would mean less vulnerability to financial swings so less pressure to commit to a single clear-cut target, while less concentration of trade on a single potential anchor would have made exchange rate fixing less attractive;[4] similar considerations would have been relevant to some extent for Russia and Brazil. Malaysia had relatively well-developed financial infrastructure and markets by this time, and that may have enabled it also to avoid committing to a single target, but this is less true of Argentina, Croatia, and Venezuela. However, for these four countries discretion may have been more the result of a push from the failure or unattractiveness of other options rather than the positive pull of discretion itself. Pakistan, on the other hand, had much less well-developed financial arrangements, with elements of direct control that may have facilitated the absence of targets, particularly in the earlier years.

A fourth group includes countries which tried a variety of different frameworks, typically some exchange rate targeting and for lengthy periods loosely structured discretion, before homing in on inflation targeting: medium-sized Brazil, Indonesia and Mexico; small Turkey; and very small Chile, Czechia, Hungary, Israel, Peru, Philippines, Poland, Romania, South Africa and Thailand. It seems plausible that intensive monetary control through IT must have offered these countries significant improvements over the looser control in their discretion periods.

[4] However, China managed its exchange rate heavily with reference to the USD between the mid-1990s and the mid-2000s.

Finally, Venezuela from 2010 to 2014 is an example of a country where monetary policy was increasingly undisciplined, with strong fiscal dominance and growing use of direct controls. The (tentative) identification of its framework as unstructured discretion seems above all to reflect the politics of the country rather than economic factors.

This brief 'narrative' discussion has highlighted size, financial development, and the concentration of countries' trade on potential anchor blocs as crucial determinants of countries' choices of MPFs. We include them, with a range of other factors, in our econometric analysis below.

3 Model

We aim to study the determinants of countries' MPF in the post-Bretton Woods period (1983 to 2014). We want to estimate

$$y_{it} = x'_{it}\beta + \epsilon_{it} \tag{1}$$

where y_{it} is country i's choice of MPF at time t. Given the discrete nature of countries' MPFs, equation (1) cannot be estimated directly. From the random utility model, the choice of countries' MPF y reflects the unobservable utility y^* associated with the choice. We adopt the multinomial logit model (MNL) for estimation. With the MNL model, it is assumed that the log-odds of each MPF choice follow a linear model

$$y^*_{it} = log\frac{\pi_{jit}}{\pi_{0it}} + x_{it}\beta_j \tag{2}$$

where i denotes country, t denotes time, x are potential determinants, β are coefficients associated with those determinants and y are MPF choices. Subscript j denotes alternative MPF choices. One of the MPF choices is the default category with $j = 0$. π_{jit} is the conditional probability of country i at time t to choose alternative j and π_{0it} is country i's probability of choosing the default category at time t. Thus

$$\pi_{jit} = \frac{\exp\left(x'_{it}\beta_j\right)}{\sum_{k=1}^{J} \exp\left(x'_{it}\beta_k\right) + 1} \tag{3}$$

Let N be the total number of observations. The corresponding log likelihood function for maximum likelihood estimation is

$$\log(L) = \sum_{it=1}^{N} \sum_{j=0}^{J} \frac{\exp\left(x'_{it}\beta_j\right)}{\sum_{k=1}^{J} \exp\left(x'_{it}\beta_k\right) + 1} \tag{4}$$

The MNL model finds coefficients that maximise the log likelihood. However, coefficients here do not directly reflect how variables change the marginal probability of adopting a certain regime. To obtain the marginal effects of the MNL model, we need predictions from a fitted model at fixed values of some covariates and integrating over the remaining covariates. The marginal effects of the explanatory variable l for the j-th alternative can be calculated from equation (5).

$$\frac{d\pi_{jit}}{dx_{lit}} = \pi_{jit}\left(\beta_{jl} - \sum_{q} \pi_{qjt}\beta_{qj}\right) \tag{5}$$

where q represents all the explanatory variables for l. The conventional method for showing the economic significance of the independent variables is to estimate the marginal effects for each observation and report the average or sum of the marginal effects. Following Levy Yeyati et al. (2010), we plot predictive margins at different values of explanatory variables instead of averaging or summing them. This plot of predictive margin method provides a clearer illustration of the economic significance of the explanatory variables. The point estimation of the coefficients tells how a variable influences the choice of one option over the default option, while the predictive margins show how a variable affects countries' probability to do a particular MPF.

The random utility framework implies the model has a unique solution. If two countries share similar characteristics in terms of determinants, they should choose the same MPF. Hence for prediction failures, we look for reasons beyond the model. The model does not imply or expect a stable solution. When the determinants evolve, the choice of MPF could change. With panel data, we exploit variations across both countries and years. We include year dummies to allow for different intercepts for each year.

3 Determinants and data sources

We use the potential determinants highlighted in section 2 with a range of other, more standard, variables, drawing on the work of Juhn and Mauro (2002), Meissner and Oomes (2009), Levy Yeyati, Sturzenegger and Reggio (2010) and Song (2018), on the determinants of exchange rate regime choices, and papers by Calderón and Schmidt-Hebbel (2008a, 2008b; also Schmidt-Hebbel, 2010), which analyse separately the choices of monetary targets, exchange rate targets and inflation targets.[5] The exchange rate regime literature has used variables such as trade openness, size, terms of trade shocks, capital openness, financial development, past inflation, central bank independence, political instability, governance, and GDP per capita, together with foreign liabilities (Levy Yeyati et al., 2010) and cross-country correlations between output and inflation (Juhn and Mauro, 2002; Calderón and Schmidt-Hebbel, 2008b).[6] Song (2018) also allows for network effects. The work by Calderón and Schmidt-Hebbel on monetary and inflation targets has used broadly similar variables, together with monetary instability for MTs and the exchange rate regime for ITs.

[5] There is an apparently unpublished paper by Calderón and Schmidt-Hebbel on inflation targets, whose main results are reported in Schmidt-Hebbel (2010).
[6] It is worth noting that this literature has not so far produced a strong consensus: earlier work reviewed and extended by Juhn and Mauro (2002) found size to be important, but no consistent results for other variables, while Levy Yeyati et al (2010) found support for a wide range of variables as determinants of exchange rate regimes.

We draw on these variables, together with an anchor network variable which builds upon the work of Meissner and Oomes (2009). We now discuss in turn the particular explanatory variables that we use, starting with our investigation of the determinants of target variables. Precise descriptions and sources are presented in table **2**.

Policymakers take into account past economic conditions in addition to the current situation when setting monetary policies. Thus we use the average value of the preceding three years for most explanatory variables. This also helps to deal with concerns about reverse causality. For example, the commitment to adopt ITs might lead to higher trade openness even before the adoption is implemented. However, the adoption of ITs would not usually be announced three years in advance. Hence if we observe an association between high trade openness and IT MPFs, it should not be caused by reverse causality. Determinants such as economic size, trade openness, whether the country is a fuel exporter and whether the country is an emerging economy can be directly calculated or identified. We adopt index measures from Chinn & Ito (2008), Svirydzenka (2016), Garriga (2016) and Jaggers & Marshall (2009) to examine the impacts of capital account openness, financial market development, central bank independence and political institutions respectively. Svirydzenka (2016) provides a new index for financial development which measures depth, access and efficiency of financial institutions and markets. Financial market depth is more relevant here, because of the crucial role of bond markets in monetary policy.[7] Hence we use financial market depth as the measure of financial development instead of Svirydzenka's combined final score.

[7] Svirydzenka does not consider the development of money markets, but bond and money markets often but not always develop more or less in tandem.

We include historical peak inflation as an indicator of past experience which may affect MPF choice. Historical peak inflation is measured as the average of the three peak years of inflation in the MPFs covering the 20 years before the current MPF. For example, if a country does not change MPF for a few years, historical inflation would be the same for the country during these years (unless the peak had occurred right at the start of the 20 years). Moreover, we use two dummies, one for if a country has an historical peak inflation higher than 10% and the other for if its peak is higher than 20%. For advanced economies, an inflation rate higher than 10% has generally been considered serious and so might cause central banks to rethink their monetary policy arrangements. However, for many emerging economies, an inflation rate of double digits has in the past often been acceptable, but most governments and/or central banks would have been concerned about an inflation rate higher than 20%.

The measure of currency network effects is more complicated. We define the currency network for a specific anchor as $A_{k,i}$:

$$A_{k,i} = \sum_{j} \left((import_{ijt} + export_{ijt}) \times \frac{D(anchor_{jt} = k)}{GDP_{it}} \right)$$

Where $import_{ijt}$ is import from country i to country j at time t, $export_{ijt}$ is export from country i to country j at time t, $anchor_{jt}$ is the anchor currency of country j at time t. Note that a country has an anchor currency only if it is a hard or soft peg country as defined in Shambaugh's Exchange Rate Regime Classification.[8] There is a set of major anchor currencies including the US dollar, French franc, Deutsche mark, British pound. $D(anchor_{jt} = k)$ is a dummy variable, equal to one if country j at time t adopted the anchor currency k. GDP_{it} is the GDP of country i at time t. Overall $A_{k,i}$ measures country i's trade volume with all

[8] See Klein and Shambaugh (2008, 2010) for construction of the Shambaugh exchange rate regime classification. The dataset can be found at https://www2.gwu.edu/~iiep/about/faculty/jshambaugh/data.cfm.

countries pegging to the anchor currency k as a share of country i's GDP. $anchor\ network_{it}$ is the largest such ratio for country i at time t:

$$anchor\ network_{it} = \max\left(A_{dollar,i},\ A_{franc,i},\ A_{mark,i},\ A_{pound,i}\right)$$

Meissner and Oomes (2009), in their study of countries' choices of anchors, measure network externalities for a country as trade flows with countries pegging to the same anchor as a percentage of GDP. This is similar to our measurement of anchor network effects, but we use the largest ratio of trade with an anchor bloc as a percentage of GDP. We can interpret the currency network as indicating the potential gains from fixing exchange rates. In this way, countries doing floats or managed floats are also potentially influenced by anchor networks.

We now turn to the aggregation of MPFs by degree of monetary control. There is a general presumption that emerging and developing countries have a number of features that complicate or restrict the choice of monetary policy regime (Mishkin, 2004; Frankel, 2010), which might imply that these countries opt for arrangements with lower monetary control. However, there are few papers that address the possible determinants of the choice of the degree of monetary control. In an attempt to bring the arguments together, Cobham (2011) discussed the stage of development of financial markets and institutions (including the central bank), and identified three polar types of 'monetary architecture' – basic, intermediate and modern – which he associated in turn with different possible monetary policy arrangements. In particular, he argued that only when the transmission channel of monetary policy – the institutional and market infrastructure – is well developed are central banks able to conduct policies mainly through interest rates and operate frameworks like inflation targeting. Given the division here into four degrees of monetary control – rudimentary, intermediate, substantial and intensive – we would expect full development of financial markets and institutions to be associated with intensive or (particularly for larger, less financially exposed, economies) substantial

frameworks, partial development with intermediate or substantial frameworks, and limited development with exchange rate fixing (which is included in the rudimentary category of MPFs while exchange rate targeting is in the intensive category). We also include in these regressions the variables used in examining the choice of target variable.

In the main regressions, we treat the Euro Area as a single unit and the ECB as its central bank. Hence for most explanatory variables of the Euro Area, we use the average value of Euro Area member countries in the sample. The log of the sum of the GDP of Euro Area member countries in the sample is used to measure the economic size of the Euro Area. For trade openness and anchor network, we measure the trade of Euro Area countries with non-Euro Area countries. Thus, intra-Euro Area member trade flows are not counted toward trade openness and anchor networks. An alternative treatment of the Euro Area will be discussed in the robustness tests.

Table 2 Data description and sources

Variable name	Measure	Calculation	Source
l_economy	Economic size	$\frac{1}{2}\left(\frac{GDP_i}{GDP_{all}}+\frac{Population_i}{Population_{all}}\right)>5\%$	WDI series
m_economy	Economic size	$5\%\geq\frac{1}{2}\left(\frac{GDP_i}{GDP_{all}}+\frac{Population_i}{Population_{all}}\right)>2\%$	
s_economy	Economic size (Default category)	$2\%\geq\left(\frac{GDP_i}{GDP_{all}}+\frac{Population_i}{Population_{all}}\right)>1\%$	
vs_economy	Economic size	$\left(\frac{GDP_i}{GDP_{all}}+\frac{Population_i}{Population_{all}}\right)\leq 1\%$	
tradeopen_avg	Trade openness	(import+export)/GDP	WDI series
anchor_network_gdp	Strength of anchor network	Largest ratio of country' trade with each of the main anchor blocs	Direction of Trade(IMF), CEPII
totstd_avg	Real shocks	Standard deviation of the logarithm of terms of trade	WDI series
fuel_exporter	Fuel exporter	Dummy variable = 1 for countries with fuel exports equal to more than 20% of their total merchandise exports	WDI series
inf_avg_d10	Past inflation	Dummy variable = 1 for countries with historical peak inflation higher than 10%.	WDI series, IFS
inf_avg_d20	Past inflation	Dummy variable = 1 for countries with historical peak inflation higher than 20%.	
lsav_avg	Domestic saving	Log of domestic saving	WDI series
fmd_avg	Financial market depth	Index measure	Svirydzenka (2016)
caopen_avg	Capital account openness	Index measure	Chinn & Ito (2008)

cbi_weighted_avg[9]	Central bank independence	Index measure	Garriga (2016)
polity_avg[10]	Political institution	Index measure	Jaggers & Marshall (2009)
emerging	Emerging economy	Dummy variable for emerging economies	Cobham (2018)
MPF	Monetary policy framework		Cobham (2018)

4 Results

There are 32 categories in Cobham (2018)'s monetary policy framework classification. We use each of the two aggregations of MPFs set out in section 2, by target variable and by degree of monetary control, in order to have a reasonable number of choices for the dependent variable. All regressions are done with the MNL model, a constant and year dummies.

4.1 Aggregation by target variable

Table **3** shows the estimates of the coefficients. Here the default category is exchange rate targets, and we focus on discretion, mixed targets and inflation targets. The parameters of most variables are statistically significant. The magnitudes of coefficients in the MNL model are hard to interpret, but we use predictive margin plots to assess the economic significance of the variables.

[9] The central bank independence index does not cover Hong Kong for the whole sample period or Cyprus before 2002. For Cyprus Garriga has LVAW = 0.575 from 2002 onwards, but nothing before that. It is clear that there was a major change in Cyprus's CBI in 2002. We give Cyprus a score of 0.25 for the years before 2002 - this is about the score for each of the UK (former colonial power of Cyprus), France and Italy in the 1980s/early 1990s. For Hong Kong, the IMF report on Financial Sector Assessment Program - Basel Core Principles for Effective Banking Supervision - Detailed assessment of observance, July 2014, says "The HKMA enjoys operational de facto independence but this is not underpinned by the law." (p. 32). As with Cyprus, this is an example of high 'informal' independence but low legal independence, and for Garriga's index it's the latter that counts. We give the HK Monetary Authority also a score of 0.25, which is close, for example, to the score of the UK BoE before 1998 when it exactly had operational independence but nothing more.

[10] The Polity IV scores do not cover economies with a total population less than 500,000 in the most recent year. We assign values to Hong Kong, Iceland and Malta in order to keep them in the sample. The Polity IV score is assigned based on political similarity with other countries in the sample. The assigned scores for Hong Kong, Iceland and Malta are -6, 10 and 8 correspondingly. Scores of -66, -77 and -88 are three special values for 'anocracies' in particular circumstances and do not reflect political situations on the basic scale. Hence we use -15 instead of the three special values to keep scores comparable.

Table 3 Results – Aggregation by target variable

	D	Mixed	IT
very small economy	-3.292***	-4.863***	-3.913***
	(0.667)	(0.850)	(0.701)
medium economy	-1.516*	0.324	-1.626*
	(0.769)	(0.892)	(0.807)
large economy	15.74	14.18	13.46
	(962.1)	(962.1)	(962.1)
trade openness	0.660*	1.867	2.646***
	(0.295)	(1.149)	(0.343)
anchor network / GDP	-9.076***	-1.274	-14.09***
	(1.185)	(2.270)	(1.288)
past inflation 10%	0.498	-1.295*	-1.205***
	(0.435)	(0.507)	(0.356)
past inflation 20%	1.195***	1.567***	1.408***
	(0.241)	(0.465)	(0.326)
financial markets depth	4.941***	1.099	5.585***
	(0.710)	(1.351)	(0.744)
capital account openness	-0.423***	-0.774***	0.139
	(0.0792)	(0.185)	(0.0936)
central bank independence	0.430	1.791	-0.105
	(0.622)	(1.108)	(0.684)
polity	-0.00817	0.848***	0.232***
	(0.0188)	(0.203)	(0.0378)
emerging	1.685***	-1.382*	0.842*
	(0.286)	(0.596)	(0.355)
fuel exporter	0.990***	-16.22	-0.609
	(0.243)	(671.6)	(0.336)
N			1442
pseudo R2			0.504
Log likelihood			-791.0

The default category is ERT. *, ** and *** represents significance level at 1%, 5% and 10% respectively. Standard errors in the brackets. The MT category is dropped automatically because of data availability and sample period.

The parameters of being a very small economy are all significant and negative, suggesting that relative to the default category of small economy, very small countries are less likely to do non-ERT MPFs. However, it is possible for a determinant to have a small and significant impact on the likelihood of countries' MPF choices. The predictive margins can tell us the magnitude and economic significance of the impacts for each variable. Figure 1 shows the predictive margins of the model. Taking the first graph as an example, the predictive margin shows that, keeping other variables constant at their mean values for continuous variables and zeros for dummy variables, for all countries with a being very small economy value equal to a

particular point (on the x-axis) the proportion of countries to choose ERT (or Mixed, D or IT, depending on the line) would be equal to the corresponding value on the y-axis. And the sum of the probabilities of choosing a certain MPF given the particular value of the determinant is always equal to 1. Since being a very small economy is a dummy variable, only the endpoints on the line (0 and 1) are meaningful. The plots suggest that, keeping other determinants constant at their mean values, being a very small economy will increase countries' probability to do ERT MPFs from 5% to 35%, decrease countries' probability to do Mixed MPFs from 25% to nearly 0% and have little impacts on countries' likelihood to do D or IT MPFs.

The coefficients on being a medium economy are negative and significant for D and IT, and insignificantly positive for Mixed: medium countries are more likely to do ERT rather than D or IT. Being a medium economy increases a countries' probability to do ERT by 20%.

The coefficients on being a large economy are all positive but insignificant. Large economies are less likely to do ERT but these results are insignificant. From the predictive margins, compared to the default category (small economy), large economies are 40% more likely to do D and 20% less likely to do ERT. In summary, large economies are more likely to do D and other economies are more likely to do ERT. Moreover, a very small economy is more likely to do ERT than a small economy.

Note that the coefficients on being a large economy are positive and insignificant, but the predictive margin of being a large economy on IT is negative. This is not common but it is normal. The raw coefficients in an MNL model refer to changes in the log of the probability of one outcome divided by the probability of the baseline outcome (conditional probability) keeping other variables constant, while the marginal effects refer to changes in the probability

of one outcome (unconditional probability) keeping other variables at the mean or default values. Hence it is important to read the results on the basis of both coefficient estimates and predictive margins.

Trade patterns are important determinants of countries' choice of target variable. Countries with a high level of trade openness are significantly more likely to do non-ERT MPFs, and countries with high anchor networks are unlikely to do non-ERT MPFs, though the coefficients on anchor network are only significant for D and IT. This fits the expectation that countries with high trade openness are more likely to want to use exchange rate flexibility as a tool to manage risk, while high anchor network effects increase countries' probability of fixing their exchange rates and joining the anchor network. From the predictive margins, the effects are strong.

A high historical peak inflation decreases countries' likelihood to do Mixed and IT MPFs, while a very high historical peak inflation is associated with all non-ERT MPFs. This suggests that when historical inflation is moderately high, countries may adopt ERT to anchor inflation expectations. But when historical inflation is very high, a more 'domestic-focused' framework would be preferred.

The coefficients of financial markets depth are significant and positive for D and IT, and insignificant and positive for Mixed. These results are broadly consistent with expectations, given that D (also Mixed) and IT are substantial and intensive MPFs respectively.

The coefficients on capital account openness are negative and significant for D and Mixed, and positive and insignificant for IT: economies with a high level of capital account openness are

less likely to do D and Mixed. This is consistent with the idea of the impossible trinity. Countries cannot have fixed or managed exchange rates, monetary autonomy and free capital flow at the same time. However, the economic significance of this variable is limited seeing the predictive margins are flat.

Central bank independence is not a significant determinant of countries' target variable. As with the previous factor, the coefficients are insignificant and the predictive margins are flat.

The coefficients on the Polity index are positive and significant for Mixed and IT. This is consistent with the idea that good political institutions could be initial conditions for doing credible Mixed and IT MPFs. It also meets the expectation of the 'policy crutch' theory that weak governments are likely to use ERTs to improve their credibility. From the predictive margins, the impacts of political conditions are significant as well.

Being an emerging economy is a significant determinant of target variable choice. Emerging economies are more likely to do D and IT and less likely to do Mixed relative to ERT. From the figure, emerging economies are 20% more likely to do D, 18% less likely to do Mixed and 5% less likely to do ERT. This could be regarded as consistent with the bi-polar hypothesis, since in mixed targeting regimes, countries are mostly targeting the exchange rate as well as other variable(s). The results show that emerging economies do not favour ERTs or mixed MPFs which usually involve a managed float.

Fuel exporter countries are more likely to do D rather than ERT. The coefficients are insignificant on other choices. Being a fuel exporter will increase a countries' likelihood to do D by 20%.

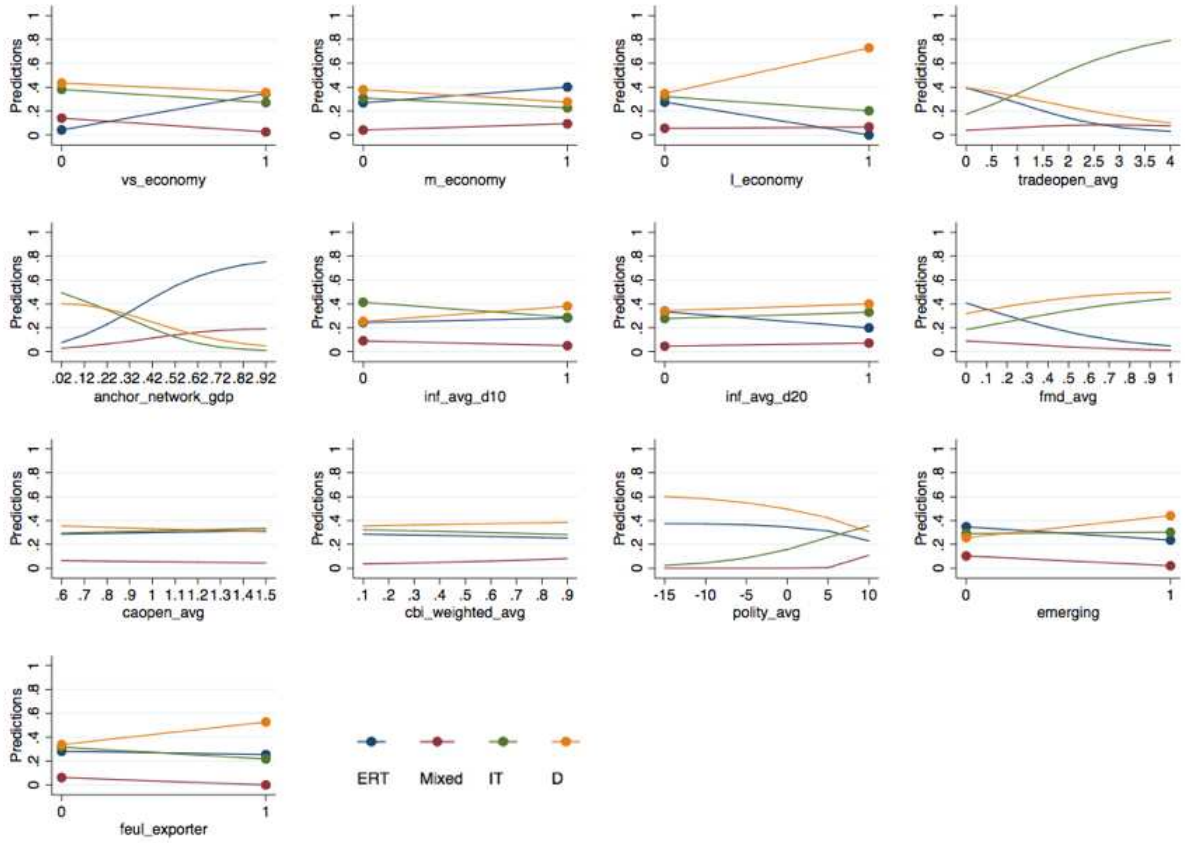

Figure 1 Predictive margins – Aggregation by target variable

Overall, large economies and economies with good financial infrastructure and low trade openness are more likely to do D. Countries with a high level of trade openness and good political institutions are more likely to do IT. Mixed MPFs are preferred by countries with high trade openness, high network effects, low level of financial development, good political institutions and advanced economies. ERT is preferred by very small to medium economies, and countries with low trade openness but high network effects and low financial market depth.

4.2 Aggregation by degree of monetary control

For the aggregation of MPFs by degree of monetary control, we treat intermediate ('inter') as the default category and focus on the probability of substantial ('subst') or intensive ('intens')

monetary control MPFs. Estimates of the coefficients are presented in table **4** and predictive margins are shown in figure **2**.[11]

Table 4 Results – Aggregation by degree of monetary control

	substantial	intensive
very small economy	-1.563**	-1.774**
	(0.604)	(0.647)
medium economy	0.171	-2.144**
	(0.745)	(0.830)
large economy	-0.238	-3.666***
	(0.910)	(0.978)
trade openness	-0.702	-1.641
	(1.001)	(1.018)
anchor network / GDP	-1.831	-0.906
	(2.864)	(2.911)
past inflation 10%	3.189***	2.842***
	(0.762)	(0.777)
past inflation 20%	-0.208	-2.775***
	(0.453)	(0.506)
financial markets depth	19.76***	18.21***
	(3.213)	(3.248)
capital account openness	1.355***	1.589***
	(0.243)	(0.251)
central bank independence	-1.371	-0.743
	(1.261)	(1.339)
polity	-0.0984***	-0.00425
	(0.0295)	(0.0352)
emerging	-1.759***	-3.096***
	(0.491)	(0.541)
fuel exporter	-1.216**	-2.196***
	(0.381)	(0.454)
N		1471
pseudo R2		0.423
Log likelihood		-727.6

The default category is intermediate. *, ** and *** represent significance at 1%, 5% and 10% levels respectively. Standard errors in brackets. The rudimentary category is dropped automatically because of data availability and sample period.

The coefficients on being a very small economy are significant and negative. Countries are unlikely to do subst or intens MPFs if they are in the very small category. From the predictive

[11] We do not use terms of trade shocks or aggregate savings in the main regressions, for data availability reasons, but they are discussed under robustness tests below.

margins shown in figure 2, countries are slightly more likely to do inter MPFs and less likely to do other MPFs if they are very small economies.

The results for being a medium economy are close to those for being a large economy. The coefficients on being a medium economy are negative and significant on intens, but positive and insignificant for subst. From the predictive margins, being a medium economy will significantly increase countries' probability to do subst MPFs, notably decrease countries' probability to do intens MPFs, and have little impact on countries' likelihood to do inter MPFs.

The coefficients on being a large economy on subst and intens are negative, but only significant on intens. The results suggest that, relative to the default category of small economy, large economies are likely to do MPFs with an intermediate level of control. The predictive margins show that the magnitudes of the impacts of being a large economy are similar to being a medium economy.

Overall, economic size is an important determinant of countries' MPF choices. When interpreting the results of economic size, it is important to note that the default category is being a small economy. Relative to being a small or very small economy, large or medium countries are likely to do subst and unlikely to do intens MPFs. Countries' likelihood to do inter MPFs is not significantly influenced by economic size.

From the coefficient estimates, countries with higher levels of trade openness and anchor network are more likely to do inter MPFs than subst and intens, but these results are statistically insignificant. The predictive margins suggest that with increases in trade openness, countries are more likely to do subst and less likely to do intens MPFs. With increases in strength of the

anchor network, countries are less likely to do subst and more likely to do inter and intens MPFs.

A historical peak inflation higher than 10% would significantly increase countries' likelihood to do an MPF with a higher degree of monetary control (subst and intens). However, when historical peak inflation is higher than 20%, countries' likelihood to do intens MPF is significantly lower. From figure **2**, countries with high historical peak inflation (more than 10%) are likely to do subst and intens and unlikely to do inter MPFs. Countries with very high historical peak inflation (more than 20%) are more likely to do inter and subst and unlikely to do intens MPFs.

The coefficients on financial market depth on subst and intens are positive and significant. Countries with a higher degree of financial market depth are more likely to do subst and intens rather than inter MPFs. From the figure, with increases of the financial market depth index from 0 to 1, countries' probability of doing inter MPFs decreases from 20% to 0%, while that of subst increases from 45% to 80% and that of intens decrease from 35% to 20%.

The coefficients on capital account openness are positive and significant. Countries with a high level of capital account openness are more likely to do subst and intens MPFs. But the predictive margins of capital account openness are flat, suggesting that the economic significance of capital account openness is limited. Central bank independence appears to be an insignificant determinant of countries' MPF choices. The coefficients are insignificant and the predictive margins are flat.

The coefficients on the Polity IV scores are negative on subst and intens, but only significant on subst. From the predictive margins, countries with good political institutions are less likely to do subst and more likely to do intens and inter MPFs.

Being an emerging economy and a fuel exporter are statistically significant determinants of MPF choices. Emerging economies and fuel exporters are more likely to do MPFs with an intermediate level of monetary control. Keeping other variables constant at their mean or default values, being an emerging economy increases countries' likelihood to do inter and subst by 10% and decreases countries' likelihood to do intens by 20%, and being a fuel exporter has similar impacts.

Combining the results from point estimates of coefficients and predictive margins, economic size, historical peak inflation, financial development, political institutions and being an emerging economy are major determinants of countries' choices of MPFs and degree of monetary control. Overall, small economies, very small and countries with low financial market depth are likely to do intens MPFs. Medium and large economies, countries with very high historical peak inflation and a high level of financial market depth, and which are emerging economies or fuel exporters, are likely to do subst MPFs.

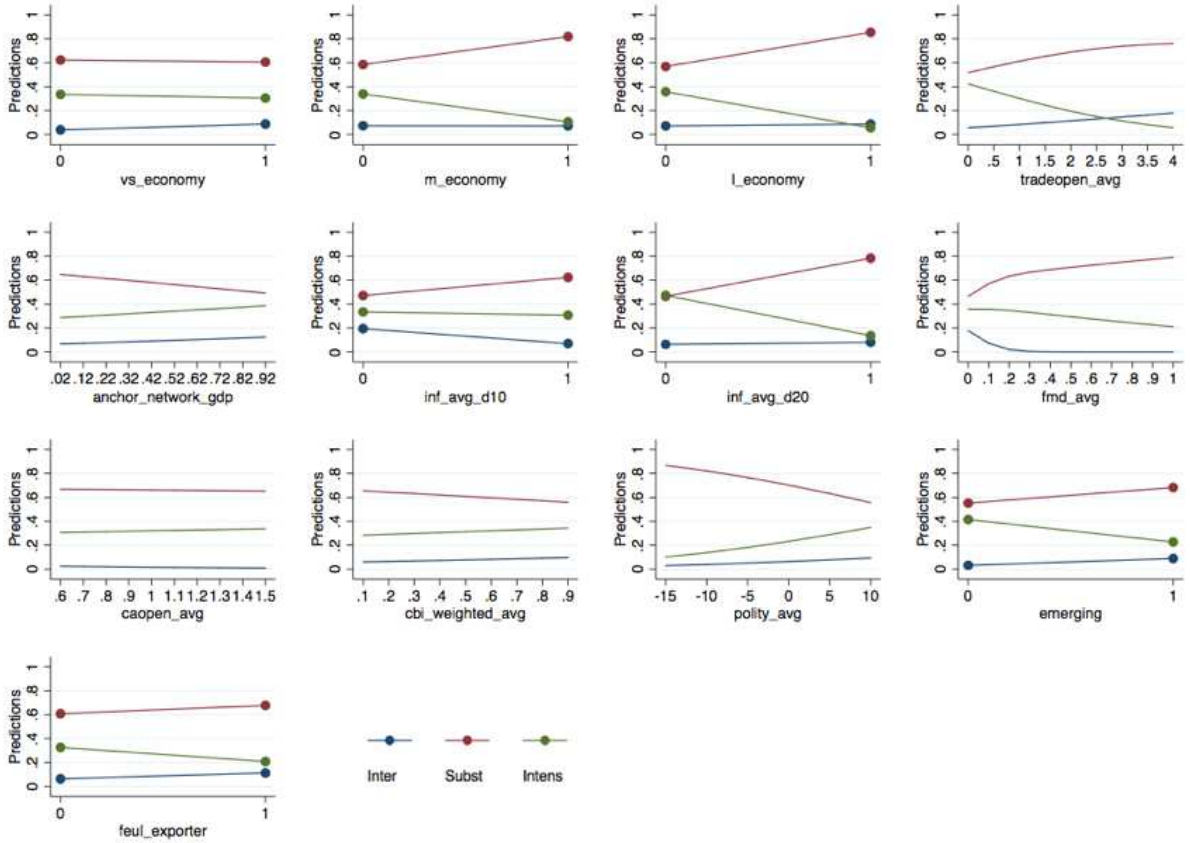

Figure 2 Predictive margins – Aggregation by degree of monetary control

5 Discussion

In figures 3 and 4 we show the trends of chosen and predicted MPFs for each aggregation. The solid lines show the number of countries choosing a particular MPF in a given year and the dashed lines show the numbers predicted. The number of countries choosing IT and intens MPFs grows steadily over the period.

The solid and dashed lines for each MPF are generally close and support the validity of the model. In the 2000s, there are predicted to be more countries doing subst and fewer countries doing intens MPFs, and also more countries doing IT and fewer doing D, than the actual numbers, and these larger divergences deserve further investigation. The former group – countries predicted to do subst but doing intens – includes, over all or most of 2000-10, Chile, Israel, Korea, Peru and Poland, which had all moved to full IT (intens), but it also includes

Cyprus, Jordan and Latvia (full ERT – intens) and Malaysia (WSD – intens). The latter group – countries predicted to do IT but doing D – includes Argentina (after its exit from the currency board), Croatia (discussed above), Iceland (2006-10 when its announced inflation targets were repeatedly and widely missed, so it is classified as (loosely structured) discretion) and Japan (in the years immediately before it adopted ITs). Thus the identification of the countries involved in these errors suggests that the errors are heterogeneous, with no clear pattern, which in turn indicates that our model is not obviously missing out some important determinant. In addition, the countries identified here do not in either case coincide well with any of the groups picked out in the narrative of section 2, and the predicted and actual choices tend to converge after 2010.

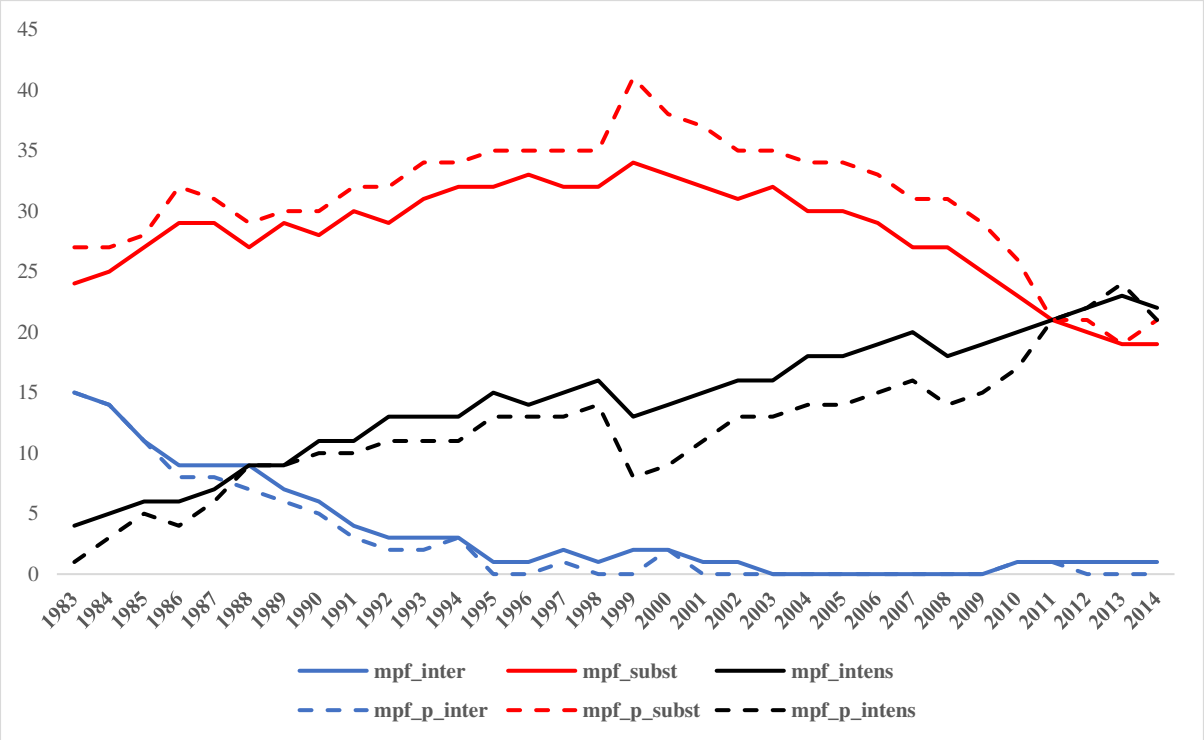

Figure 3 Predicted versus actual, by degree of control

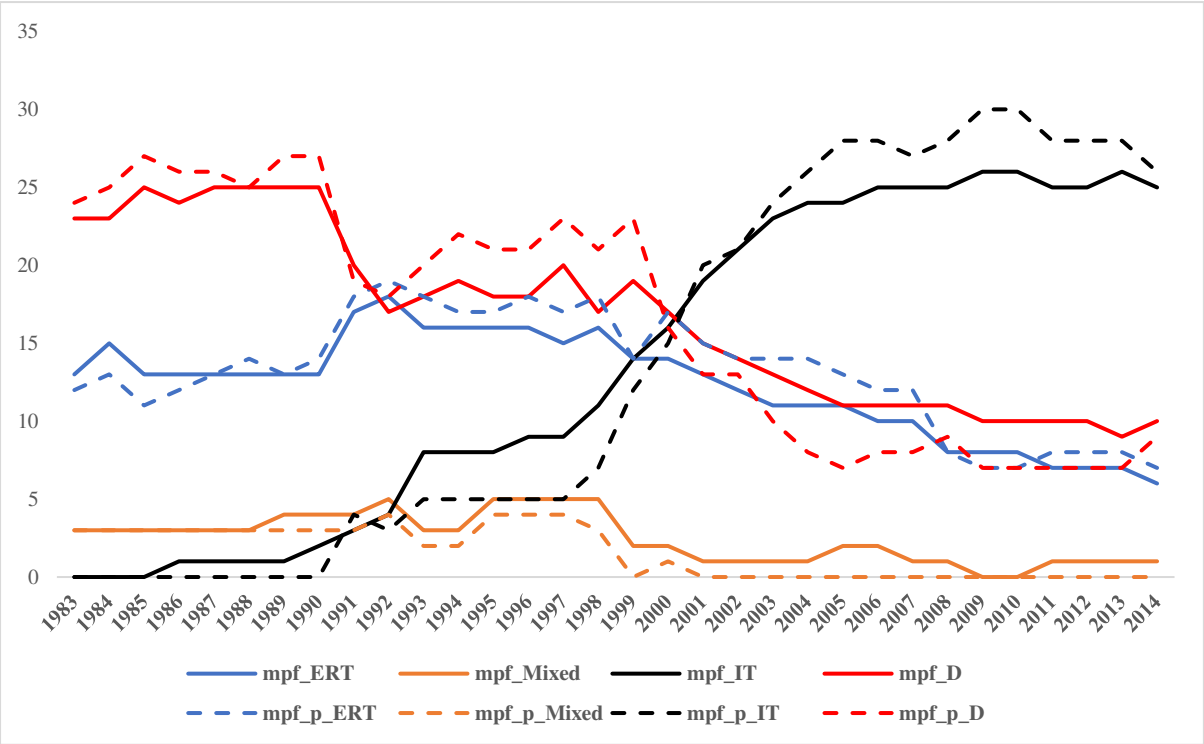

Figure 4 Predicted versus actual, by target variable

We now examine in more detail how well our model can explain countries' choices of MPFs and where the predictions are in error. With the multinomial logit model, we can predict the probability of a country doing a certain MPF. If a country has the highest predicted probability for doing some particular MPF, we call this MPF the predicted choice of MPF. For example, in the year 2000, the UK has a probability of 0.501 to do intens MPF, 0.499 to do subst MPF and close to 0 to do inter MPF. Hence the predicted choice of MPF of the UK in 2000 is intens MPF. In 2000, the probability of Turkey to do intens, subst and inter MPF is 0.11, 0.89 and 0 correspondingly, so the predicted choice of Turkey is subst MPF. If a country's predicted and actual choice of MPF is the same, then the prediction is correct. We calculate the proportion of correct predictions of MPF choice year by year for the two main regressions. Figure 5 shows the percentage of accurate predictions over the years and the average. Overall the model performs well with an average accuracy of 75%, and the accuracy of predictions is quite smooth

over the years. However, the predictions for MPF aggregated by target variable are notably poorer in the early 2000s (but better in the late 1980s and the mid-2000s) .

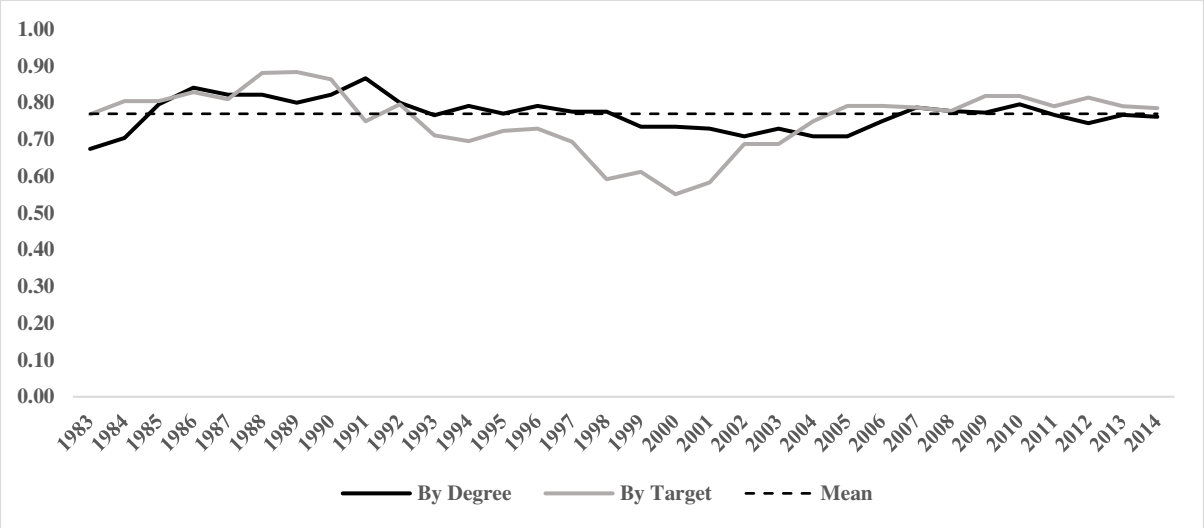

Figure 5 Prediction accuracy by year

Figure 6 shows the proportion of correct predictions by country. For some countries, the model can predict their degrees of monetary control but not the target variables, and for others the opposite. Most cases of poor predictions are for emerging economies, and the countries with the poorest predictions are Croatia, Latvia, Malaysia, the Slovak Republic, Slovenia and Switzerland.

Croatia does D throughout (from 1992). In the early 2000s, as a small economy with low financial market depth and high anchor network effects, Croatia is predicted to do ERT, while in the later period, because of improved political institutions after 2000 and higher trade openness, it is predicted to do IT. Malaysia did D and ERT in the 1990s and 2000s, but it is predicted to do ERT and IT for the period because it is a small economy with high anchor network effects, high trade openness and (from 2008) improved political institutions. Slovenia did mixed targeting in the 2000s but is predicted to do ERT. Slovenia fits the characteristics of both Mixed and ERTs, but Mixed MPFs are more often pursued by advanced economies.

Latvia during the 2000s did intens, although as a very small economy, with very high historical peak inflation, it is predicted to do subst MPFs. In contrast to Latvia, Slovakia did subst but is predicted to do intens MPFs because it is a small economy with a low level of financial market depth. Switzerland did subst but is predicted to do intens MPFs since it is a very small economy with great financial market depth and considerable trade concentration.

Our model accurately predicts 75% of countries' choices, that is, it can explain most of those choices, but that leaves a significant margin unexplained, which is likely to reflect country-specific factors not taken into account. For example, in Croatia, the lagged effects of conflict and the lack of political and social consensus may explain the unwillingness to commit to precise targets, while Malaysia is widely recognised to have taken a deliberately different direction from other countries in the aftermath of the Asian financial crisis. Slovakia and Slovenia, on the other hand, were trying to qualify for entry into EMU under the (multiple) Maastricht Treaty criteria, and that may explain their use of multiple targets (which means subst rather than intens).[12]

[12] Another example of a country-specific factor is Denmark, which is predicted to do ITs between 2001 and 2014 but does ERTs: Denmark held a referendum in 2000 on adopting the euro and, although the proposal was supported by the government, business, trade unions and the main political parties, it was defeated by 53.2% to 46.8%.

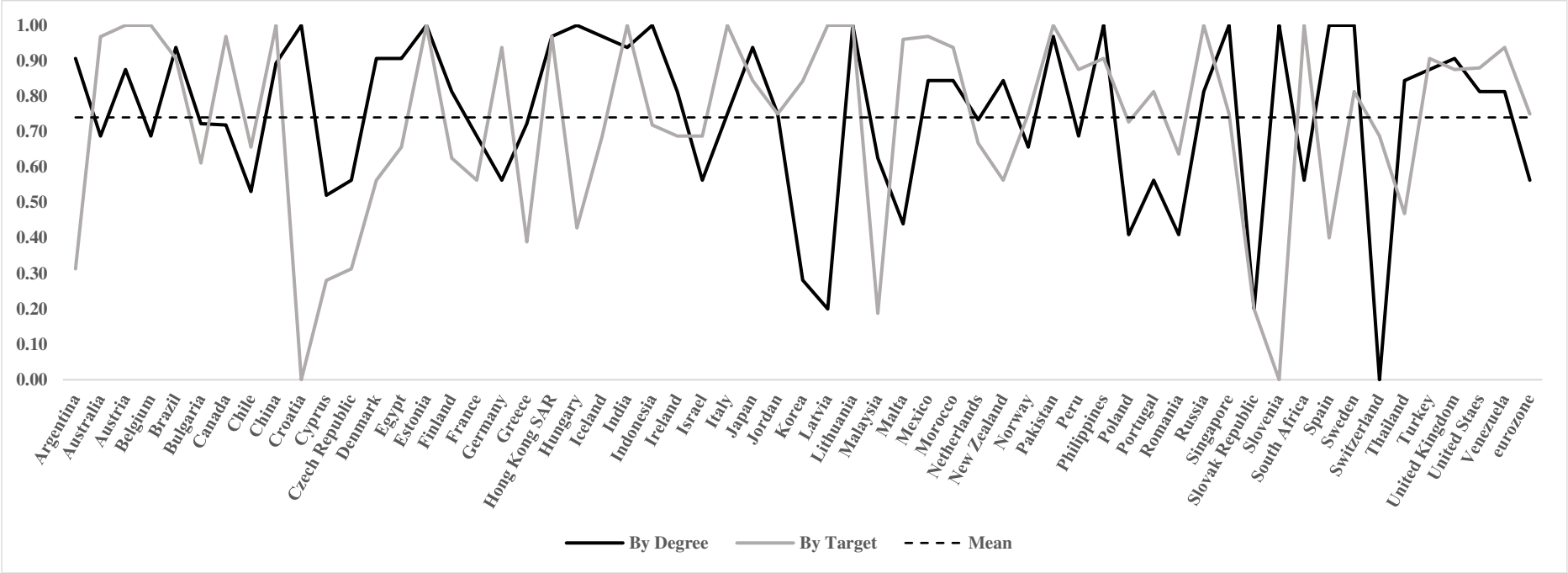

Figure 6 Prediction accuracy by country

6 Robustness tests

Our model is robust to a different treatment of the Euro Area and different model specifications. In the previous section, we treat the Euro Area as a single unit. In robustness tests we treat the Euro Area member countries as individual units undertaking full exchange rate targeting. Thus, in the aggregations, they are doing ERTs and intens MPFs. The results are shown in table *4* and are similar to the main results.

We have also tried including terms of trade shocks (used by Levy Yeyati et al., 2010) and aggregate savings (used by Erdem and Özmen, 2015, in a different context) as determinants of MPF choices. The data availability on these two variables is limited and including them shrinks our sample. When we ran the regression with the smaller sample and more variables, the coefficients on terms of trade shocks and aggregate savings are statistically insignificant, while other coefficients are little changed from the main results. We have also tried to examine the association between economic development and MPF choices by considering the log of GDP per capita as an additional determinant (as in Juhn and Mauro, 2002; Calderón and Schmidt-Hebbel, 2008a and 2008b). Including this variable might raise a concern about endogeneity. Though we use the average value of three preceding years for determinants, both GDP per capita and MPF choices have strong inertia. Hence we do not include the log of GDP per capita in the main regressions. However, when we do include it the results show only that more developed economies are likely to do Mixed MPFs. The coefficients on the log of GDP per capita are insignificant for other MPFs, and the coefficients on other variables are similar to the main results in magnitudes, signs and significance levels. Regression tables from these tests are available upon request from the authors.

7 Conclusions

In this paper we have investigated the determinants of countries' choices of monetary policy frameworks, using a new classification of frameworks which is based on de facto as well as de jure information, combines internal and external targets, and emphasises the context of monetary policy in the form of the development of financial infrastructure and the financial system more widely. We use a brief narrative based around those frameworks to motivate an econometric analysis of MPF choices. Our model uses a variable which measures the concentration of a country's trade with potential anchor currencies and a new index of financial market depth, as well as more standard determinants. The model is able to explain three quarters of countries' MPF choices, and there appears to be no systematic pattern in the prediction errors. The unexplained quarter of those choices can probably be attributed to policy inertia and country-specific factors or historical events not taken into account (and probably not able to be taken into account in this sort of analysis), and the model's overall explanatory performance can be regarded as more than satisfactory. Its ability to track the major trends over time in the choices of MPFs suggests that changes in fashion such as the rise in popularity of inflation targeting are of limited importance.

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Appendix

Table A1 Classification of countries by relative size

Advanced countries		**Emerging economies**	
Euro Area	large	Argentina	very small
Austria	very small	Brazil	medium
Belgium	very small	Bulgaria	very small
Finland	very small	Chile	very small
France	medium	China	large
Germany	large to medium, mainly medium	Croatia	very small
Greece	very small	Cyprus	very small
Ireland	very small	Czech Republic	very small
Italy	medium	Egypt	very small to small, mainly very small
Luxembourg	very small	Estonia	very small
Netherlands	small to very small, mainly very small	Hungary	very small
Portugal	very small	India	large
Spain	medium to small, mainly small	Indonesia	medium
Australia	small	Israel	very small
Canada	medium to small, mainly small	Jordan	very small
Denmark	very small	Latvia	very small
Hong Kong	very small	Lithuania	very small
Iceland	very small	Malaysia	very small
Japan	large	Malta	very small
Korea (South)	small to very small, mainly small	Mexico	small to medium, mainly medium
New Zealand	small to very small, mainly very small	Morocco	very small
Norway	small to very small, mainly very small	Pakistan	small
Singapore	small to very small, mainly very small	Peru	very small
Sweden	small to very small, mainly very small	Philippines	very small to small, mainly very small
Switzerland	small to very small, mainly very small	Poland	very small
United Kingdom	medium	Romania	very small
United States	large	Russian Federation	medium
		Slovak Republic	very small
		Slovenia	very small
		South Africa	very small
		Thailand	very small
		Turkey	small
		Venezuela, RB	very small

Note: classification by average of country's share in GDP and share in population for total 60 countries, large = ≥ 5%, medium = < 5% but ≥ 2%, small = < 2% but ≥ 1%, all others very small.

Table A2: Trade openness and anchor networks

Country	Year	Trade openness	Anchor network	Anchor currency
Argentina	1983	14.99	0.029	USD
	1993	16.22	0.037	USD
	2003	40.64	0.112	USD
	2013	29.33	0.105	USD
Australia	1983	29.22	0.078	USD
	1993	35.47	0.120	USD
	2003	40.31	0.136	USD
	2013	41.27	0.179	USD
Austria	1983	62.47	0.138	DM/Euro
	1993	63.27	0.340	DM/Euro
	2003	86.39	0.539	DM/Euro
	2013	104.07	0.660	DM/Euro
Belgium	1983	119.51	0.538	DM/Euro
	1993	108.20	0.668	DM/Euro
	2003	131.99	0.994	DM/Euro
	2013	162.22	1.183	DM/Euro
Brazil	1983	20.43	0.098	USD
	1993	19.60	0.078	USD
	2003	28.14	0.104	USD
	2013	25.56	0.120	USD
Bulgaria	1993	84.04	0.286	DM/Euro
	2003	79.63	0.501	DM/Euro
	2013	129.71	0.706	DM/Euro
Canada	1983	46.69	0.314	USD
	1993	58.24	0.397	USD
	2003	69.84	0.488	USD
	2013	61.97	0.433	USD
Chile	1983	44.82	0.130	USD
	1993	53.61	0.181	USD
	2003	66.32	0.204	USD
	2013	64.97	0.343	USD
China	1983	17.92	0.041	USD
	1993	36.06	0.298	USD
	2003	51.80	0.262	USD
	2013	46.57	0.216	USD
Croatia	2003	85.22	0.430	DM/Euro
	2013	85.13	0.415	DM/Euro
Cyprus	1983	114.38	0.185	USD
	1993	95.42	0.296	DM/Euro
	2003	114.01	0.257	DM/Euro
	2013	115.47	0.295	DM/Euro
Czech Republic	1993	79.13	0.333	DM/Euro
	2003	95.02	0.780	DM/Euro
	2013	147.98	1.157	DM/Euro
Denmark	1983	69.63	0.216	DM/Euro
	1993	65.61	0.243	DM/Euro
	2003	80.88	0.373	DM/Euro
	2013	103.05	0.405	DM/Euro
Egypt, Arab Rep.	1983	61.91	0.206	DM/Euro

	1993	55.93	0.126	DM/Euro
	2003	46.18	0.087	DM/Euro
	2013	40.37	0.166	USD
Estonia	2003	123.28	0.888	DM/Euro
	2013	165.79	1.022	DM/Euro
Finland	1983	57.37	0.169	DM/Euro
	1993	58.14	0.252	DM/Euro
	2003	68.04	0.348	DM/Euro
	2013	78.51	0.356	DM/Euro
France	1983	45.14	0.121	DM/Euro
	1993	39.91	0.171	DM/Euro
	2003	50.80	0.291	DM/Euro
	2013	59.76	0.308	DM/Euro
Germany	1983	43.72	0.203	GBP
	1993	40.64	0.167	DM/Euro
	2003	61.52	0.348	DM/Euro
	2013	84.84	0.446	DM/Euro
Greece	1983	41.18	0.099	DM/Euro
	1993	37.03	0.149	DM/Euro
	2003	48.19	0.178	DM/Euro
	2013	63.52	0.206	DM/Euro
Hong Kong SAR, China	1983	186.33	0.447	USD
	1993	233.97	0.851	USD
	2003	292.46	1.029	USD
	2013	442.62	1.403	USD
Hungary	1983	0.00	0.122	DM/Euro
	1993	53.47	0.320	DM/Euro
	2003	116.43	0.745	DM/Euro
	2013	164.34	1.127	DM/Euro
Iceland	1983	77.21	0.207	DM/Euro
	1993	62.38	0.286	DM/Euro
	2003	68.88	0.333	DM/Euro
	2013	102.41	0.395	DM/Euro
India	1983	13.84	0.044	USD
	1993	19.86	0.071	USD
	2003	30.92	0.088	USD
	2013	53.84	0.264	USD
Indonesia	1983	56.56	0.128	USD
	1993	50.52	0.142	USD
	2003	53.62	0.183	USD
	2013	48.64	0.210	USD
Ireland	1983	97.62	0.367	GBP
	1993	116.46	0.588	DM/Euro
	2003	146.55	0.625	DM/Euro
	2013	193.29	0.546	DM/Euro
Israel	1983	63.40	0.144	DM/Euro
	1993	67.20	0.235	DM/Euro
	2003	70.08	0.213	USD
	2013	64.72	0.205	USD
Italy	1983	40.31	0.109	DM/Euro
	1993	37.88	0.158	DM/Euro
	2003	46.27	0.236	DM/Euro

	2013	55.47	0.270	DM/Euro
Japan	1983	25.06	0.126	USD
	1993	16.01	0.089	USD
	2003	21.58	0.123	USD
	2013	34.15	0.220	USD
Jordan	1983	117.14	0.301	USD
	1993	130.49	0.350	USD
	2003	115.71	0.388	USD
	2013	114.31	0.512	USD
Korea, Rep.	1983	58.05	0.261	USD
	1993	47.59	0.206	USD
	2003	63.39	0.313	USD
	2013	102.77	0.517	USD
Latvia	2003	84.78	0.574	DM/Euro
	2013	124.16	0.788	DM/Euro
Lithuania	2003	98.13	0.465	DM/Euro
	2013	166.87	0.830	DM/Euro
Luxembourg	1983	170.97	0.467	DM/Euro
	1993	176.67	0.580	DM/Euro
	2003	254.10	0.838	DM/Euro
Malaysia	1983	107.69	0.263	USD
	1993	157.94	0.514	USD
	2003	194.19	0.859	USD
	2013	142.72	0.736	USD
Malta	1983	133.46	0.360	DM/Euro
	1993	178.91	0.948	DM/Euro
	2003	214.57	0.692	DM/Euro
	2013	307.85	0.703	DM/Euro
Mexico	1983	28.42	0.167	USD
	1993	27.83	0.200	USD
	2003	50.21	0.391	USD
	2013	63.76	0.538	USD
Morocco	1983	52.61	0.163	DM/Euro
	1993	49.67	0.206	DM/Euro
	2003	58.33	0.312	DM/Euro
	2013	80.02	0.357	DM/Euro
Netherlands	1983	105.36	0.300	DM/Euro
	1993	99.45	0.432	DM/Euro
	2003	112.65	0.604	DM/Euro
	2013	153.32	0.900	DM/Euro
New Zealand	1983	57.58	0.127	USD
	1993	57.63	0.154	USD
	2003	57.91	0.134	USD
	2013	56.02	0.213	USD
Norway	1983	74.75	0.205	DM/Euro
	1993	68.05	0.264	DM/Euro
	2003	66.58	0.371	DM/Euro
	2013	67.49	0.328	DM/Euro
Pakistan	1983	34.90	0.127	USD
	1993	38.75	0.134	USD
	2003	32.84	0.156	USD
	2013	33.33	0.232	USD

Peru	1983	43.24	0.144	USD
	1993	28.50	0.119	USD
	2003	37.62	0.128	USD
	2013	49.78	0.281	USD
Philippines	1983	49.42	0.195	USD
	1993	71.17	0.280	USD
	2003	101.85	0.521	USD
	2013	60.25	0.298	USD
Poland	1993	40.52	0.232	DM/Euro
	2003	69.44	0.404	DM/Euro
	2013	90.69	0.562	DM/Euro
Portugal	1983	58.92	0.171	DM/Euro
	1993	54.17	0.250	DM/Euro
	2003	60.44	0.400	DM/Euro
	2013	78.03	0.446	DM/Euro
Romania	1993	51.00	0.193	DM/Euro
	2003	76.51	0.484	DM/Euro
	2013	80.27	0.520	DM/Euro
Russian Federation	1993	68.70	0.074	DM/Euro
	2003	59.13	0.223	DM/Euro
	2013	46.19	0.179	DM/Euro
Singapore	1983	333.31	1.326	USD
	1993	313.20	1.471	USD
	2003	382.84	1.456	USD
	2013	365.69	1.265	USD
Slovak Republic	1993	114.80	0.519	DM/Euro
	2003	126.28	0.750	DM/Euro
	2013	183.41	1.296	DM/Euro
Slovenia	2003	102.11	0.729	DM/Euro
	2013	143.47	1.040	DM/Euro
South Africa	1983	44.30	0.059	DM/Euro
	1993	39.12	0.101	DM/Euro
	2003	51.40	0.189	DM/Euro
	2013	64.24	0.391	USD
Spain	1983	39.82	0.088	USD
	1993	36.99	0.166	DM/Euro
	2003	53.11	0.290	DM/Euro
	2013	61.18	0.302	DM/Euro
Sweden	1983	65.50	0.214	DM/Euro
	1993	59.24	0.276	DM/Euro
	2003	76.15	0.359	DM/Euro
	2013	83.09	0.377	DM/Euro
Switzerland	1983	88.41	0.195	DM/Euro
	1993	78.48	0.328	DM/Euro
	2003	89.53	0.419	DM/Euro
	2013	131.80	0.393	DM/Euro
Thailand	1983	47.38	0.147	USD
	1993	77.75	0.223	USD
	2003	116.69	0.474	USD
	2013	133.41	0.631	USD
Turkey	1983	29.03	0.110	USD
	1993	33.02	0.120	DM/Euro

	2003	45.60	0.220	DM/Euro
	2013	50.35	0.215	DM/Euro
United Kingdom	1983	49.51	0.166	DM/Euro
	1993	48.48	0.161	DM/Euro
	2003	49.47	0.199	DM/Euro
	2013	61.35	0.226	DM/Euro
United States	1983	16.65	0.046	USD
	1993	19.99	0.074	USD
	2003	22.45	0.061	USD
	2013	30.23	0.149	USD
Venezuela, RB	1983	30.72	0.134	USD
	1993	54.14	0.320	USD
	2003	50.58	0.295	USD
	2013	54.28	0.220	USD
Euro Area	2003	28.96	0.131	DM/Euro
	2013	37.08	0.187	DM/Euro

Notes: trade openness = (exports + imports)/GDP, %;
anchor network = highest (exports + imports)/GDP for any currency bloc;
currency bloc = bloc with highest (exports + imports)/GDP for that country.

Table A3 Robustness test: treatment of Euro Area countries as separate countries

	D	Mixed	IT	substantial	intensive
very small economy	-3.161***	-4.364***	-3.667***	-1.633**	-1.696**
	(0.643)	(0.711)	(0.664)	(0.607)	(0.651)
medium economy	-1.269	0.639	-1.059	0.147	-1.791*
	(0.747)	(0.794)	(0.773)	(0.749)	(0.822)
large economy	16.37	14.19	13.63	-0.144	-4.455***
	(1214.3)	(1214.3)	(1214.3)	(0.915)	(1.013)
trade openness	0.512	3.946***	2.637***	-0.156	-0.942
	(0.301)	(0.482)	(0.316)	(0.849)	(0.855)
anchor network / GDP	-8.154***	-5.110***	-13.50***	-2.878	-2.040
	(1.149)	(1.158)	(1.144)	(2.679)	(2.712)
past inflation 10%	0.624	-0.213	-1.116***	3.118***	2.805***
	(0.438)	(0.358)	(0.335)	(0.754)	(0.766)
past inflation 20%	1.111***	0.731*	1.714***	-0.110	-2.774***
	(0.236)	(0.357)	(0.318)	(0.444)	(0.495)
financial markets depth	4.844***	1.510	5.523***	19.37***	17.93***
	(0.681)	(0.884)	(0.693)	(3.132)	(3.164)
capital account openness	-0.422***	-0.462***	0.106	1.391***	1.654***
	(0.0791)	(0.130)	(0.0967)	(0.245)	(0.252)
central bank independence	0.688	6.414***	-1.365*	-1.535	-0.194
	(0.621)	(0.915)	(0.682)	(1.258)	(1.332)
polity	-0.00910	0.920***	0.250***	-0.101***	0.0139
	(0.0186)	(0.130)	(0.0393)	(0.0296)	(0.0357)
emerging	1.636***	-3.449***	0.912**	-1.730***	-3.313***
	(0.284)	(0.515)	(0.354)	(0.490)	(0.539)
fuel_exporter	0.982***	-1.996***	-0.708*	-1.236**	-2.137***
	(0.240)	(0.544)	(0.333)	(0.382)	(0.448)
N			1649		1678
pseudo R2			0.538		0.484
Log likelihood			-1041.6		-760.0

The default category is Intermediate and ERT respectively. *, ** and *** represents significance level at 1%, 5% and 10% respectively. Standard errors in the brackets. Euro Area member countries are treated separately.