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Transitions between monetary policy frameworks and their effects on economic performance[*]

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Abstract

The widespread adoption of inflation targeting (IT) from the early 1990s led to investigations of its effect on macroeconomic performance (inflation and growth), with the emergence of a majority view that the effects were small for advanced countries but possibly larger for emerging economies. We revisit the issue, using a new de facto (rather than de jure) classification of monetary policy frameworks and employing the difference-in-differences approach with regression to the mean effects in order to deal with the problem of endogeneity. We find small effects for advanced countries but insignificant effects for emerging economies. We then question the nature of the mean to which regression occurs and suggest instead that there are strong international trend/network effects leading policymakers to make similar policy decisions (with similar macro outcomes) from within different frameworks. We also find IT has not affected macro performance in the period after the Global Financial Crisis.

JEL: E42, E52, E61, F42

Keywords: monetary policy frameworks, inflation targets, differences-in-differences, regression to the mean, international trends, network effects

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1. Introduction

The widespread adoption of inflation targeting (IT) from the early 1990s has led to considerable interest amongst researchers in the effect of this change: is the adoption of IT a reliable way to improve macro performance (notably inflation, economic growth)? If the answer is yes, that suggests that countries which have not yet adopted IT should move to adopt it as soon as possible. The majority finding, as seen in the surveys of Ball (2010) and Walsh (2009), has been that IT has at most a small effect in advanced economies but perhaps a rather more significant one in emerging economies.

In this paper we revisit the question, using the classification of monetary policy frameworks recently presented by Cobham (2020) which takes account of the de facto attainment of targets as well as their de jure announcement, and covers a range of emerging as well as advanced economies. This classification enables us to consider a number of other transitions between MPFs as well, notably those between frameworks that offer lower and higher degrees of monetary control. We use the difference-in-differences (DID) approach with initial conditions as in Ball and Sheridan (2005) and Ball (2010), which is arguably the best way of dealing with the problem of endogeneity (that is, the possibility that low inflation could lead to the adoption of IT rather than the other way round).

We are able to replicate Ball's (2010) finding of a small cut in inflation in advanced countries from the adoption of inflation targeting, but that result turns out to depend heavily on the sample of countries chosen. We also find no effects from IT in emerging economies, and no effects, for advanced or emerging economies, from the adoption of MPFs which offer greater overall monetary control. In nearly all cases, the most important explanatory factors are the initial conditions, in line with the regression to the mean effects emphasised by Ball.

We also offer a reinterpretation of Ball's 'regression to the mean' which brings in the concept of international trends and network effects, which we think of as driven by both direct and indirect influences from leading countries: direct influences on economic performance plus indirect effects via national monetary policy. We recast the initial conditions as past values of the international trends, e.g. in inflation, instead of past values of the country's own inflation. We then suggest that these effects have led to similar decisions being taken (particularly from within the various higher monetary control frameworks which we have been able to test). We

also propose a new specification to examine the effect of inflation targeting on economic performance in the period after the Global Financial Crisis, and we find that it has not been significant.

Overall, our paper contributes to the literature by confirming, with the new de facto identification of MPFs, that changes to MPFs are not clearly associated with changes in economic performance; by proposing a new specification to examine the effect of IT in response to the Global Financial Crisis; and by providing a reinterpretation of the significance of the initial conditions. We also emphasise that specific policy decisions are not completely dictated by the choice of policy framework or, in other words, policymakers can take similar decisions from within different frameworks: this is the natural explanation for the result that the frameworks are not always associated with differences in economic performance. We therefore suggest that researchers should focus more on the determinants and effects of alternative decisions taken within the limits set by those frameworks.

Section 2 reviews the literature examining the performance of alternative monetary regimes. Section 3 sets out the methodology employed and outlines the new classification of monetary policy frameworks. Section 4 presents an initial set of results, covering the effects of the adoption of inflation targeting and of the euro in advanced economies, the move to IT in emerging economies, the switch between loose and full IT, and the move to monetary policy frameworks with greater monetary control. Section 5 raises some questions about Ball's regression to the mean, proposes an alternative which brings in the relationship between national monetary policies and international trends, and reruns the main regressions on that basis. Section 6 investigates the contribution of inflation targeting to economic performance in the years of and after the Global Financial Crisis. Section 7 concludes.

2. Literature review

There is a range of studies of the effects of inflation targeting, in particular: panel studies such as Mishkin and Schmidt-Hebbel (2007), see also Schmidt-Hebbel (2010); propensity score matching studies such as Vega and Winkelreid (2005) and Lin and Ye (2007, 2009); and the DID approach set out by Ball & Sheridan (2005) and extended by Ball (2010). The principal issues involved in these studies include the identification of appropriate control or comparator groups; whether to allow for past inflation; and selection bias and endogeneity. Overall, the

evidence points to only small, if any, effects from IT in reducing inflation in advanced economies, while the evidence for emerging and/or developing economies is more mixed.

Ball (2010), in his review of this literature (see also Walsh, 2009), made a number of critical points about the non-DID approaches. In particular, he questioned Mishkin and Schmidt-Hebbel's use of a lagged IT dummy as an instrument for the current IT dummy in order to deal with the issue of endogeneity, and raised various concerns about Vega and Winkelreid's approach (for which Lin and Ye get very different results). This paper follows (and we hope develops) the DID approach, so this section focuses on papers that have used that approach.

Ball and Sheridan (2005) argued that there is a regression to the mean process in inflation as in other variables, and research should allow for this. When they did so, by including lagged inflation as an additional independent variable, the effect of IT on inflation disappeared. Ball (2010) presents that approach as specifically addressing the issue of the possible endogeneity of changes in policy regime. We discuss the methodological issues in more detail in the next section. But an intuitive way of expressing their argument is this: countries with previously high inflation might be able to reduce their inflation significantly by giving a higher weight to inflation and adopting the IT framework, whereas countries with previously low inflation could not obtain a large fall whether they adopted IT or not; in which case it may be the previous history of high inflation that drives both the decision to adopt IT and the subsequent improvement in performance, and that is what their econometric results suggest. In that case there is no effect from the adoption of IT per se on economic performance.

Batini and Laxton (2007) applied Ball and Sheridan's approach to a group of 35 emerging economies (plus another 7), with the baseline result that IT reduces inflation by 4.8 percentage points. Gonçalves and Salles (2008) considered a group of 36 emerging economies along the same lines, and found that the adoption of IT was associated with a significant fall in inflation of 2 to 2.5 percentage points, and a smaller but significant cut in growth volatility. Ball (2010) made no reference to Batini and Laxton (2007) but questioned Gonçalves and Salles's choice of non-IT countries (which included 5 countries with hard exchange rate pegs), and their decisions to drop cases where inflation exceeded 50%, among other matters. More recently Thornton (2016) has revisited Gonçalves and Salles's work, using a rather larger sample of countries and controlling for the use of hard exchange rate pegs by some of the non-IT countries

in the sample, in line with a suggestion by Ball. He found that IT did not lower inflation more than hard currency pegs and had no significant effect on growth volatility.

Ball returned to the issue in his (2010) review of the effects of alternative monetary regimes on performance. He reiterated the argument for including the lagged dependent variable but recast the approach to analyse both the adoption of IT and the adoption of the euro, in a three-period model with a sample of advanced economies. He found that the former had a significant but small effect on inflation, while neither change had any significant effect on inflation volatility or the level or volatility of growth.

The issue of the possible endogeneity of monetary policy frameworks and the relationship between low inflation and IT has been widely considered in papers using non-DID approaches as well. Angeriz and Arestis (2008) find that while the IT strategy seems to 'lock-in' low inflation rates, the strategy was introduced well after inflation had begun its downward trend, while Angeriz and Arestis (2007) came to similar conclusions with respect to countries pursuing 'Inflation Targeting Lite'. In addition, Svensson (2010) notes that some non-IT developed countries have adopted many of the monetary policy practices used in IT, which makes the role of the latter difficult to interpret. Cornand and M'baye (2018), using laboratory experiments with human subjects, suggest that doing IT does not necessarily lead to low inflation, but communication of the target matters for the wider economic performance of IT regimes. Our paper provides an intuitive interpretation of the low inflation/IT relationship by proposing international network effects as determinants of the trend of low inflation.[1]

3. Data and Methodology

3.1 Methodology

It is convenient to start as Ball (2010) does, with the following equation:

$$X_{it} = \alpha_i + \beta I_{it}^{*} + \gamma_t + \nu_{it} \qquad (1)$$

where X_{it} is a variable of interest, such as inflation, I_{it}^{*} is a dummy which equals one if country i operates some specific MPF in period t, α_i is a country fixed effect, γ_t is a time effect, and

[1] In recent years research on IT has focused also on a range of other aspects of its operation and contribution. For example, Montes (2013) analyses the effect of the adoption of IT on credibility, the monetary transmission mechanism and entrepreneurial expectations. Fouejieu (2017) investigates whether IT reduces the vulnerability of a country's financial sector (even though its monetary policy is more sensitive to financial imbalances).

ν_{it} is a country-time effect, with the last three terms assumed to be independent of each other. Equation (1) captures all the possible determinants of X as well as the MPF. The conventional DID method to examine the effects of a change from one period to the next is to take the first difference of (1), where the country effect drops out, the difference in the time effects provides the constant and the error term is the change in the country-time effects:

$$\mathrm{X_{i2}} - \mathrm{X_{i1}} = \mathrm{a} + \mathrm{b}T_i^j + \epsilon_\mathrm{i} \qquad (2)$$

where T_i^j is the dummy variable for country i's transition to monetary policy framework j in period 2, b is the average difference in X between countries which transition to MPF^j and countries which do not, ϵ is the error term, subscript i denotes country i, and subscripts 1 and 2 denote periods 1 and 2. Equation 1 is for a standard two period two regime case where there are two types of countries, one experiencing policy shifts and $T_i^j = 1$, and the other experiencing no policy shifts and $T_i^j = 0$. Since b captures the differences between the control and treatment group, we can think of it as the effect of the change in MPFs.

However, this formulation is subject to the problem of endogeneity, where a high previous period value of X may drive the change in MPF and this induces a possible estimation bias. As set out in Ball (2010, p1308), "X_{i1} has a positive effect on I_i [Ball's indicator of a policy shift, comparable to our T_i^j] and a negative effect on ϵ_i. As a result, variation in X_{i1} induces a negative correlation between I_i and ϵ_i, which biases downward the OLS estimate of b". Following Ball we therefore add X_{i1}, the initial conditions of the variable, on the right hand side to control for regression to the mean. Hence the extended version of DID is shown in equation 2:

$$\mathrm{X_{i2}} - \mathrm{X_{i1}} = \mathrm{a} + \mathrm{b}T_i^j + \mathrm{cX_{1i}} + \epsilon_\mathrm{i} \qquad (3)$$

where c captures the regression to the mean effects.

We can further extend the method to three periods with two regimes and three periods with three regimes as shown in equations 4 and 5 respectively.

$$\mathrm{X_{it}} - \mathrm{X_{it-1}} = \mathrm{aD_t^2} + \mathrm{bD_t^3} + \mathrm{c}T_{it}^j + \mathrm{dX_{it-1}(D_t^2)} + \mathrm{eX_{it-1}(D_t^3)} + \epsilon_\mathrm{it}, \qquad \mathrm{t = 2,3} \qquad (4)$$

$$\mathrm{X_{it}} - \mathrm{X_{it-1}} = \mathrm{aD_t^2} + \mathrm{bD_t^3} + \mathrm{c}T_{it}^1 + \mathrm{d}T_{it}^2 + \mathrm{eX_{it-1}(D_t^2)} + \mathrm{fX_{it-1}(D_t^3)} + \epsilon_\mathrm{it}, \qquad \mathrm{t = 2,3} \qquad (5)$$

where $\mathrm{D_t^2}$ and $\mathrm{D_t^3}$ are dummy variables for periods 2 and 3, and these dummies allow for different constants for the two periods. In equation 5, there are two dummies for transitions in

MPFs, T_{it}^1 and T_{it}^2, in which $\mathrm{T}_{\mathrm{it}}^1 = 1$ if country i switched from other MPFs to MPF^1 in period t and $\mathrm{T}_{\mathrm{it}}^2 = 1$ if country i switched from other MPFs or MPF^1 to MPF^2 in period t.

3.2 The framework classification

Monetary policy frameworks (MPFs) are defined in Cobham (2020, pp3-4) as "combinations 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". The aim is to bring together domestic (e.g. money, inflation) and external (exchange rate) targets, and to consider both de jure (announced) objectives and the extent to which they are realised (de facto). The classification, which is based on close reading of the monetary policy sections of IMF Article IV consultation reports, proceeds from a number of distinctions: whether there is a preannounced target, what variable that target is for, whether the target is narrow and precise or wide and broadbrush, whether it is regularly attained, and so on. It also distinguishes between exchange rate 'fixes' and exchange rate targets, between 'pure' and 'augmented' currency boards, and between three types of discretion: unstructured, loosely structured and well structured.[2]

We can illustrate the innovative nature of the classification with respect to the identification of inflation targeting, on which this paper concentrates. First, it distinguishes between 'loose' IT, where the target is less precisely defined and/or attainment of the targets is less accurate, and 'full' IT. While most advanced country ITers do full IT, a number of emerging economies continued for several years, or even to this day, to do loose IT. Singapore, which does an idiosyncratic form of IT in which the exchange rate is systematically adjusted in order to hit the inflation target (Parrado, 2004), is identified as a loose ITer because its inflation target is not announced (but widely understood to be 2-3%). The Euro Area is also identified as a loose ITer, since it has a definition of price stability rather than an actual inflation target, and the US

[2] An exchange rate 'fix' is when the monetary authorities dominate forex transactions and there is no autonomous forex market; 'augmented' fixes and currency boards involve some limited use of monetary instruments in addition to the exchange rate arrangements; under 'unstructured' ('well structured') discretion the monetary authorities have an unclear (coherent) set of objectives and ineffective (effective) monetary instruments available to pursue them, while loosely structured discretion is where the instruments are effective but the objectives are unclear; or where the objectives are clear but the instruments are ineffective; or (more often) where both criteria are partly but only partly fulfilled. See Cobham (2020) and the website www.monetaryframeworks.org for further details and the country-year classification, full and aggregated.

is similarly defined as a loose ITer from 1996 to 2011 (after which it announced a formal target and became a full ITer). Second, because the identification as ITer requires that the targets should be typically attained, there are two countries which adopted IT but are later classified as reverting to loosely structured discretion (LSD) because they missed their targets by wide (and repeated) margins: Iceland, loose IT (LIT) 2001-5, LSD 2006-12, LIT 2013-17; and Turkey, loose converging IT 2003-5, LSD 2006-8, LIT 2009-13, and LSD 2014-17. Existing tests of the effect of IT, on the other hand, have invariably used a de jure identification: if the country announces an inflation target it is labelled as IT, which excludes Singapore, the Euro Area and the US, and ignores the failings of IT in Iceland and Turkey.

The 'full menu' of the classification covers some 32 frameworks, a number of which have very low frequency, but we use mainly the two aggregations of the frameworks suggested in Cobham (2020), one focused on the target variable (if any), the other focused on what is referred to as the degree of monetary control, as shown in Table *10* in the Appendix. The two key trends that are revealed by the classification are the trend over time from other frameworks towards inflation targeting, and the trend over time towards frameworks with greater monetary control. Both trends have gone faster and further for the advanced countries but they are also clearly present for the emerging economies.

3.3 Data

We examine the impact of transitions on the mean and standard deviation of two main macroeconomic variables, GDP growth and inflation rates. Both annual GDP growth and inflation data are obtained from the World Bank database. Given the specific transitions between MPFs that we want to study, we use subgroups of 59 countries conditional on countries' choices of MPFs in each period. The detailed list of the countries chosen, their MPFs, and the time period of each study is set out in section 5 together with the results.

There are a wide range of potential variables which could be examined, as discussed in Ball (2010), such as inflation expectations, nominal interest rates, capital flows and trade volumes. However, the data for policy rates, inflation expectations and nominal interest rates are limited to a small number of countries and we need a reasonable sample size to implement regression analysis. Though data on capital flows and trade volumes are available for more countries, there is no clear theoretical foundation for their relationship with MPFs. Hence in our study, we focus on the effects of transitions between MPFs on growth and inflation rates.

4. Results

We first replicate Ball's (2010) work as closely as possible subject to the structure and coverage of the MPF classification in Cobham (2020). Then we examine the robustness of the relationship by including more countries and extending the method to other MPF transitions. In contrast to Ball (2010), we use yearly instead of quarterly data since the MPF classification is constructed on a yearly basis. Moreover, quarterly data is limited for non-OECD countries and we want to apply the analysis to larger samples. But since the data cover pre- and post-transition periods rather than individual quarters or years this is unlikely to make much difference.

4.1 The effects of transition to ITs or the Euro

We use the method and sample in Ball (2010) to examine the effects of transitions between MPFs identified in Cobham (2020). There are three regimes and three periods. Some countries choose to adopt (some form of) ITs or the euro or other MPFs, and other MPFs are the control group. The first period starts from the year 1985. The second period starts from the year they adopt ITs for countries that transition to ITs or the average year of adoption of ITs in the first wave for countries that have chosen other MPFs. The third period starts from the year they adopt ITs or the euro for countries that transition to ITs or the euro in the second wave or the average year of adoption of ITs or the euro in the second wave for countries that have other MPFs. The MPFs for each country and period are shown in Table 16. In the main tests, we focus on the pre-crisis (i.e. pre-2008) performance of economic indicators since different considerations are relevant for studying the impacts of significant economic downturns. We discuss the performance of MPFs in the post-crisis era in section 7.

Table 1 shows the effects of the adoption of ITs or the euro as in Ball (2010). The dependent variables are the first differences of the variables at the top of the columns. Models 1 to 4 use the standard DID method, and models 5 to 8 include lagged variables to control for regression to the mean effects. The first two rows here provide the most important results, in the form of the coefficients on the transition dummy variables T_i^j, while the following rows show the coefficients on the initial conditions and the last two show the basic constant (cons=D^2 in the notation of section 3), and the additional element of the constant in period 3 (period3=D^3). Model 1 shows that the adoption of ITs and the euro increases average GDP growth of countries, but only the effect of ITs is significant. Model 2 shows that growth is less volatile in countries adopting ITs and the euro, but the effects are insignificant. Inflation is significantly

reduced under ITs and insignificantly reduced after joining the Eurozone, as shown in model 3. As presented in model 4, the volatility of inflation rates is unaffected by the adoption of ITs or the euro. In summary, the standard DID method suggests that transition to ITs significantly increases average growth and reduces average inflation.

In models 5 to 8, we follow Ball (2010) and control for the initial conditions of countries, that is, we include in each case the previous period values of the variable whose first difference constitutes the dependent variable. In this case, the effect of ITs on average GDP growth is insignificant, but the effect of ITs on average inflation remains significant, with a coefficient of -0.74 which is close to Ball's result of -0.65. The coefficients on the initial conditions of variables of interest are negative and mostly significant, suggesting there are regression to the mean effects, while the adjusted R^2s are higher than in models 1-4.

Table 1 Effects of transition to ITs or the Euro, with 20 countries as in Ball (2010)

	(1) GDP_avg	(2) GDP_sd	(3) Inf_avg	(4) Inf_sd	(5) GDP_avg	(6) GDP_sd	(7) Inf_avg	(8) Inf_sd
T^{IT}	1.475**	-0.526	-0.631*	-0.419	0.891	-0.289	-0.743**	-0.04
	(0.474)	(0.283)	(0.266)	(0.303)	(0.486)	(0.243)	(0.245)	(0.135)
T^{Euro}	0.953	-0.022	-0.223	0.211	0.718	0.486	-0.127	0.293
	(0.565)	(0.337)	(0.317)	(0.361)	(0.530)	(0.284)	(0.296)	(0.159)
GDP_avg1					-0.702*			
					(0.293)			
GDP_avg2					-0.308			
					(0.185)			
GDP_sd1						-0.471*		
						(0.197)		
GDP_sd2						-0.847***		
						(0.195)		
Inf_avg1							-0.754***	
							(0.057)	
Inf_avg2							-0.480*	
							(0.177)	
Inf_sd1								-0.727***
								(0.074)
Inf_sd2								-1.039***
								(0.180)
period3	-0.64	0.007	0.627*	0.277	-1.651	0.183	-0.014	0.138
	(0.474)	(0.283)	(0.266)	(0.303)	(1.046)	(0.488)	(0.479)	(0.249)
cons	-0.3	-0.196	-0.362	-0.557**	1.827	0.601	1.152***	0.453**
	(0.320)	(0.191)	(0.179)	(0.204)	(0.918)	(0.365)	(0.298)	(0.144)
N	40	40	40	40	40	40	40	38
adjusted R2	0.187	0.0206	0.226	0.0803	0.302	0.399	0.914	0.823

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods. No initial conditions are included in models 1-4.

Cobham (2020) covers 26 advanced economies and thus we apply Ball's (2010) framework to this extended sample to examine if the effect of ITs on average inflation is robust. Table *2* shows the results with more advanced countries. Model 1 is for all advanced economies included in Cobham (2020) and here the effect of ITs is insignificant. We are interested in what causes the differences in the two sets of regressions. There are six countries in model 1 of Table *2* but not in Table *1*, namely Greece, Hong Kong, Iceland, Luxembourg, Singapore and South Korea. Among them, Iceland was classified as an ITer since 2001, however, Iceland was not able to maintain its IT framework and transitioned to LSD in 2006. If we exclude the data of the two years in the third period that Iceland was not doing IT, the ITs dummy remains insignificant, as shown in column 2. If we exclude Iceland from the sample altogether as in column 3, the ITs dummy is significant. Thus the ITs dummy is significant when and only

when Iceland is entirely excluded from the sample.[3] Overall, the implication is that the effect of IT found in Ball (2010) is not robust to marginal changes in the sample.[4]

Table 2 Effects of transition to ITs or the Euro on average inflation, with more advanced economies

	(1) Inf avg all advanced	(2) Inf avg adv excluding IS 2006-07	(3) Inf avg adv excluding IS entirely
T^{IT}	-0.302	-0.356	-0.569*
	(0.305)	(0.294)	(0.272)
T^{Euro}	0.142	0.188	0.288
	(0.383)	(0.369)	(0.335)
Inf_avg1	-0.782***	-0.782***	-0.711***
	(0.045)	(0.043)	(0.047)
Inf_avg2	-0.633***	-0.654***	-0.711***
	(0.153)	(0.147)	(0.134)
period3	-0.036	-0.044	0.235
	(0.501)	(0.482)	(0.445)
cons	1.242***	1.262***	1.037**
	(0.325)	(0.312)	(0.297)
N	52	52	50
adjusted R2	0.897	0.904	0.886

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The headings of models 2-3 indicate the country/countries excluded from the sample. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

4.2 The effects of transition to ITs

We further examine the effect of transition to ITs by applying Ball's (2010) framework to a two regime and three period case for the adoption of ITs alone (without the Euro). We regress changes in the performance of GDP and inflation on the dummy for the adoption of IT MPFs, initial conditions of the variables and the dummy variables for period 2 and 3. In Table *3*, models 1 to 4 show results for the average and standard deviation of GDP and inflation respectively for the advanced economies, while models 5 to 8 show the results for the emerging economies. In the advanced economies, the adoption of ITs improves macroeconomic performance by increasing average GDP growth, decreasing average inflation, and decreasing

[3] Iceland's inflation rate fell from 32.1% in the first period to 3.1% in the second but rose to 5.5% in the third period (which is when it moved to ITs).

[4] It is also worth noting that when we re-run the regressions for the whole sample without the initial conditions, the IT and euro dummies are insignificant in each of the regressions.

the standard deviations of growth and inflation, but these relationships are statistically insignificant. For the emerging economies, transition to IT decreases average growth and inflation and reduces the standard deviation of both, but the effects of IT are insignificant for emerging economies as well. The initial conditions of the dependent variables are nearly always significant. We are not able to replicate exactly the tests of Gonçalves and Salles (2008) or Thornton (2016) because their samples of countries are not all covered in the new classification, but the results in this paper are clearly against the proposition that the adoption of IT has significant and desirable effects on economic performance in emerging economies.

Table 3 Effects of transition to ITs

	(1) GDP_avg advanced	(2) GDP_sd advanced	(3) Inf_avg advanced	(4) Inf_sd advanced	(5) GDP_avg emerging	(6) GDP_sd emerging	(7) Inf_avg emerging	(8) Inf_sd emerging
T^{IT}	0.856	-0.526	-0.333	-0.32	-0.571	-0.852	-1.02	-0.486
	(0.449)	(0.465)	(0.291)	(0.300)	(0.599)	(0.762)	(4.370)	(6.397)
GDP_avg1	-0.927***				-0.705***			
	(0.143)				(0.071)			
GDP_avg2	-0.294				-0.795***			
	(0.163)				(0.159)			
GDP_sd1		-0.714*				-0.706***		
		(0.304)				(0.195)		
GDP_sd2		-0.836***				-0.881***		
		(0.164)				(0.201)		
Inf_avg1			-0.782***				-0.894***	
			(0.045)				(0.030)	
Inf_avg2			-0.619***				-0.895***	
			(0.147)				(0.120)	
Inf_sd1				-0.799***				-0.737***
				(0.113)				(0.092)
Inf_sd2				-0.850***				-0.991***
				(0.155)				(0.133)
period3	-2.011*	-0.244	-0.009	-0.394	1.786*	0.021	-7.237	-5.318
	(0.783)	(0.800)	(0.491)	(0.401)	(0.840)	(1.176)	(4.392)	(6.020)
cons	2.789***	1.516*	1.254***	1.037**	3.022***	2.187*	10.741***	7.645
	(0.563)	(0.684)	(0.320)	(0.300)	(0.368)	(0.845)	(2.862)	(3.953)
N	52	50	52	48	56	52	64	54
adjusted R2	0.545	0.408	0.899	0.628	0.689	0.369	0.941	0.688

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

Next, Cobham (2020) separates loose IT (LIT) and full IT (FIT) MPFs, so we can extend the study in table 3 by treating LIT and FIT as separate regimes. The transitions of countries' MPFs based on LIT and FIT are presented in appendix Table *17*. Table *4* shows the results of

examining the effects of transition to LIT or FIT in advanced and emerging economies. Models 1 and 2 suggest that the average and the standard deviation of growth in advanced economies are reduced by transition to LIT or FIT respectively. Model 3 suggests that average inflation is increased by the adoption of LIT and decreased by FIT, but both LIT and FIT decrease the volatility of inflation rates in advanced economies as shown in model 4. Models 5 to 8 shows the results for emerging economies, which are similar to those for the advanced economies, except that in emerging economies LIT increases average growth and decreases average inflation. Nevertheless, the effects of LIT and FIT for advanced and emerging economies are always statistically insignificant. The coefficients on the initial conditions of variables of interest are, as before, negative and mostly significant.

Iceland and Turkey were not able to maintain IT frameworks after 2006. To take this into consideration, we try two different specifications for regressions, as we did above with respect to Table 1. First, we disregard the data for Turkey and Iceland from 2006 to 2007. Second, we exclude the two countries from the sample. For table 3, if we exclude the data of the two years that Iceland was not doing IT, the ITs dummy remains insignificant, and if we exclude Iceland from the sample altogether, the ITs dummy is significant for average inflation and insignificant for other economic variables. Having IT frameworks significantly decreases average inflation in advanced economies excluding Iceland. These results are consistent with table 2. The results in table 3 for emerging economies are robust to the corresponding alternative treatments of Turkey. For results in table 4, neither specification alters the signs and significance levels of IT dummies, and the changes in the magnitudes of the coefficients are modest as well. Regression tables are available upon request.

In summary, the effects of IT on economic performance are fragile and countries' initial conditions have significant impacts on both growth and inflation.

Table 4 Effects of transition to Loose IT or Full IT

	(1) GDP_avg advanced	(2) GDP_sd advanced	(3) Inf_avg advanced	(4) Inf_sd advanced	(5) GDP_avg emerging	(6) GDP_sd emerging	(7) Inf_avg emerging	(8) Inf_sd emerging
T^{LIT}	-0.041	-0.068	0.093	-0.235	0.381	-0.889	-1.203	-4.165
	(0.394)	(0.286)	(0.318)	(0.262)	(0.646)	(0.711)	(4.671)	(6.678)
T^{FIT}	-0.1	-0.677	-0.285	-0.322	-0.616	-0.159	-2.514	-2.78
	(0.616)	(0.429)	(0.485)	(0.406)	(0.991)	(1.100)	(8.065)	(11.343)
GDP_avg1	-0.599***				-0.663***			
	(0.123)				(0.083)			
GDP_avg2	-0.284				-0.931***			
	(0.157)				(0.176)			
GDP_sd1		-0.073				-0.813***		
		(0.198)				(0.180)		
GDP_sd2		-0.559***				-0.742**		
		(0.139)				(0.213)		
Inf_avg1			-0.796***				-0.889***	
			(0.054)				(0.032)	
Inf_avg2			-0.597**				-0.838***	
			(0.171)				(0.124)	
Inf_sd1				-0.914***				-0.760***
				(0.101)				(0.093)
Inf_sd2				-0.830***				-0.976***
				(0.156)				(0.140)
period3	-2.093*	1.343*	0.082	-0.33	1.694	-0.663	-8.081	-3.455
	(0.810)	(0.586)	(0.539)	(0.369)	(0.903)	(1.173)	(4.456)	(6.051)
cons	2.513***	-0.51	1.101**	0.989***	3.014***	2.376**	11.308***	7.304
	(0.474)	(0.495)	(0.358)	(0.267)	(0.438)	(0.871)	(2.990)	(4.223)
N	52	52	52	52	54	54	62	52
adjusted R2	0.42	0.317	0.873	0.7	0.637	0.362	0.935	0.69

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

4.3 The effects of transition to MPFs with greater monetary control

The previous regressions treat all non-IT and non-euro MPFs as other MPFs and examine if economic performance is different under ITs or the euro. Cobham (2020) also provides an alternative aggregation of MPFs based on the degree of monetary control under different monetary policy frameworks. In this section, we examine whether transition to MPFs with greater monetary control changes economic performance. There are four categories of MPFs in this aggregation – rudimentary, intermediate, substantial and intensive control – and the MPFs in each category can be found in the appendix Table 1*8*.[5]

[5] It should be noted that although both Iceland and Turkey 'lapsed' from LIT to LSD both of these MPFs are in the same substantial control MPF here, so the previous issue does not arise.

In Table *5*, models 1 to 4 examine the effects of transition from intermediate to substantial or intensive control MPFs. Given that we need countries starting with intermediate MPFs to be able to apply Ball's (2010) DID method, our sample is restricted to 22 countries as shown in Table *18*. Most of these 22 countries are emerging economies since many advanced economies had substantial or intensive control MPFs from the beginning of the period of the classification. We include a dummy variable for emerging economies to allow for differences in economic performance between emerging and advanced economies. The results suggest that substantial control MPFs impair economic performance by decreasing average growth, increasing average inflation and increasing the volatility of both GDP growth and inflation. The adoption of intensive control MPFs mostly improves economic performance by increasing average growth, decreasing average inflation and reducing the standard deviation of growth rates, but intensive MPFs also increase the volatility of inflation rates. However, all these effects of substantial and intensive control MPFs are statistically insignificant.

Models 5 to 8 in Table *5* show the results of examining the impact of transition from intermediate or substantial to intensive MPFs. We have three periods and two regimes. We have 44 countries starting from either intermediate or substantial and the details of the transitions of these countries are in Table *19*. The results show that intensive control MPFs decrease the average and the standard deviation of growth and inflation rates, but these effects are insignificant. Overall, the main explanatory factor for the differences in countries' GDP and inflation rates is the initial conditions of the variables.

Table 5 Effects of transition to MPFs with greater monetary control

	(1) GDP_avg subst-intens	(2) GDP_sd subst-intens	(3) Inf_avg subst-intens	(4) Inf_sd subst-intens	(5) GDP_avg intens	(6) GDP_sd intens	(7) Inf_avg intens	(8) Inf_sd intens
T^{Subst}	-0.577	2.067	2.665	1.132				
	(1.915)	(1.724)	(18.516)	(13.952)				
T^{Intens}	0.636	-1.03	-3.054	14.528	-0.229	-0.559	-2.173	-0.995
	(0.835)	(0.750)	(13.724)	(10.442)	(0.360)	(0.360)	(4.079)	(4.460)
GDP_avg1	-0.537***				-0.355**			
	(0.129)				(0.108)			
GDP_avg2	-0.666***				-0.616***			
	(0.161)				(0.105)			
GDP_sd1		-0.561**				-0.598***		
		(0.176)				(0.166)		
GDP_sd2		0.193				-0.678***		
		(0.156)				(0.151)		
Inf_avg1			-0.582**				-0.052	
			(0.168)				(0.105)	
Inf_avg2			-0.974***				-0.989***	
			(0.158)				(0.080)	
Inf_sd1				-0.535***				1.055***
				(0.128)				(0.276)
Inf_sd2				0.044				-1.023***
				(0.177)				(0.088)
emerging	0.628	-0.012	5.313	2.093	0.584	0.861*	7.03	4.428
	(0.689)	(0.654)	(11.115)	(8.649)	(0.349)	(0.380)	(4.035)	(4.372)
period3	-0.33	1.892	0.036	-10.846	0.839	-0.326	4.554	2.18
	(2.241)	(1.755)	(19.087)	(14.117)	(0.646)	(0.671)	(4.264)	(4.556)
cons	2.604	-0.753	1.991	0.386	1.355**	1.525**	-3.143	-3.479
	-2.121	-1.815	-20.163	-15.428	-0.482	-0.523	-3.753	-4.05
N	42	42	44	44	86	86	82	82
R2	0.513	0.376	0.586	0.361	0.359	0.308	0.698	0.713

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

4.4 Robustness checks

As robustness checks, we assume for all countries the same time period based on the average years of the waves of MPF transitions. The robustness tests are in accordance with our main results in each section. On the same sample and method as in Ball (2010), the adoption of ITs significantly reduces average inflation, but the relationship is fragile if we include more advanced economies. In most cases the significance of MPFs in the robustness tests is the same as in the main results. However, if we include the advanced economies covered in Cobham (2020) other than Iceland, the effect of IT on inflation is significant in the main results, but insignificant if all countries have the same time periods. In other studies, the effects of MPFs

are insignificant in both the main results and the robustness tests. The results of these robustness tests for each set of main results are presented in the Appendix, tables 11-15.

5. Further discussion and results

Our work above, and the work in this approach discussed earlier, all assumes that inflation has a tendency of regression to the mean. Batini and Laxton (2007, p476) say that "In the case of the inflation rate for inflation targeters, this mean should, of course, correspond to the inflation target; for other countries, this would simply be the 'normal' level of inflation to which observed inflation reverts", but other researchers (including Ball) offer little explanation. For advanced countries during most of the Great Moderation, the idea of a regression to the mean sounds plausible: countries were all trying to keep inflation low, so that overshoots would tend to be followed by reductions (though this regression is less clear for undershoots). However, for emerging and developing economies this is not so obvious: many Latin American countries, for example, experienced high and widely varying inflation rates in the 1970s and 1980s and there is little evidence of inflation reverting to any particular level.

This also raises the question of whether we should expect inflation in each country to revert to some general mean, or to a country-specific mean, and that in turn raises the issue of international trends, which affect all countries equally, and/or international network effects, where one country's actions affect how other countries choose to act. These trends and effects have been investigated by economists in a number of related areas in recent years. Earlier work by Ciccarelli and Mojon (2010) identified a common factor in OECD countries' inflation, which they claimed accounted for 70% of the variability of country inflation, with an error correction mechanism such that individual countries' inflation reverted to the common rate.[6] Arestis et al. (2014) have shown that inflation rates have converged, between inflation targeters, between non-inflation targeters and across the two groups, and have suggested that "the reduction of inflation rates and inflation convergence could be the outcome of the coordination implicit in the economic policies pursued in a globalised environment rather than that of inflation targeting per se" (p. 294). Rey (2015) has identified a global financial cycle in capital flows, asset prices and credit growth, while Miranda-Agrippino and Rey (2015) find

[6] This and other work in the same vein (see, for example, Kearns, 2016) are focused on using global inflation estimates and forecasts to improve national inflation forecasts. See also Kamber and Wong (2018) who emphasise the role of national monetary policy in determining national variations from the international trend.

evidence of large spillover effects from US monetary policy on the rest of the world.[7] Jordà, Schularick, Taylor and Ward (2019) have identified a growing synchronisation of financial cycles across (advanced) countries especially since the 1990s, and find that US monetary policy "is a powerful driver of global risk appetite and thus binds together global equity prices", with transmission effects stronger to countries on fixed exchange rates but still sizable for floating rate countries.

Network effects play a prominent role in Meissner and Oomes's (2009) analysis of how countries choose the anchor currencies to which they peg; they argue that countries may end up in a sub-optimal equilibrium where no individual country would gain by shifting its peg to some other anchor on its own, but they would all be better off if they did so together. Song (2018) investigates the wider issue of exchange rate regime choice within a spatial econometric approach, and similarly finds network effects to be important.

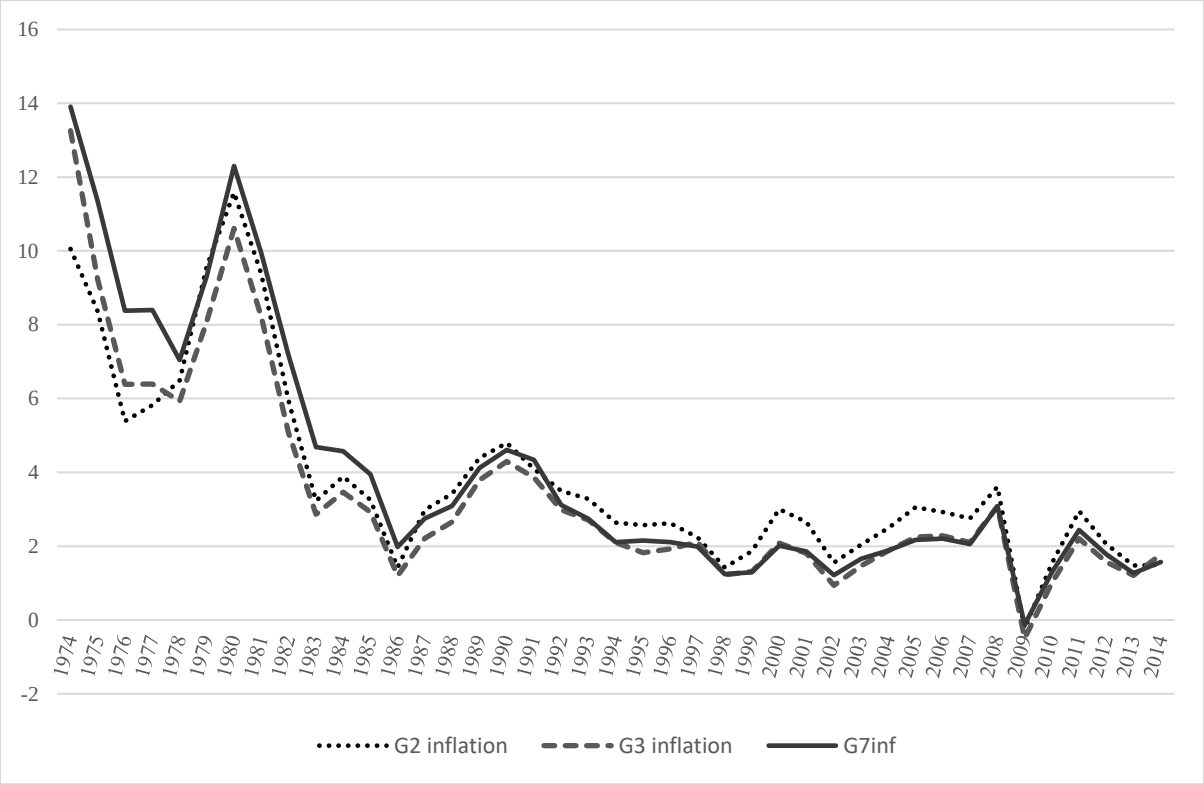

Figure 1 G2, G3 and G7 GDP-weighted averages of inflation

[7] Rey (2015) also argues that the existence of the global financial cycle means that the traditional 'trilemma' with respect to exchange rate fixity, capital mobility and monetary policy autonomy no longer holds. See Klein and Shambaugh (2013) and Gopinath (2017) for some qualifications to that view.

In the light of these considerations we suggest that Ball's regression to the mean could be reinterpreted as a reversion to an international trend driven by (i) direct effects from the global business cycle (e.g. effects from US inflation on inflation in other countries), (ii) indirect effects from policy in hegemonic countries on policy in other countries (e.g. effects from US policy interest rate decisions on other countries' policy rate decisions), and (iii) common fads and fashions among policymakers (which may have been particularly strong during the Great Moderation). We operationalise this proposal by redoing the regressions above with the deviation of national inflation from the G2 average in place of national inflation in the initial conditions. The averages for the G2 (US and Germany), G3 (G2 plus Japan) and G7 (G3 plus Canada, France, Italy and UK) all move closely together over the period concerned, as shown in Figure 1, but the G2 – the US and Germany – comprises the countries that other countries were most likely to emulate and be influenced by.

Table 6 Regression to international trend – Inflation relative to G2 trend

	(1) Inf_avg Ball 20	(2) Inf_sd Ball 20	(3) Inf_avg advanced	(4) Inf_sd advanced	(5) Inf_avg subst-intens	(6) Inf_sd subst-intens	(7) Inf_avg intens	(8) Inf_sd intens
T^{IT}	-0.765**	-0.304	-0.287	-0.363				
	(0.248)	(0.292)	(0.313)	(0.443)				
T^{Euro}	-0.128	0.41	0.132	0.708				
	(0.302)	(0.355)	(0.394)	(0.556)				
T^{Subst}					2.747	3.176		
					(18.603)	(9.466)		
T^{Intens}					-3.005	0.358	-2.504	-0.498
					(13.780)	(6.987)	(4.142)	(4.203)
G2inf_avg1	-1.678***		-1.744***		-1.279**		-0.217	
	(0.130)		(0.104)		(0.376)		(0.233)	
G2inf_avg2	-1.089*		-1.361***		-2.209***		-2.260***	
	(0.400)		(0.343)		(0.360)		(0.181)	
G2inf_sd1		-0.401*		-0.396**		-1.788***		2.393***
		(0.153)		(0.147)		(0.258)		(0.560)
G2inf_sd2		-0.554		-1.417**		-2.293***		-2.319***
		(0.471)		(0.484)		(0.370)		(0.190)
emerging					5.158	2.082	8.191*	3.171
					(11.158)	(5.745)	(3.909)	(3.953)
period3	1.414***	-0.131	1.104**	-0.859	0.544	-5.185	0.087	2.182
	(0.278)	(0.327)	(0.327)	(0.462)	(18.944)	(9.745)	(3.903)	(4.114)
cons	-1.441***	-0.355	-1.436***	-0.017	-1.657	3.156	-2.424	-3.575
	(0.171)	(0.201)	(0.231)	(0.326)	(20.224)	(10.378)	(3.574)	(3.739)
N	40	40	52	52	44	44	92	90
r2	0.923	0.321	0.902	0.27	0.582	0.71	0.679	0.715

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

We redo the key regressions in the last section with the deviation of national inflation from the G2 average. The dependent variables are still the differences in national inflation, but the lagged initial conditions are now national inflation relative to the international trend instead of just national inflation. In Table *6*, Models 1 and 2 show the results with the 20 countries used by Ball (2010) to study the effects of transition to ITs or the euro, as in Table 1. The adoption of ITs significantly reduces average inflation in the 20 countries but has insignificant effects on the standard deviation of inflation rates. The coefficients on initial conditions of inflation relative to the G2 trend are negative and significant, suggesting inflation rates are regressing to the world trend. Models 3 and 4 also study the effects of transition to ITs or the euro but with the 26 advanced economies covered in Cobham (2020), as in Table 2. The MPFs do not have significant impacts as in the main results, but the coefficients on previous period inflation relative to the G2 trend are negative and significant. Models 5 to 8 replicate the results in Table *5* to see the impacts of transition to more developed MPFs. The results show that MPFs do not have significant impacts on the average level and volatility of inflation and there is evidence for regression to the world trend. The results using the inflation deviation from the G7 trend are very similar to the ones using the G2 trend in terms of the signs, significance levels and magnitudes.[8]

An alternative measure of the global inflation trend is the principal component of major economies' inflation. We apply principal component analysis (PCA) to the inflation rates of 24 early OECD member countries, which were members of the OECD before 1974. PCA is a method to find a linear combination of variables to reduce the dimension of the data. Thus we only need to include the principal component/components of countries' inflation instead of the inflation of all 24 countries. Here the first component of the 24 countries' inflation explains 75% of the variations in the data and the second component only explains an additional 6.15%. Therefore, we take just the first component of inflation of the 24 early OECD member countries as the international trend of inflation. Moreover, the Kaiser-Meyer-Olkin measure of sample adequacy is 0.885, which is greater than 0.5 and supports the use of PCA on the data (Cerny and Kaiser, 1977). In Table *7*, we present the results for regressions similar to those in Table *6*, but the lagged initial conditions are national inflation relative to the principal component of inflation of the 24 early OECD member countries. The results, in terms of signs, significance

[8] These results are available from the authors on request.

levels and magnitudes of coefficients as well as adjusted R^2s, are very similar to those using weighted G2 inflation as the global trend.

It is hard to distinguish statistically whether inflation rates are regressing to the mean or converging to an international trend, because over the period concerned the international trend is close to constant. However, the idea of convergence on the international trend offers a more attractive intuitive interpretation of the findings, which should provide a focus for further research.

Table 7 Regression to international trend – Inflation relative to the principal component of OECD countries' inflation

	(1) Inf_avg Ball 20	(2) Inf_sd Ball 20	(3) Inf_avg advanced	(4) Inf_sd advanced	(5) Inf_avg subst-intens	(6) Inf_sd subst-intens	(7) Inf_avg intens	(8) Inf_sd intens
T^{IT}	-0.767**	-0.313	-0.391	-0.363				
	(0.259)	(0.299)	(0.328)	(0.448)				
T^{Euro}	-0.18	0.365	0.036	0.651				
	(0.310)	(0.358)	(0.409)	(0.559)				
T^{Subst}					3.074	3.001		
					(18.576)	(9.509)		
T^{Intens}					-2.48	-0.27	-2.442	-0.367
					(13.737)	(7.039)	(4.138)	(4.208)
OECDinf_avg1	-1.713***		-1.738***		-1.292**		-0.215	
	(0.140)		(0.109)		(0.376)		(0.234)	
OECDinf_avg2	-1.085*		-1.287***		-2.231***		-2.296***	
	(0.423)		(0.354)		(0.363)		(0.184)	
OECDinf_sd1		-0.367*		-0.384*		-1.784***		2.421***
		(0.162)		(0.149)		(0.260)		(0.566)
OECDinf_sd2		-0.483		-1.358**		-2.328***		-2.346***
		(0.489)		(0.484)		(0.377)		(0.192)
emerging					5.665	2.067	8.133*	2.78
					(11.151)	(5.770)	(3.906)	(3.971)
period3	1.5	0.457	1.664*	1.504	3.169	-5.059	3.931	2.005
	(0.843)	(0.974)	(0.783)	(1.070)	(19.010)	(9.803)	(4.015)	(4.098)
cons	0.746*	0.091	0.723*	0.444	-1.967	3.372	-2.375	-3.326
	(0.293)	(0.338)	(0.326)	(0.445)	(20.188)	(10.427)	(3.586)	(3.720)
N	40	40	52	52	44	44	92	90
R2	0.915	0.284	0.894	0.255	0.584	0.707	0.679	0.715

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

6. The post-financial crisis performance of alternative MPFs

While in the periods considered so far policymakers were essentially concerned to keep inflation low, their concerns, and perhaps also the dynamics of economics, are likely to have been different under the impact of the financial crisis. Most advanced economies were now focused on combatting deflation rather than inflation. Nearly all countries had completed their MPF transitions before the financial crisis, and few further transitions took place during or after the crisis. Hence the methodology in section 3 cannot be applied to examine the post-financial crisis performance of alternative MPFs. However, we can investigate the impact of (previously adopted) MPFs on the performance of policy after the crisis. We propose a new equation to examine if IT countries performed better after the crisis:

$$\mathrm{X_{it}} = \alpha_i + \gamma_t + \beta \times \mathrm{D_{post-crisis}} + \mathrm{c} \times \mathrm{IT_{it}} \times D_{post-crisis} + v_{it} \qquad (5a)$$

where $\mathrm{X_{it}}$ is the variable of interest, α_i and γ_t are the country and time effects as before, $\mathrm{D_{post-crisis}}$ is the dummy variable for the post-crisis period, and $\mathrm{IT_i}$ is the dummy variable for countries that have previously adopted IT. There are two periods, before the crisis and after the crisis. What we then estimate is

$$\mathrm{X_{it}} = \mathrm{a} + b \times \mathrm{D_{post-crisis}} + \mathrm{c} \times \mathrm{IT_{it}} \times D_{post-crisis} + v_{it} \qquad (5b)$$

where the constant a is equal to $\bar{\alpha} + \gamma_1$ and b is equal to $\bar{\alpha} + \gamma_2 + \beta$ ($\bar{\alpha}$ is the average level of X for all countries in period 1). The regression of this equation gives us a specific estimate for the effect of the crisis on all countries plus any other time trend, and a separate estimate of the effect of the crisis on IT countries.

The average and the standard values of variables from 1998 to 2007 are used as the pre-crisis values, and those from 2008 to 2017 as the post-crisis values. We examine the impact of IT through the interactive dummy variable, given that (as we have shown above) countries, especially advanced economies, behave in broadly similar ways before 2008. Thus, through the coefficient on the interactive dummy, we are able to infer whether doing IT causes countries to perform differently in the post-crisis period.

There is a wide consensus among advanced economies that 2% is the appropriate target for inflation for IT and non-IT central banks. Central banks were trying to bring inflation down to that level before the crisis and to boost inflation up to that level after the crisis. Hence instead

of examining if IT reduces inflation, we test if doing IT keeps countries' inflation rates near to this target. Column 1 in table 8 shows that the standard deviation of inflation from this target is not significantly different for countries doing IT. If we treat the eurozone member countries as IT as well, as shown in column 2, the deviation of inflation from target is not significantly influenced by MPF choice. The standard tests of the impact of doing IT (with and without the euro countries as ITers) on the average level and standard deviation of inflation as well as GDP growth are listed in columns 3 to 10. The impacts of doing IT on inflation are all insignificant. However, doing IT significantly increases both the average level and standard deviation of GDP growth, though the magnitudes of the impacts are small. These results are insignificant if we count eurozone members as ITers. Iceland tried to do IT but could not maintain the framework during 2006 to 2012. If we treat Iceland as a non-ITer, the effects of doing IT on inflation and GDP growth rates are all insignificant (see appendix Table 22). Overall, having adopted IT or having joined the eurozone did not significantly improve – or worsen – the post-crisis economic performance in terms of inflation and growth for advanced economies.

Table 8 The effect of ITs on performance after the financial crisis (Advanced Economies)

	(1) Inf_ deviation	(2) Inf_ deviation	(3) Inf_avg	(4) Inf_avg	(5) Inf_sd	(6) Inf_sd	(7) GDP_avg	(8) GDP_avg	(9) GDP_sd	(10) GDP_sd
Crisis*IT	0.279		0.683		0.274		0.019*		0.023*	
	(0.214)		(0.406)		(0.234)		(0.010)		(0.011)	
Crisis	0.391*	0.303	-0.595	-0.394	0.121	0.105	-0.067***	-0.043**	-0.015	-0.028
	(0.174)	(0.332)	(0.332)	(0.642)	(0.191)	(0.364)	(0.008)	(0.015)	(0.009)	(0.017)
Crisis *ITorEuro		0.233		0.0998		0.150		-0.018		0.026
		(0.334)		(0.646)		(0.367)		(0.015)		(0.018)
cons	0.794***	0.794***	2.011***	2.011***	0.673***	0.673***	0.074***	0.074***	0.092***	0.092***
	(0.105)	(0.107)	(0.201)	(0.206)	(0.116)	(0.117)	(0.005)	(0.005)	(0.005)	(0.005)
N	52	52	52	52	52	52	52	52	52	52
R2	0.214	0.195	0.075	0.022	0.066	0.043	0.621	0.601	0.088	0.050

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively.

The emerging economies do not have the same common ground in the form of inflation objectives as the advanced economies. We want to focus on deviations of inflation from some central point. Most IT economies have a level or range target for inflation, so here we take the point target or the mid-point of a target range. For non-IT countries, we take simply the average

inflation for each country. The average level of inflation or the target in 2017 if a country has one is listed in table

Table 20 and the annual targets for IT emerging economies are shown in table

Table 21. Table 9 shows the economic performance of MPFs after the financial crisis for emerging economies. The variable of interest in column 1 and 2 is the standard deviation of inflation from its target (for IT countries) or from the average level (for non-IT countries). Columns 3 to 10 show the test results where the variables of interest are the same as in the pre-crisis tests. Basically, all the regressions show that having adopted IT, whether eurozone member countries are counted as IT or not, did not improve economic performance in emerging economies. The only exception is that having adopted IT or joined the eurozone decreases the average level of inflation. Since Turkey was not able to do IT continuously after 2006, we treat Turkey as non-IT in the robustness tests and present the results in appendix table Table 23. The results are the same in terms of signs and significance levels.

Table 9 The effect of ITs on performance after the financial crisis (Emerging Economies)

	(1) Inf_ deviation	(2) Inf_ deviation	(3) Inf_avg	(4) Inf_avg	(5) Inf_sd	(6) Inf_sd	(7) GDP_avg	(8) GDP_avg	(9) GDP_sd	(10) GDP_sd
Crisis*IT	-5.230		-3.775		-4.963		0.002		-0.017	
	(3.625)				(3.487)				(3.604)	
Crisis	1.554	3.446	0.304	2.961	1.824	3.840	-0.063***	-0.050***	-0.003	0.008
	2.964	3.334	2.851	3.169	2.947	3.309	0.011	0.012	0.018	0.021
Crisis *ITorEuro		-6.782		-7.027*		-6.801		-0.019		-0.031
		(3.627)		(3.448)		(3.600)		(0.013)		(0.022)
cons	5.052**	5.052**	7.359***	7.359***	5.052**	5.052**	0.105***	0.105***	0.129***	0.129***
	(1.792)	(1.772)	(1.724)	(1.685)	(1.781)	(1.759)	(0.006)	(0.006)	(0.011)	(0.011)
N	66	66	66	66	66	66	66	66	66	66
R2	0.033	0.054	0.023	0.066	0.029	0.054	0.424	0.443	0.016	0.036

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively.

7. Conclusions

In this paper we have applied Ball's version of the DID approach, with the initial conditions of the variable of interest included as an additional independent variable, in conjunction with the new classification of monetary policy frameworks by Cobham (2020). That enabled us to test for the effects on inflation and growth (and their volatilities) of a variety of changes in MPFs, including the adoption of inflation targeting, the adoption of the euro and shifts towards frameworks that provide greater monetary control, differentiating between advanced and emerging economies. We have found only very small effects from the changes to the MPFs

that we have examined.[1] We have also examined the effect of IT in the post-crisis period, and found that it has not been significant. In most cases, the most important explanatory factors are the initial conditions, that is, the previous values of the dependent variables, which is consistent with regression to the mean effects. However, it is not clear why or to what mean regression occurs in these cases.

We have therefore proposed an alternative interpretation of this finding: we recast the initial conditions as deviations from an international trend, rather than mean regression, where we think of that trend as driven by both direct and indirect influences from leading countries: direct influences on economic performance plus indirect effects via national monetary policy. On this basis we find very similar results. It is not possible at this stage to establish that this trend is a better explanation in statistical terms, but we believe it makes more sense of the results in intuitive terms.

The main overall finding remains that the transitions considered from one MPF to another do not seem to have made much difference to economic performance. Given that the MPFs refer to the objectives of the monetary authorities and the contexts within which they take specific monetary policy decisions, most MPFs do not completely dictate the decisions which are important for the outcomes in terms of inflation and growth, and that is why transitions between MPFs are not clearly associated with differences in economic performance. Researchers should therefore focus more attention on the determinants and effects of alternative decisions taken within the limits set by the frameworks.

[1] Changes such as those from unstructured to loosely structured discretion or from basic to intermediate, which could not be tested because of the small size of the sample of countries, might have yielded more significant results.

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Appendix

Table 10 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 (2020)

Table 11 Robustness: Effects of transition to ITs or the Euro, with 20 countries as in Ball (2010), using the same time periods for all countries

	(1) GDP_avg	(2) GDP_sd	(3) Inf_avg	(4) Inf_sd	(5) GDP_avg	(6) GDP_sd	(7) Inf_avg	(8) Inf_sd
T^{IT}	1.027*	-0.388	-0.426	-0.505	0.622	-0.042	-0.537*	0.019
	(0.488)	(0.212)	(0.230)	(0.297)	(0.490)	(0.153)	(0.222)	(0.132)
T^{Euro}	-0.22	0.148	-0.112	-0.178	-0.169	0.117	-0.054	0.031
	(0.581)	(0.252)	(0.274)	(0.354)	(0.551)	(0.173)	(0.267)	(0.146)
GDP_avg1					-0.535			
					(0.337)			
GDP_avg2					-0.387*			
					(0.181)			
GDP_sd1						-0.761***		
						(0.140)		
GDP_sd2						-0.971***		
						(0.236)		
Inf_avg1							-0.788***	
							(0.061)	
Inf_avg2							-0.141	
							(0.184)	
Inf_sd1								-0.874***
								(0.070)
Inf_sd2								-0.886***
								(0.207)
period3	-1.766***	0.807***	0.480*	0.608*	-1.851	0.357	-0.655	-0.16
	(0.488)	(0.212)	(0.230)	(0.297)	(1.114)	(0.401)	(0.465)	(0.244)
cons	0.656	-0.853***	-0.313	-0.713**	2.145*	0.569	1.157***	0.624***
	(0.329)	(0.143)	(0.155)	(0.200)	(0.954)	(0.287)	(0.296)	(0.134)
N	40	40	40	40	40	40	40	40
adjusted R2	0.432	0.453	0.166	0.142	0.498	0.747	0.915	0.855

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods. No initial conditions are included in models 1-4.

Table 12 Robustness: Effects of transition to ITs or the Euro on average inflation, with more advanced economies, using the same time periods for all countries

	(1) Inf avg all advanced	(2) Inf avg adv excluding IS 2006-07	(3) Inf avg adv excluding IS entirely
T^{IT}	-0.263	-0.298	-0.546
	(0.319)	(0.309)	(0.272)
T^{Euro}	0.267	0.291	0.406
	(0.393)	(0.382)	(0.330)
Inf_avg1	-0.788***	-0.789***	-0.709***
	(0.052)	(0.050)	(0.051)
Inf_avg2	-0.576***	-0.582***	-0.616***
	(0.164)	(0.159)	(0.136)
period3	-0.093	-0.115	0.087
	(0.527)	(0.512)	(0.453)
cons	1.174**	1.187**	0.954**
	(0.351)	(0.341)	(0.310)
N	52	52	50
adjusted R2	0.878	0.884	0.873

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The headings of model 2-3 indicate the country/countries excluded from the sample. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

Table 13 Robustness: Effects of transition to ITs, using the same time periods for all countries

	(1) GDP_avg advanced	(2) GDP_sd advanced	(3) Inf_avg advanced	(4) Inf_sd advanced	(5) GDP_avg emerging	(6) GDP_sd emerging	(7) Inf_avg emerging	(8) Inf_sd emerging
T^{IT}	0.666	-0.406	-0.326	-0.127	-1.168*	-0.591	-0.987	-0.592
	(0.392)	(0.295)	(0.303)	(0.249)	(0.567)	(0.771)	(4.665)	(6.655)
GDP_avg1	-0.586***				-0.665***			
	(0.119)				(0.072)			
GDP_avg2	-0.342*				-0.823***			
	(0.149)				(0.148)			
GDP_sd1		-0.062				-0.858***		
		(0.204)				(0.193)		
GDP_sd2		-0.558***				-0.831***		
		(0.139)				(0.199)		
Inf_avg1			-0.789***				-0.896***	
			(0.051)				(0.032)	
Inf_avg2			-0.555**				-0.837***	
			(0.160)				(0.123)	
Inf_sd1				-0.842***				-0.769***
				(0.093)				(0.093)
Inf_sd2				-0.754***				-0.987***
				(0.150)				(0.138)
period3	-1.927*	1.243*	-0.028	-0.485	1.996*	-0.642	-8.499	-4.586
	(0.763)	(0.571)	(0.516)	(0.339)	(0.779)	(1.226)	(4.628)	(6.236)
cons	2.303***	-0.486	1.198**	0.887**	2.931***	2.767**	11.569***	7.524
	(0.473)	(0.501)	(0.347)	(0.255)	(0.357)	(0.907)	(3.054)	(4.232)
N	52	52	52	52	56	54	62	52
adjusted R2	0.493	0.306	0.88	0.678	0.683	0.387	0.938	0.694

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

Table 14 Robustness: Effects of transition to Light IT or Full IT, using the same time periods for all countries

	(1) GDP_avg advanced	(2) GDP_sd advanced	(3) Inf_avg advanced	(4) Inf_sd advanced	(5) GDP_avg emerging	(6) GDP_sd emerging	(7) Inf_avg emerging	(8) Inf_sd emerging
T^{LIT}	-0.128	-0.161	0.064	-0.288	-0.124	-0.927	-1.858	-3.785
	(0.402)	(0.292)	(0.306)	(0.246)	(0.575)	(0.740)	(4.764)	(6.636)
T^{FIT}	0.092	-0.708	-0.386	-0.437	-0.624	-0.619	-2.706	-2.875
	(0.628)	(0.439)	(0.466)	(0.381)	(0.915)	(1.184)	(8.217)	(11.299)
GDP_avg1	-0.601***				-0.675***			
	(0.125)				(0.075)			
GDP_avg2	-0.362*				-0.791***			
	(0.157)				(0.157)			
GDP_sd1		-0.111				-0.843***		
		(0.203)				(0.193)		
GDP_sd2		-0.570***				-0.850***		
		(0.143)				(0.200)		
Inf_avg1			-0.780***				-0.896***	
			(0.052)				(0.032)	
Inf_avg2			-0.538**				-0.837***	
			(0.163)				(0.126)	
Inf_sd1				-0.829***				-0.765***
				(0.094)				(0.094)
Inf_sd2				-0.775***				-0.981***
				(0.150)				(0.141)
period3	-1.939*	1.272*	0.014	-0.312	1.488	-0.565	-8.351	-3.897
	(0.821)	(0.599)	(0.522)	(0.355)	(0.777)	(1.233)	(4.608)	(6.125)
cons	2.571***	-0.413	1.068**	0.908***	2.936***	2.823**	11.749***	7.855
	(0.485)	(0.507)	(0.345)	(0.251)	(0.385)	(0.908)	(3.122)	(4.294)
N	52	52	52	52	56	54	62	52
adjusted R2	0.452	0.302	0.876	0.684	0.653	0.388	0.937	0.69

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

Table 15 Robustness: Effects of transition to MPFs with greater monetary control, using the same time periods for all countries

	(1) GDP_avg subst-intens	(2) GDP_sd subst-intens	(3) Inf_avg subst-intens	(4) Inf_sd subst-intens	(5) GDP_avg intens	(6) GDP_sd intens	(7) Inf_avg intens	(8) Inf_sd intens
T^{Subst}	-0.635	2.639	-2.803	14.053				
	(1.853)	(2.140)	(16.715)	(25.908)				
T^{Intens}	-0.232	-1.22	-3.653	4.466	-0.364	-0.274	-2.218	-1.674
	(0.801)	(0.925)	(12.207)	(19.165)	(0.371)	(0.359)	(4.240)	(5.002)
GDP_avg1	-0.345*				-0.408***			
	(0.145)				(0.101)			
GDP_avg2	-0.781***				-0.652***			
	(0.148)				(0.104)			
GDP_sd1		-0.353				-0.576**		
		(0.254)				(0.169)		
GDP_sd2		0.03				-0.658***		
		(0.180)				(0.149)		
Inf_avg1			0.227				0.066	
			(0.189)				(0.114)	
Inf_avg2			-1.000***				-0.994***	
			(0.114)				(0.079)	
Inf_sd1				-0.519				0.835**
				(0.660)				(0.309)
Inf_sd2				-0.002				-1.008***
				(0.201)				(0.095)
emerging	0.306	-0.054	7.846	1.102	0.475	0.870*	7.528	5.864
	(0.663)	(0.765)	(10.129)	(16.115)	(0.364)	(0.391)	(4.186)	(4.936)
period3	1.295	2.686	7.867	-22.226	0.839	0.015	5.613	3.177
	(2.166)	(2.176)	(17.233)	(26.225)	(0.666)	(0.688)	(4.442)	(5.137)
cons	1.931	-1.522	-6.263	2.865	1.439**	1.180*	-4.265	-2.813
	-2.074	-2.341	-18.12	-28.644	-0.504	-0.546	-3.92	-4.558
N	42	42	42	42	86	86	82	82
r2	0.49	0.188	0.724	0.174	0.406	0.255	0.714	0.657

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively. 1 and 2 denote the initial (i.e. previous period) conditions of the relevant variables for the second and third periods.

Table 16 Transitions from other to ITs or the Euro – country list

	period 1	class	period 2	class	period 3	class	First wave	Second wave
Australia	1974-92	other	1993-01	ITs	2002-07	ITs	1993	
Austria	1974-93	other	1994-98	other	1999-07	euro		1999
Belgium	1974-93	other	1994-98	other	1999-07	euro		1999
Canada	1974-91	other	1992-01	ITs	2002-07	ITs	1992	
Denmark	1974-93	other	1994-01	other	2002-07	other		
Finland	1974-93	other	1994-98	other	1999-07	euro		1999
France	1974-93	other	1994-98	other	1999-07	euro		1999
Germany	1974-93	other	1994-98	other	1999-07	euro		1999
Greece	1974-93	other	1994-00	other	2001-07	euro		2001
Hong Kong	1974-93	other	1994-01	other	2002-07	other		
Iceland	1974-93	other	1994-01	other	2001-07	ITs		2001
Ireland	1974-93	other	1994-98	other	1999-07	euro		1999
Italy	1974-93	other	1994-98	other	1999-07	euro		1999
Japan	1974-93	other	1994-01	other	2006-07	ITs		2006
Luxembourg	1974-93	other	1994-98	other	1999-07	euro		1999
Netherlands	1974-93	other	1994-98	other	1999-07	euro		1999
New Zealand	1974-89	other	1990-01	ITs	2002-07	other	1990	
Norway	1974-93	other	1994-00	other	2001-07	ITs		2001
Portugal	1974-93	other	1994-98	other	1999-07	euro		1999
Singapore	1974-85	other	1986-01	ITs	2002-07	ITs	1986	
SKorea	1974-97	other	1998-01	ITs	2002-07	ITs	1998	
Spain	1974-93	other	1994-98	other	1999-07	euro		1999
Sweden	1974-92	other	1993-01	ITs	2002-07	ITs	1993	
Switzerland	1974-93	other	1994-99	other	2000-07	ITs		2000
UK	1974-92	other	1993-01	ITs	2002-07	ITs	1993	
USA	1974-95	other	1996-01	ITs	2002-07	ITs	1996	
Argentina	1974-93	other	1994-01	other	2002-07	other		
Brazil	1974-93	other	1994-03	other	2004-07	ITs		2004
Bulgaria	1974-93	other	1994-01	other	2002-07	other		
Chile	1984-90	other	1991-01	ITs	2002-07	ITs	1991	
China	1974-93	other	1994-01	other	2002-07	other		
Croatia	1974-93	other	1994-01	other	2002-07	other		
Cyprus	1974-93	other	1994-01	other	2008-07	euro		
Czech Rep	1974-97	other	1998-01	Its	2002-07	Its	1998	
Egypt	1974-93	other	1994-01	other	2002-07	other		
Estonia	1974-93	other	1994-10	other	2011-07	other		
Hungary	1974-93	other	1994-01	other	2001-07	ITs		2001
India	1974-93	other	1994-01	other	2002-07	other		
Indonesia	1974-93	other	1994-01	other	2006-07	ITs		2006
Israel	1974-96	other	1997-01	ITs	2002-07	ITs	1997	
Jordan	1974-93	other	1994-01	other	2002-07	other		
Latvia	1974-93	other	1994-01	other	2002-07	other		
Lithuania	1974-93	other	1994-01	other	2002-07	other		
Malaysia	1974-93	other	1994-01	other	2002-07	other		
Malta	1974-93	other	1994-01	other	2008-07	euro		
Mexico	1974-93	other	1994-01	other	2001-07	ITs		2001
Morocco	1974-93	other	1994-01	other	2002-07	other		
Pakistan	1974-93	other	1994-01	other	2002-07	other		
Peru	1974-93	other	1994-01	other	2002-07	ITs		2002
Philippines	1974-93	other	1994-01	other	2002-07	ITs		2002
Poland	1974-97	other	1998-01	ITs	2002-07	ITs	1998	
Romania	1974-93	other	1994-01	other	2006-07	ITs		2006
Russia	1974-93	other	1994-01	other	2002-07	other		
Slovakia	1974-93	other	1994-01	other	2007-07	euro		
Slovenia	1974-93	other	1994-01	other	2009-07	euro		
South Africa	1974-93	other	1994-01	other	2003-07	ITs		2003
Thailand	1974-93	other	1994-01	other	2000-07	ITs		2000
Turkey	1974-93	other	1994-01	other	2003-07	ITs		2003
Venezuela	1974-93	other	1994-01	other	2002-07	other		
						Average	1994	2001

Note: ITs include LIT and FIT.

Countries in Ball (2010) are Austria, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherland, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK and US.

Table 17 Transitions from other to LIT or FIT – country list

	period 1	class	period 2	class	period 3	class	First wave	Second wave
Australia	1974-92	other	1993-96	LIT	1999-07	FIT	1993	1997
Austria	1974-93	other	1994-98	other	1999-07	LIT		1999
Belgium	1974-93	other	1994-98	other	1999-07	LIT		1999
Canada	1974-91	other	1992-00	FIT	2001-07	FIT	1992	
Denmark	1974-93	other	1994-00	other	2001-07	other		
Finland	1974-93	other	1994-98	other	1999-07	LIT		1999
France	1974-93	other	1994-98	other	1999-07	LIT		1999
Germany	1974-93	other	1994-98	other	1999-07	LIT		1999
Greece	1974-93	other	1994-00	other	2001-07	LIT		2001
Hong Kong	1974-93	other	1994-00	other	2001-07	other		
Iceland	1974-93	other	1994-00	other	2001-07	LIT		2001
Ireland	1974-93	other	1994-98	other	1999-07	LIT		1999
Italy	1974-93	other	1994-98	other	1999-07	LIT		1999
Japan	1974-93	other	1994-05	other	2006-12	LIT		2006
Luxembourg	1974-93	other	1994-98	other	1999-07	LIT		1999
Netherlands	1974-93	other	1994-98	other	1999-07	LIT		1999
New Zealand	1974-89	other	1990-00	FIT	2001-07	FIT	1990	
Norway	1974-93	other	1994-00	other	2001-07	FIT		2001
Portugal	1974-93	other	1994-98	other	1999-07	LIT		1999
Singapore	1974-85	other	1986-00	LIT	2001-07	LIT	1986	
SKorea	1974-97	other	1998-00	FIT	2001-07	FIT	1998	
Spain	1974-93	other	1994-98	other	1999-07	LIT		1999
Sweden	1974-92	other	1993-00	FIT	2001-07	FIT	1993	
Switzerland	1974-93	other	1994-99	other	2000-07	LIT		2000
UK	1974-92	other	1993-96	LIT	1997-07	FIT	1993	1997
USA	1974-93	other	1996-00	LIT	2001-07	LIT	1996	
Argentina	1974-93	other	1994-00	other	2001-07	other		
Brazil	1974-93	other	1994-03	other	2004-07	LIT		2004
Bulgaria	1974-93	other	1994-00	other	2001-07	other		
Chile	1974-93	other	1991-99	LIT	2000-07	FIT	1991	2000
China	1974-93	other	1994-00	other	2001-07	other		
Croatia	1974-93	other	1994-00	other	2001-07	other		
Cyprus	1974-93	other	1994-00	other	2001-07	other		
Czech Rep	1974-93	other	1998-05	LIT	2006-07	FIT	1998	2006
Egypt	1974-93	other	1994-00	other	2001-07	other		
Estonia	1974-93	other	1994-00	other	2001-07	other		
Hungary	1974-93	other	1994-00	other	2001-07	LIT		2001
India	1974-93	other	1994-00	other	2001-07	other		
Indonesia	1974-93	other	1994-05	other	2006-07	LIT		2006
Israel	1974-93	other	1997-03	LIT	2004-07	FIT	1997	2004
Jordan	1974-93	other	1994-00	other	2001-07	other		
Latvia	1974-93	other	1994-00	other	2001-07	other		
Lithuania	1974-93	other	1994-00	other	2001-07	other		
Malaysia	1974-93	other	1994-00	other	2001-07	other		
Malta	1974-93	other	1994-00	other	2001-07	other		
Mexico	1974-93	other	1994-00	other	2001-07	LIT		2001
Morocco	1974-93	other	1994-00	other	2001-07	other		
Pakistan	1974-93	other	1994-00	other	2001-07	other		
Peru	1974-93	other	1994-01	other	2002-07	FIT		2002
Philippines	1974-93	other	1994-00	other	2002-07	LIT		2002
Poland	1974-97	other	1998-03	LIT	2004-07	FIT	1998	2004
Romania	1974-93	other	1994-00	other	2006-07	LIT		2006
Russia	1974-93	other	1994-00	other	2001-07	other		
Slovakia	1974-93	other	1994-00	other	2001-07	other		
Slovenia	1974-93	other	1994-00	other	2001-07	other		
South Africa	1974-93	other	1994-02	other	2003-07	LIT		2003
Thailand	1974-93	other	1994-99	other	2000-07	LIT		2000
Turkey	1974-93	other	1994-02	other	2003-07	LIT		2003
Venezuela	1974-93	other	1994-00	other	2001-07	other		
						Average	1994	2000

Table 18 Transition from intermediate to substantial and/or intensive – country list

	period 1	class	period 2	class	period 3	class	First wave	Second wave
Argentina	1977-90	inter	1991-98	subst	1999-07	subst	1991	
Brazil	1974-85	inter	1986-98	subst	1999-07	subst	1986	
Chile	1974-86	inter	1987-99	subst	2000-07	intens	1987	2000
China	1984-93	inter	1994-98	subst	1999-07	subst	1994	
Cyprus	1974-89	inter	1990-91	subst	1993-07	intens	1990	1992
Egypt	1977-91	inter	1992-98	subst	1999-07	subst	1992	
Greece	1974-90	inter	1991-00	subst	2001-07	intens	1991	2001
Hong Kong	1974-83	inter	1984-98	subst	1999-07	subst	1984	
Hungary	1987-94	inter	1995-98	subst	1999-07	subst	1995	
Iceland	1974-84	inter	1985-98	subst	1999-07	subst	1985	
Indonesia	1974-78	inter	1979-98	subst	1999-07	subst	1979	
Israel	1974-85	inter	1986-03	subst	2004-07	intens	1986	2004
Jordan	1974-84	inter	1985-95	subst	1996-07	intens	1985	1996
Malta	1974-86	inter	1987-94	inter	1995-07	intens		1995
Morocco	1974-80	inter	1981-06	subst	2007-07	intens	1981	
New Zealand	1974-84	inter	1985-89	subst	1990-07	intens	1985	1990
Pakistan	1974-81	inter	1982-98	subst	1999-07	subst	1982	
Peru	1974-92	inter	1993-01	subst	2002-07	intens	1993	2002
SKorea	1974-8	inter	1979-87	subst	1988-07	intens	1979	1988
South Africa	1974-78	inter	1979-98	subst	1999-07	subst	1979	
Thailand	1974-81	inter	1982-09	subst	2010-07	intens	1982	
Turkey	1974-88	inter	1989-98	subst	1999-07	subst	1989	
						Average	1986	1996

Table 19 Transition from intermediate and/or substantial to intensive – country list

	period 1	class	period 2	class	period 3	class	First wave	Second wave
Australia	1977-85	subst	1986-96	subst	2000-07	intens		1997
Austria	1974-79	subst	1980-98	intens	1999-07	intens	1980	
Belgium	1974-82	subst	1983-99	intens	1999-07	intens	1983	
Canada	1974-91	subst	1992-99	intens	2000-07	intens	1992	
Denmark	1974-82	subst	1993-99	intens	2000-07	intens	1993	
Finland	1974-82	subst	1983-98	intens	1999-07	intens	1983	
France	1974-92	subst	1993-98	intens	1999-07	intens	1993	
Germany	1974-86	subst	1987-98	subst	1999-07	intens		1999
Greece	1974-90	inter	1991-00	subst	2001-07	intens		2001
Hong Kong	1974-83	inter	1984-98	subst	1999-07	subst		
Iceland	1974-84	inter	1985-98	subst	1999-07	subst		
Ireland	1979-86	subst	1987-98	intens	1999-07	intens	1987	
Italy	1974-86	subst	1987-98	subst	1999-07	intens		1999
Japan	1974-85	subst	1986-12	subst	2013-07	intens		
Luxembourg	1974-82	subst	1983-98	intens	1999-07	intens	1983	
Netherlands	1974-86	intens	1987-98	intens	1999-07	intens		
New Zealand	1974-84	inter	1985-89	subst	1990-07	intens	1990	
Norway	1974-85	subst	1986-00	subst	2001-07	intens		2001
Portugal	1978-85	subst	1986-94	subst	1995-07	intens		1995
Singapore	1974-85	subst	1986-98	subst	1999-07	subst		
SKorea	1974-78	inter	1979-87	subst	1988-07	intens		1998
Spain	1974-85	subst	1986-99	subst	1999-07	intens		1999
Sweden	1974-84	subst	1985-99	intens	2000-07	intens	1985	
Switzerland	1974-85	subst	1986-98	subst	1999-07	subst		
UK	1974-85	subst	1986-96	subst	1997-07	intens		1997
USA	1974-85	subst	1986-98	subst	1999-11	subst		
Argentina	1977-90	inter	1991-98	subst	1999-07	subst		
Brazil	1974-85	inter	1986-98	subst	1999-07	subst		
Chile	1974-86	inter	1987-99	subst	2000-07	intens		2000
China	1984-93	inter	1994-98	subst	1999-07	subst		
Cyprus	1974-89	inter	1990-91	subst	1993-07	intens	1993	
Egypt	1977-91	inter	1992-98	subst	1999-07	subst		
Hungary	1987-94	inter	1995-98	subst	1999-07	subst		
Indonesia	1974-78	inter	1979-98	subst	1999-07	subst		
Israel	1974-85	inter	1986-03	subst	2004-07	intens		2004
Jordan	1974-84	inter	1985-95	subst	1996-07	intens		1996
Malaysia	1974-85	subst	1986-98	subst	1999-07	intens		1999
Malta	1974-86	inter	1987-94	inter	1995-07	intens		1995
Morocco	1974-80	inter	1981-06	subst	2007-07	intens		
Pakistan	1974-81	inter	1982-98	subst	1999-07	subst		
Peru	1974-92	inter	1993-01	subst	2002-07	intens		2002
South Africa	1974-78	inter	1979-98	subst	1999-07	subst		
Thailand	1974-81	inter	1982-09	subst	2010-07	intens		
Turkey	1974-88	inter	1989-98	subst	1999-07	subst		
						Average	1987	1999

Table 20 The target or average level of inflation for emerging economies

Country name	class	Average inflation 1999-2007	Average or Target inflation 2008-2017
Argentina		7.08	9.29
Brazil	IT	6.64	4.50
Bulgaria		7.39	2.53
Chile	IT	3.31	3.00
China		1.11	2.62
Croatia		3.37	1.67
Cyprus		2.66	0.84
Czech Republic	IT	3.34	2.00
Egypt, Arab Rep.		5.23	13.18
Estonia		4.43	2.79
Hungary	IT	7.52	3.00
India	IT	5.43	4.00
Indonesia	IT	14.88	3.50
Israel	IT	2.28	2.00
Jordan		2.81	3.73
Latvia		4.66	2.83
Lithuania		2.06	2.88
Malaysia		2.39	2.59
Malta		2.31	1.77
Mexico	IT	7.42	3.00
Morocco		1.77	1.42
Pakistan		5.61	9.47
Peru	IT	2.80	2.00
Philippines	IT	4.92	3.00
Poland	IT	4.64	2.50
Romania	IT	25.51	2.50
Russian Federation	IT	22.73	4.00
Slovak Republic		6.60	1.65
Slovenia		5.66	1.56
South Africa	IT	5.47	4.50
Thailand	IT	2.82	2.50
Turkey	IT	36.82	5.00
Venezuela, RB		21.17	68.15

For IT countries, the final column shows the target inflation for 2017

Table 21 The inflation targets for IT emerging economies

	Brazil	Chile	Czech Republic	Hungary	India	Indonesia	Israel	Mexico	Peru	Philippines	Poland	Romania
1998			6.00				8.50				9.50	
1999		4.30	4.50				4.00				7.20	
2000	6.00	3.50	4.00				3.50				6.10	
2001	4.00	3.00	3.00	7.00			3.00	6.50			7.00	
2002	3.50	3.00	3.00	4.50			2.50	4.50	2.50	5.00	5.00	
2003	3.25	3.00	3.00	3.50			2.00	3.00	2.50	5.00	4.00	
2004	5.50	3.00	3.00	3.50			2.00	3.00	2.50	4.50	2.50	
2005	4.50	3.00	3.00	4.00		6.00	2.00	3.00	2.50	5.50	2.50	7.50
2006	4.50	3.00	3.00	3.50		8.00	2.00	3.00	2.50	4.50	2.50	5.00
2007	4.50	3.00	3.00	3.00		6.00	2.00	3.00	2.50	4.50	2.50	4.00
2008	4.50	3.00	3.00	3.00		5.00	2.00	3.00	2.00	4.00	2.50	3.80
2009	4.50	3.00	3.00	3.00		4.50	2.00	3.00	2.00	3.50	2.50	3.50
2010	4.50	3.00	2.00	3.00		5.00	2.00	3.00	2.00	4.50	2.50	3.50
2011	4.50	3.00	2.00	3.00		5.00	2.00	3.00	2.00	4.00	2.50	3.00
2012	4.50	3.00	2.00	3.00		4.50	2.00	3.00	2.00	4.00	2.50	3.00
2013	4.50	3.00	2.00	3.00		4.50	2.00	3.00	2.00	4.00	2.50	2.50
2014	4.50	3.00	2.00	3.00	8.00	4.50	2.00	3.00	2.00	4.00	2.50	2.50
2015	4.50	3.00	2.00	3.00	6.00	4.00	2.00	3.00	2.00	3.00	2.50	2.50
2016	4.50	3.00	2.00	3.00	4.00	4.00	2.00	3.00	2.00	3.00	2.50	2.50
2017	4.50	3.00	2.00	3.00	4.00	3.50	2.00	3.00	2.00	3.00	2.50	2.50

Note: these are the point targets where they exist, or the mid-points of target ranges.

Table 22 Robustness: The effect of ITs on performance after the financial crisis (Advanced Economies) – Treat Iceland as non-ITer

	(1) Inf_deviation	(2) Inf_deviation	(3) Inf_avg	(4) Inf_avg	(5) Inf_sd	(6) Inf_sd	(7) GDP_avg	(8) GDP_avg	(9) GDP_sd
Crisis*IT	-0.169		0.164		-0.212		0.019		0.013
	(0.219)				(0.424)				(0.2390)
Crisis	0.574**	1.056***	-0.369	0.458	0.319	0.899**	-0.066***	-0.045**	-0.011
	(0.173)	(0.279)	(0.334)	(0.551)	(0.189)	(0.302)	(0.008)	(0.013)	(0.009)
Crisis *ITorEuro		-0.646*		-0.903		-0.781*		-0.016	
		(0.283)		(0.558)		(0.306)		(0.013)	
cons	0.794***	0.794***	2.011***	2.011***	0.673***	0.673***	0.074***	0.074***	0.092***
	(0.107)	(0.102)	(0.206)	(0.201)	(0.116)	(0.110)	(0.005)	(0.005)	(0.006)
N	52	52	52	52	52	52	52	52	52
R2	0.197	0.265	0.025	0.072	0.055	0.153	0.619	0.601	0.035

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively.

Table 23 Robustness: The effect of ITs on performance after the financial crisis (Emerging Economies) – Treat Turkey as non-ITer

	(1) Inf_deviation	(2) Inf_deviation	(3) Inf_avg	(4) Inf_avg	(5) Inf_sd	(6) Inf_sd	(7) GDP_avg	(8) GDP_avg	(9) GDP_sd
Crisis*IT	-5.574		-4.153		-4.672		0.004		-0.015
	(3.660)				(3.653)		(0.013)		(0.023)
Crisis	1.531	3.278	0.339	2.821	1.559	3.317	-0.064***	-0.052***	-0.004
	(2.911)	(3.244)	(2.801)	(3.081)	(2.906)	(3.235)	(0.011)	(0.012)	(0.018)
Crisis*ITorEuro		-6.847		-7.153*		-6.251		-0.017	
		(3.582)		(3.402)		(3.573)		(0.012)	
cons	5.052**	5.052**	7.359***	7.359***	5.052**	5.052**	0.105***	0.105***	0.129***
	(1.788)	(1.770)	(1.721)	(1.682)	(1.785)	(1.766)	(0.006)	(0.006)	(0.011)
N	66	66	66	66	66	66	66	66	66
R2	0.037	0.056	0.026	0.070	0.025	0.047	0.424	0.438	0.014

Note: Standard errors in brackets. *, ** and *** represent significance at 10%, 5%, and 1% respectively. The dependent variables are the first differences of the variables at the top of the columns. avg and sd refer to average and standard deviation, respectively.