Martin T Bohl – David G Mayes – Pierre L Siklos

The quality of monetary policy and inflation performance: globalization and its aftermath

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The quality of monetary policy and inflation performance: globalization and its aftermath

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Abstract

With a few unfortunate exceptions the last three decades have seen reductions in inflation around the world to the point that many would argue that further improvements in price stability would offer only limited welfare gains. This experience is the result of many factors, some of which are country-specific. In this paper we seek to isolate one of the factors, namely, the improvement in the quality of monetary policy. There are two novel aspects to the study. Firstly, we essentially estimate a gravity-like model. Secondly, we propose generally a more exhaustive analysis of the potential role of a large number of institutional factors than has been done before. Briefly, we find that institutional factors play a role in explaining inflation relative to the US experience, which is used as the benchmark. Nevertheless, any reduction in inflation stemming from greater central bank autonomy is a feature of the 1980s and early 1990s. Thereafter, central banks in the OECD look very much alike.

Keywords: globalization, inflation differentials, monetary policy strategy, institutional change

JEL classification numbers: E42, E58, C33

Selittävätkö inflaation hidastumista rahapolitiikan institutionaaliset ominaisuudet vai globalisaation jälkivaikutukset?

Suomen Pankin keskustelualoitteita 31/2009

Martin T. Bohl – David G. Mayes – Pierre L. Siklos

Rahapolitiikka- ja tutkimusosasto

Tiivistelmä

Muutamaa poikkeusta lukuun ottamatta inflaatiovauhti on viimeisten kolmen vuosikymmenen aikana hidastunut merkittävästi kaikkialla maailmassa. Onkin väitetty, että hintavakauden parantuminen nykyisestä ei enää olennaisesti kohenna kansalaisten hyvinvointia. Hintavakauden parantumista voidaan selittää monella tekijällä, jotka ovat osin maakohtaisia. Tässä työssä keskitytään nimenomaan niihin tekijöihin, joiden ansiosta harjoitettua rahapolitiikkaa on kyetty laadullisesti parantamaan. Tämän tutkimuksen lähestymistapaa voidaan pitää uudenlaisena kahdesta syystä. Ensinnäkin tutkimuksen empiirisessä osassa estimoidaan eräänlainen gravitaatiomalli. Toiseksi työssä analysoidaan tyhjentävämmin kuin aiemmissa tutkimuksissa lukuisten institutionaalisten tekijöiden mahdollinen merkitys hintavakauden paranemisen kannalta. Tutkimustulosten mukaan näillä institutionaalisilla tekijöillä kyetäänkin osittain selittämään eri maiden inflaatiovauhdin hidastumista suhteessa Yhdysvaltoihin, jota käytetään tässä työssä vertauskohtana. Keskuspankin itsenäisyyden kasvun vaikutus inflaatiovauhdin hidastumiseen erottuu kuitenkin selkeimmin 1980-luvulla ja 1990-luvun alussa. Jälkeenpäin OECD-alueen keskuspankit näyttävät hyvin samanlaisilta.

Avainsanat: globalisaation, inflaatioerot, rahapolitiikan strategia, institutionaalinen muutos

JEL-luokittelu: E42, E58, C33

Contents

1 Introduction

With a few unfortunate exceptions the last three decades has seen reductions in inflation around the world to the point that many would argue that further improvements in price stability would offer only limited welfare gains. This experience is the result of many factors, some of which are country-specific (eg see IMF, 2006). In this paper we seek to isolate one of the factors, namely, the improvement in the quality of monetary policy. There is very considerable consensus at present over what constitutes 'good' monetary policy – see Woodford (2003) for example – but over that three decade period there has been considerable variety in policy just as there has been considerable variation in the concomitant inflation rates. As with any such study we have to be able to take account of the main range of other factors that could explain the differences in performance. We do this with a panel study of 20 OECD countries over the last 30 years using what is in effect a difference-in-differences estimator so that we can draw some conclusions for the role of monetary policy.

Not only is there some debate about the role that monetary policy has played but there are disagrements about whether particular monetary policy frameworks have been more effective than others (eg see Freytag and Schneider, 2007). Over much of the period the Swiss and German performance has been best, with monetary policy based on the control of monetary aggregates. However, since the Volcker years, the United States has also performed well with a somewhat pragmatic, some would say, flexible, policy. However, others have outperformed the United States, particularly with the rise of inflation targeting, and Switzerland and Germany no longer stand out as exceptional. Of course the comparison is complicated by the creation of the euro area, where a single monetary policy affects the inflation rates of 16 countries, 10 of which are in our sample. Additionally, one might wish to extend the range of countries affected to those with currency boards or with very tight pegs such as in Denmark.

Several papers have recently been written that attempt to document the extent to which inflation rates around the world have been driven by global factors (eg a partial list includes Borio and Filardo, 2007; Tootell, 1998; Gamber and Hung ,2001; Bean, 2006; Pain, Kospke, and Sollie, 2006; Tytell and Wei, 2004). In particular, there has been keen interest in the role that China's inflation rate has played in driving down inflation rates in various parts of the world (eg see Côté and De Resende, 2008). A related literature has documented how the Maastricht Treaty, and the requirements of inflation convergence among European Union member countries, may also have indirectly contributed to inflation developments around the globe (eg see Siklos, 2008, and references therein). There continues to be an ongoing debate about the role that the choice of a monetary strategy plays in generating a particular inflation outcome. For example, the jury is still out about

whether the adoption of explicit inflation targets independently contributes to consistently, or even permanently, anchoring inflationary expectations (eg Mishkin and Schmidt-Hebbel, 2007). Most would not object to interpreting an inflation targeting strategy as one that has succeeded in reducing inflation. The controversy is whether this kind of monetary policy works better than others that have been tried in the past, and were found wanting, such as a rigid exchange rate peg. Finally, there is a lingering view that certain institutional characteristics that describe both the relationship between the central bank and government, and the manner in which central bank sets the course of monetary policy, should also be a significant factor in overall inflation performance (eg Acemoglu et al, 2008). After all, the drop in inflation worldwide also took place when central banks both became more autonomous, accountable, and transparent (eg Dincer and Eichengreen, 2007; van der Cruijsen and Eijffinger, 2008). Needless to say, there are skeptics of the notion that there are significant links between central bank institutional characteristics and inflation performance (eg Hayo and Hefeker, 2008).

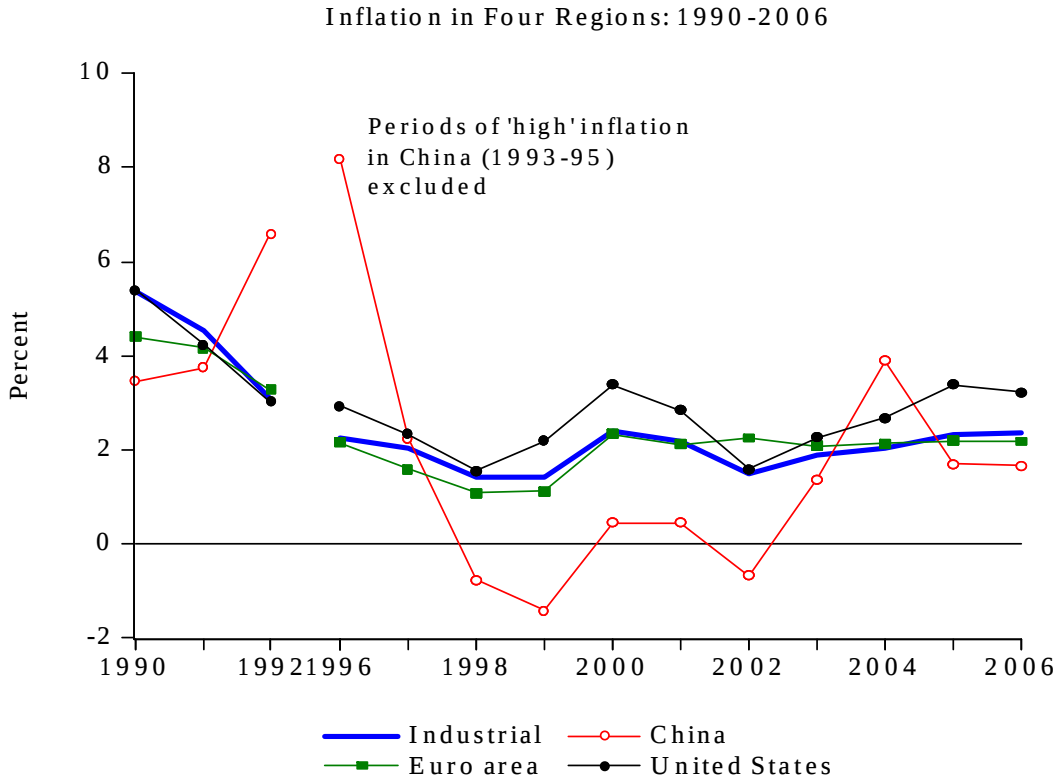
Figure 1.1 plots inflation in the 1990s, as well as inflation since the 1960s for different regions of the world. The apparent convergence of inflation rates seems clear from the data for the 1990s while a longer run perspective suggests that cross-country similarities in inflation rates is not exactly a new phenomenon. We have seen this before, although both the institutional and policy environments of the 1960s versus the 1990s are, of course, markedly different.

This paper is firmly in the camp of studies relying on a fairly large cross-section of countries over the past decade and a half that asks: to what extent are institutional or global factors, whether of the economic or political varieties (eg see Eichengreen and Leblang, 2006), responsible for the fall in global inflation? However, unlike other studies (eg Borio and Filardo, 2007) we eschew reliance on a global measure of the slack in output, in part because this proxy has proved somewhat controversial (eg see Ihrig et al, 2007). Instead we consider a measure of economic distance, originally proposed by Alesina and Grilli (1992) which, given the difficulties inherent in proxying global factors in the first place, seems both an intuitively plausible and tractable way of capturing international influences on inflation in a cross-sectional model of the kind used here.

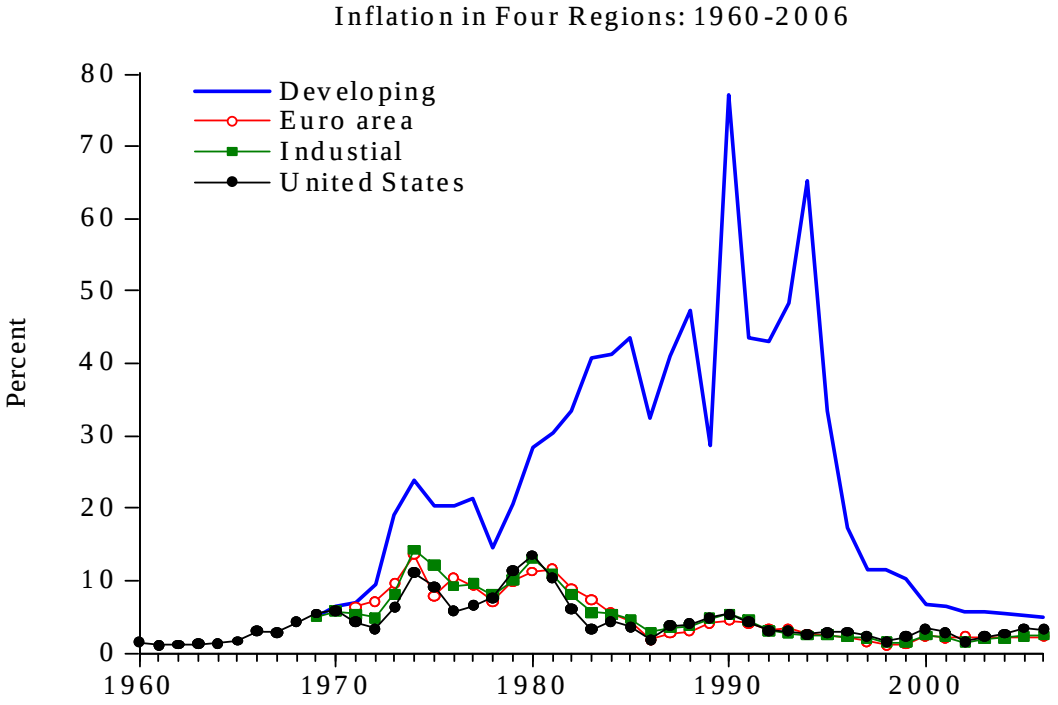
The rest of the paper is organized as follows. First, we briefly survey some of the approaches that have been taken to address the impact of globalization on inflation performance. Next, we outline the methodology used to estimate our version of the determinants, institutional or otherwise, of inflation in a cross-sectional framework. Then, we turn to a description of the data and a discussion of some stylized facts, prior to presenting the empirical results. The paper concludes with a summary and explores potential avenues for future research.

Figure 1.1

A.



B.



Note: Inflation is defined here as 100 times the firs log difference in the CPI. Data are annual from the International Monetary Fund's International Financial Statistics CD-ROM.

Briefly, we find that institutional factors play a role in explaining inflation relative to the US experience, which is used as the benchmark. Nevertheless, any reduction in inflation stemming from greater central bank autonomy is a feature of the 1980s and early 1990s. Thereafter, central banks in the OECD look very much alike. For this reason, the ongoing financial crisis will provide in future not only a means of testing the robustness of our results but may well permit researchers to sort out the question whether some monetary policy strategies are better than others. In particular, we may well be able to answer more definitively whether, as Mishkin (2009) argues, '…increased commitment to stabilizing inflation [is] the right thing to do when we are in the throes of a financial crisis…'.

2 Background literature

There exist a variety of approaches taken to explore the connection between inflation and its global determinants. Some estimate a Phillips curve, or some version of it, and ask whether the trade-off has weakened in recent years. Various reasons are given such as general improvements in the conduct of monetary policy or perhaps due to the so-called Great Moderation (Bernanke, 2004) which began during the mid 1980s, interpreted as a reduction in both the frequency and size of economic shocks (eg Ball and Sheridan, 2005; Borio and Filardo, 2007).

Alternatively, the suggestion is that global factors, especially during the second half of the 1990s and early in the 21st century, have contributed significantly to explaining cross-country inflation performance. Nevertheless, the evidence concerning the role of globalization is not yet conclusive. Disagreements about the relative importance of global factors stem partly from the manner in which the aggregate supply curve is empirically specified, namely the extent to which backward versus forward-looking elements in the trade-off are allowed to determine current inflation. Perhaps more importantly, there have been concerns expressed over the measurement and reliability of global measures of output slack. For example, Borio and Filardo (2007) estimate a weighted average of international output gaps, where the latter are approximated via H-P filtering (other filters are also considered) and find that these help us understand the determination of inflation. Ihrig et al (2007) report that how the global output gap measure is estimated matters and that Borio and Filardo's results are not robust.

A different approach has been to determine empirically the extent to which inflation from China, whose economic importance has grown considerably in recent years, has been imported. This development has taken place at the same time as views about the extent to which pass-through effects from exchange rate changes to inflation have moderated considerably in recent years as inflation expectations have become better anchored (eg Balliu and Fujii, 2004; Campa,

Goldberg and Gonzalez-Minguez, 2007). The role of pass-through effects is not entirely divorced from an earlier literature, starting with Romer (1993), who reports a negative correlation between inflation and the degree of economic openness.[1] Accordingly, as globalization has grown in influence so have economies become more open with the implication that they have become less inflation prone. Also contributing to this outcome has been the relaxation in capital controls (eg see Edwards, 2007).

Another literature examines whether the international environment has become more competitive, again in no small part due to the rise of China and the remaining BRIC countries (viz., China, Brazil, Russia, and India), thereby driving down inflation on a global scale (eg see Guerrieri, Gust, Lopez-Salido, 2008).

Finally, an altogether different approach tries to find some common features in the data. These may emerge as a form of convergence in inflation across various parts of the world, which can be approximated according to whether inflation differentials between pairs of countries are stationary. The more cointegration that is found between inflation rates the fewer common trends there are. Siklos and Wohar (1997) show that, in a sample of N countries, convergence requires not only that there must be N-1 cointegrating vectors but that they must be of the (1, -1) form. Alternatively, as in Busetti et al (2007), the simple inflation differential must be stationary. Clearly, if there is a global connection that drives inflation rates to be attracted to each other, this can imply that inflation rates are cointegrated. Unfortunately, this approach is not directly informative about the source of the cointegration, namely whether it stems from institutional factors, the monetary policy strategy that is followed, or other factors?[2]

Indeed, this kind of strategy has been indirectly criticized because the so-called convergence in inflation is simply thought to represent a regression to the mean. Ball and Sheridan (2005) contend that the superior inflation performance of an inflation targeting regime, a policy choice that involves considerable institutional transformation (eg see Bernanke et al, 1999), is merely a statistical artifact (Ball, 2006). They estimate a regression of the form

$$\overline{\pi}_{it} - \overline{\pi}_{it-1} = \beta_0 + \beta_1 \overline{\pi}_{it-1} + \varepsilon_{it} \qquad (2.1)$$

where $\overline{\pi}_{it}$ is average inflation in country i over period t, or regime, while $\overline{\pi}_{it-1}$ represents average inflation in an earlier 'period', or regime. The regime in question is, of course, inflation targeting and whatever other regime preceded it.

[1] Measured as the sum of exports and imports to GDP. While openness and other phenomena associated with what is commonly referred to as globalization may have exerted an impact on inflationary developments, Woodford (2007) finds it difficult to square this result with the notion of an increased difficulty for central banks to set their own course for inflation.

[2] Stock and Watson (2003) ascribe to 'luck' a significant portion of macroeconomic performance during the Great Moderation.

An estimate of the parameter β_1 is an empirical indication of the size and statistical significance of a 'regime shift'.

While Ball and Sheridan present evidence suggesting that inflation targeting did not represent an improvement (also see Dueker and Fischer, 2006), there have also been several critics of the approach implicit in (2.1), including Vega and Winkelried (2005), and Ragan (2005), who point out, among other faults with the Ball and Sheridan approach, that the results can be sensitive to the choice of the sample period chosen to compare one regime with an earlier one, and that the specification relies exclusively realized inflation. Inflation targeting is perhaps most distinctive in its attempt to anchor inflationary expectations directly.[3] Moreover, there is insufficient scope given to the subtle but important differences that exist concerning the idiosyncratic features of different inflation targeting regimes. In addition, there is too little recognition of the fact that inflation targeting has outlasted the obvious alternative 'global' monetary policy strategy, namely Bretton Woods (eg see Rose, 2007; Siklos, 2008a). Moreover, the Ball and Sheridan test does not make allowances for the notion that the choice of the regime is possibly endogenous. Hence, countries may have chosen inflation targeting because of a poor earlier historical record with inflation although some (eg Lin and Ye, 2007) contend that, as a result, the adoption of inflation targeting amounts to a form of 'window dressing'. Therefore, this kind of regime cannot independently explain the successful reduction in inflation. However, the transparency normally entailed by inflation targeting makes it rather difficult for the policy to be simply window dressing – one of the sources of its success is that the authorities have to make a visible commitment for the policy to be credible. Moreover, the test of accountability for an inflation targeting regime is more demanding than for competing monetary policy strategies. Notably, the central bank is more autonomous but, in the bargain, must publicly explain itself if the agreed to inflation control ranges are violated.

Finally, the Ball and Sheridan approach essentially amounts to treating inflation targeting as a 'straw man' thereby setting up the test for failure of the regime while ignoring other forces that may impinge on inflation performance, especially the role of 'globalization'. This is the view taken by, among others, Rogoff (2003) who argues that global factors, difficult as they may be to measure, lie behind a significant portion of the reduction in inflation worldwide in recent years. Performance under inflation targeting somehow needs to be compared with how performance might have been under an alternative, and perceived to be, good monetary policy.

Another global factor, emphasized in the literature that addresses the consequences of institutional arrangements more explicitly, concerns the impact

[3] Other monetary policy frameworks also try to anchor expectations. A currency board for example tries to relate them to inflation in country of the backing currency.

of central bank independence (CBI). To say that the evidence in favor of central bank independence reducing inflation is mixed is an understatement. Supporters of a connection between CBI and levels of inflation abound (eg Cukierman, 1992; Grilli, Masciandaro, and Tabellini, 1991; Eijffinger and de Haan, 1996; Siklos, 2002) but a number of valid concerns and objections about how *de jure* forms of CBI are constructed have also been leveled at this literature (eg Banaian, Burdekin and Willett, 1998; Mangano, 1998).[4]

Just as criticisms of the inflation strategy have emerged, there have been similar doubts raise about the resort to monetary aggregates to control inflation (Bernanke and Mishkin, 1992), in spite of the prominent role of this kind of indicator as one of the pillars in the monetary policy strategy of the European Central Bank (ECB).

Finally, exchange rate regime choice considerations have often loomed large in the literature that considers the driving forces behind inflation performance (eg see Reinhart and Rogoff, 2004). In a related fashion, crises of the financial variety may also, perhaps indirectly, contribute to inflation performance. Attempting to take account of this possibility also raises a number of thorny econometric issues which are highlighted in the following section.[5]

Neglected in all the foregoing arguments is that the mere declaration of a desire for lower inflation, or inheriting a lower inflation from abroad, does not take place in a vacuum. Institutions, and how they adapt to changing domestic and international circumstances, may also have had a role in changes in inflation performance worldwide. It is with this in mind that the methodological approach followed in this paper, while not entirely dissimilar to the Ball and Sheridan approach, is substantively different in emphasis, as is shown below.

[4] Concerns about the subjectivity of *de jure* measures of CBI led some authors to resort to proxies for *de facto* forms of CBI, such as turnover rates of central bank governors.

[5] In the sample of countries considered below, virtually none of them suffered either a banking or a currency crisis. The only exceptions are: Finland (1991–1993), Japan (1997), Norway (1991), and Sweden (1991, 1993). In contrast, hardly a year has gone by during the 1990–2006 period examined when one or several countries did not experience a banking or a currency crisis. It is, therefore, unlikely that directly accounting for crises will be fruitful. For a compendium of crisis events, see Laeven and Valencia (2008).

3 Methodological considerations

This section has two parts. In the first we consider how the model and the variables within it can be specified. In the second we explore the nature of the data available and the problems they pose for estimation.

3.1 Estimation strategy

This paper proposes to explain the determinants of inflation convergence among industrial countries and the role played institutional factors. Quarterly data from 20 OECD countries, for the most part since 1990, are used in a panel setting.[6] There are two novel aspects to the study. First, we essentially estimate a gravity like model. Second, we propose generally a more exhaustive analysis of the potential role of a large number of institutional factors than has heretofore been done.

One can view the proposed specification as akin to a differences-in-differences estimator. Hence, if we treat a particular country as having followed the most desirable monetary policies, on average, then the tests below emphasize the attraction, or pull, of that particular benchmark country in influencing the others' inflation. We have used the US as our main focus, to quite some extent because it followed the typical route of letting inflation get out of control, recognizing the problem and putting in place a strategy to establish price stability.[7] All countries in the sample had more or less flexible exchange rates vis-à-vis the US.[8] This transforms the problem into one that asks: what determines the differential in country pair's inflation rates. The basic specification can thus be written as follows

$$\ln \pi_{ijt} = \alpha_0 + \alpha_t + \alpha_{ij} + \beta' Z_{ijt} + \varepsilon_{ijt} \qquad (3.1)$$

[6] It is natural to want to consider as large as possible a panel to investigate the issues under study. However, if one takes seriously the results and Acemoglu et al (2008) – and the comments on this study were rather critical – then institutional factors matter a great deal more when there are significant constraints on the political principals. There are, in addition, as will become clearer in the discussion below, data availability constraints. All the countries in our data set, save Portugal and Spain, are ones with high constraints on the executive. See the appendix in Acemoglu et al (2008).

[7] An alternative benchmark could be the euro area. Indeed, the tests below were also repeated for this case and the conclusions are largely the same. One difficulty with this alternative benchmark is that the euro area has only formally existed since 1999, although pseudo-data can be generated as far back as the 1980s. While there may be other benchmarks one could consider it is difficult to conceive of better ones than either the US or the euro area.

[8] According to Levy-Yeyati and Sturzenegger (2002).

where π_{ijt} is the inflation differential between country i and j,[9] and α are three constants, the first common to all country pairs and years, the second specific to year t, and the third specific to country pairs but constant through time (eg these would include country and region dummies). Z_{ijt} is a vector of 'gravity' variables. Following the usual convention in the literature $\beta_{ijt} = \beta'$ (though these are testable hypothesis, of course). Cheng and Wall (2005) give an overview of specifications such as equation (3.1) and suggest that a model which includes country fixed pairs effects performs best in statistical terms. Note that one test of convergence, namely the unit root or cointegration version of the test for convergence, would set $\alpha_t = \alpha_{ij} = \beta' Z_{ijt} = 0$ thereby concluding that inflation differentials are stationary. One of many tests for panel unit roots can also be used to confirm or reject this hypothesis.

Critical to (3.1) is the definition of Z_{ijt}. Relying on the arguments made above these consist of measures of central bank autonomy, transparency and accountability, qualitative measures of governance, the type of exchange rate regime or monetary policy strategy in place, a measure of economic distance suggested by Alesina and Grilli (1992), and a measure of relative 'stress' in monetary policy as a proxy for 'distance' in the stance of monetary policy. Qualitative indicators of transparency from Siklos (2002, Chapter 6, 2008) were also employed. An alternative measure of transparency is from Dincer and Eichengreen (2007) which was also applied to the data. These include the type of central bank information that is released (eg whether there is an inflation report, whether staff forecast are publicly available, whether fixed dates are made for interest rate announcements, and so on). Governance variables are constructed from Siklos (2002, 2008). They capture the size and type of committee structure, the frequency of meetings, whether committee votes are publicly made, whether committee decision-making is sanctioned by legislation or not. There is a growing body of evidence that associates the emphasis on greater transparency and accountability in central banking with better inflation performance (eg see Eijffinger and Geraats, 2006). Exchange rate regimes and monetary policy strategy classifications are from Levy-Yeyati and Sturzenegger (2002) and Reinhart and Rogoff (2004).

While measures of central bank autonomy, such as the seminal ones created by Cukierman (1992) and since used by many authors (see Siklos, 2008b, and references therein), have been criticized for valid reasons (eg see Acemoglu et al, 2008; Banaian, Burdekin, and Willett, 1998), they contain a grain of truth about what explains inflation rates (also see Polillo and Guillén, 2005) and, possibly more importantly, inflation differentials. Finally, recent improvements are refinements in the measurement of political and economic independence of central

[9] Following Cukierman (1992), we define ln(1+%ΔP/100), where %ΔP is the percent change in consumer prices, to represent inflation.

banks (Arnone, Laurens, Segolatto, and Sommer, 2007), building upon the original work by Grilli, Masciandaro, and Tabellini (1991), seem to be associated with changes in inflation performance, at least for several regions of the world (Arnone, Laurens, Segolatto, Sommer, 2007).

Economic distance refers to an indicator of divergence in output performance defined as the ratio of standard deviations adjusted for the correlation in output growth between two countries based on a four year moving average. Since Alesina and Grilli (1992) introduce this measure as a short-hand way of evaluating the likely costs of monetary union this is a natural variable to use in the present context to represent some of the economic forces contributing to inflation convergence. Presumably, the smaller are the differences in output performance between pairs of countries the smaller the costs of inflation convergence. More precisely, the Alesina and Grilli (1992) statistic is evaluated as

$$((\sigma_i / \sigma_j)^2 + (1 + \rho_{ij})^2)^{1/2} \tag{3.2}$$

where σ is the standard deviation of output growth in countries i and j, and ρ_{ij} is the simple correlation in output growth between countries i and j. Expression (3.2) makes it clear that economic distance is a function of the variation in output growth (or inflation) in one country relative to some benchmark, as well as how closely income (or inflation) are correlated between these same pairs of countries. As output growth volatility in country i rises over time relative to that of the US, this will also likely reduce the correlation between the growth rate of the i,j country pair. Consequently, economic distance will rise and this reflects divergences in economic performance between pairs of countries. The data reveal (not shown, but see the Appendix) that there has been considerable variation in economic distance over the decade of the 1990s and, while cross-country differences persist, differences have narrowed since the early 1990s.

Contrary to the belief held by some that economic growth in the US was becoming decoupled from the rest of the world the evidence suggests, at least for many of the OECD economies in our sample, that growth correlations have actually risen over time. Nevertheless, it is interesting to note that there is a discrepancy between those economies that chose an inflation targeting strategy, who have generally seen their growth correlations with the US falling, and other

non-inflation targeting countries.[10] Interested readers can examine the relevant plots in an appendix (not shown).[11]

The measure of 'distance' in the stance of monetary policy is simply the difference between country pairs ij in a measure of 'stress' introduced by Clarida, Gali, and Gertler (1998) that is meant to '…gauge how different interest rates might be but for a binding commitment to an exchange rate arrangement, monetary union, or currency board.' The proposed stress indicator for each country i is evaluated as the difference between the central bank's interest rate instrument and the rate predicted by an interest rate rule.

$$\text{STRESS}_i = i_{i,t} - \beta E\left(\pi_{jt+n} \middle| \Omega_t\right) - \gamma E\left(z_{jt} \middle| \Omega_t\right) \tag{3.3}$$

where i is the central bank interest rate instrument, π is inflation, and z are other variables in the central bank's reaction function (usually the output gap, but in open economies the real exchange rate too). STRESS_{ij} is then the differential in stress measures between pairs of countries i and j. The larger the value of the STRESS variable, the greater the 'distance' in the monetary policy stance between countries i and j. the weights β and γ reflect the central bank's preferences for inflation versus output gap control. For reasons explained below, instead of estimating these coefficients we impose values that are thought to capture how the 'typical' central bank trades-off inflation and output gap objectives in OECD economies.

3.2 Data and stylized facts

Annual data since at least 1990 are used to estimate a version of equation (3.1). The data are essentially either quantitative (eg inflation, output, output gap) or qualitative (eg central bank autonomy, transparency, etc…) represented by categorical variables. More detailed sources are provided in the appendix, as well as the mnemonics for the variables used and the country codes.

[10] To be fair, the decoupling view was primarily associated either with the evolution of economic growth between emerging markets and the US, and not necessarily between OECD economies and the US Siklos (2008) shows that the decoupling hypothesis does not hold even when emerging market economies are considered. However, there has been a reduction in growth correlations between economies that have adopted inflation targeting and the US that is noticeably stronger than among economies that do not target inflation and US economic growth. These same correlations were not generated for the euro area and the economies in our sample since half the countries in this study eventually adopted the euro.

[11] It is also noteworthy that correlations can be interrupted by crisis (eg the 1992 ERM crisis).

3.2.1 Inflation

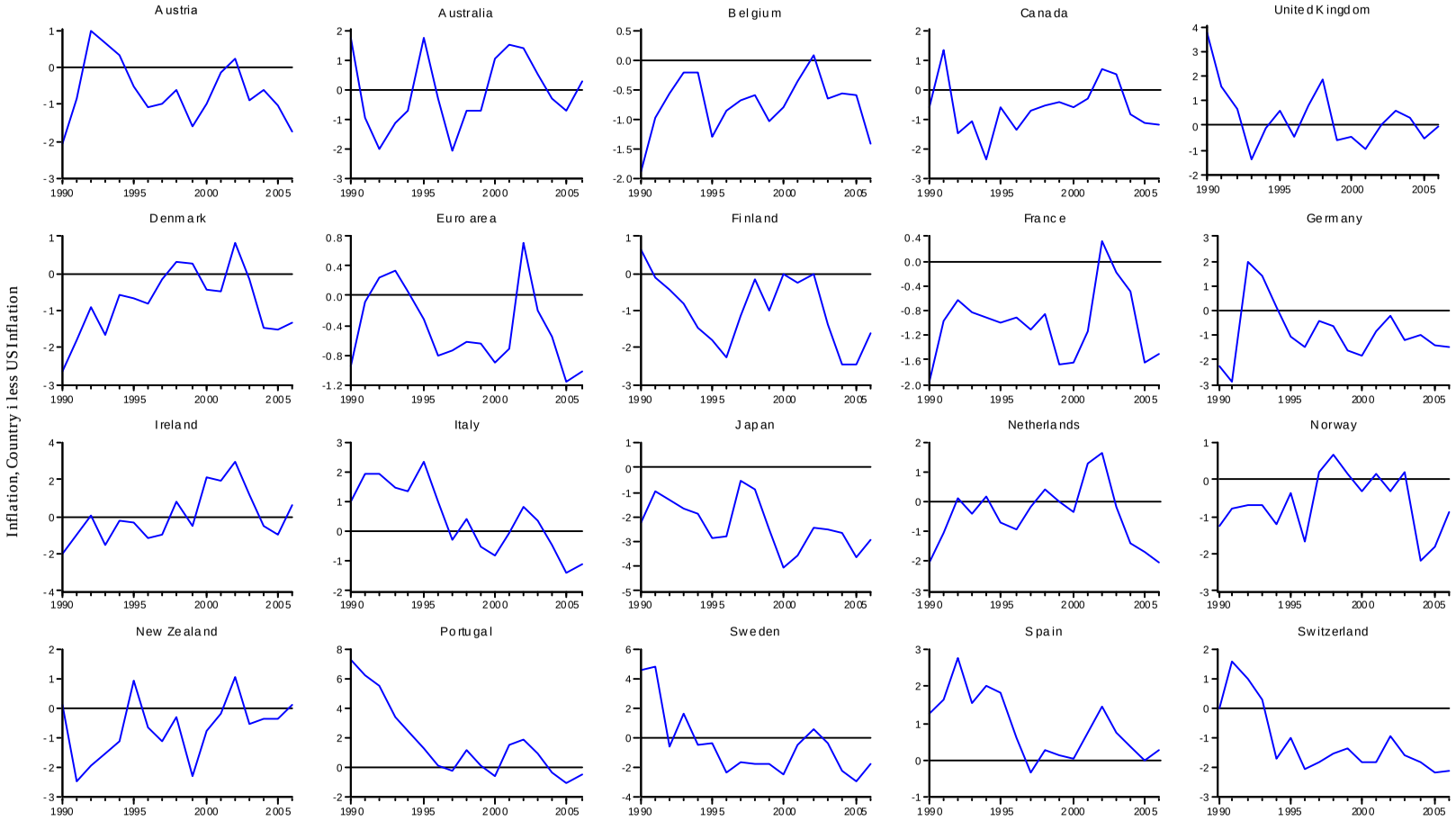
Figure 3.1 plot the inflation differentials vis-á-vis the US during the 1990s while the same plot showing the differential during the decade of the 1980s is shown in Figure 3.2. By the 1990s US inflation is not much different than inflation in almost all of the OECD countries considered in this study. The results are not substantially different when the benchmark is the euro area, again for data since the 1990s. Note that some countries (eg Portugal, Sweden, even the UK) have experienced larger disinflations relative to the US than many other countries. Indeed, by the end of the 1990s, inflation differentials become small, often below 1%. In contrast, the 1980s (Figure 3.2) sees US inflation as substantially lower than it is elsewhere in the OECD. Moreover, the order of magnitude of the inflation differentials during the 1980s is many times higher than in the 1990s, and thereafter. The change in cross-country inflation performance is nothing short of dramatic. One of the only exceptions is Japan which returns consistently lower inflation than in the US.

Is the comparison between the 1980s and 1990s and beyond the correct one? To the extent that the last two decades or so have seen the introduction of major changes in the relationship between central bank and their governments, on the one hand, and the public, on the other, as well as the absence of major aggregate supply shocks, the answer is yes. Table 3.1 presents decanal data on mean inflation differentials between the US and the remaining OECD economies in our sample since 1960. Whereas relatively few countries had inflation rates that were, on average, lower than in the US during the 1960s (only 1 country), or the 1970s (4 countries), the situation changes rapidly thereafter with 6 countries during the 1980s and 15 countries displaying inflation performance superior to that in the US.[12] Moreover, a stylized fact often ignored, is the substantial drop in inflation volatility, with the most notable drop occurring beginning during the 1990s. Volatility plays a role in the diminution of economic distance, as we shall see below.[13]

[12] Not all the differentials are, of course, statistically significant. Blanchard and Simon (2001) drew attention to the drop in volatility of inflation and real economic growth that has since come to be called the Great Moderation.

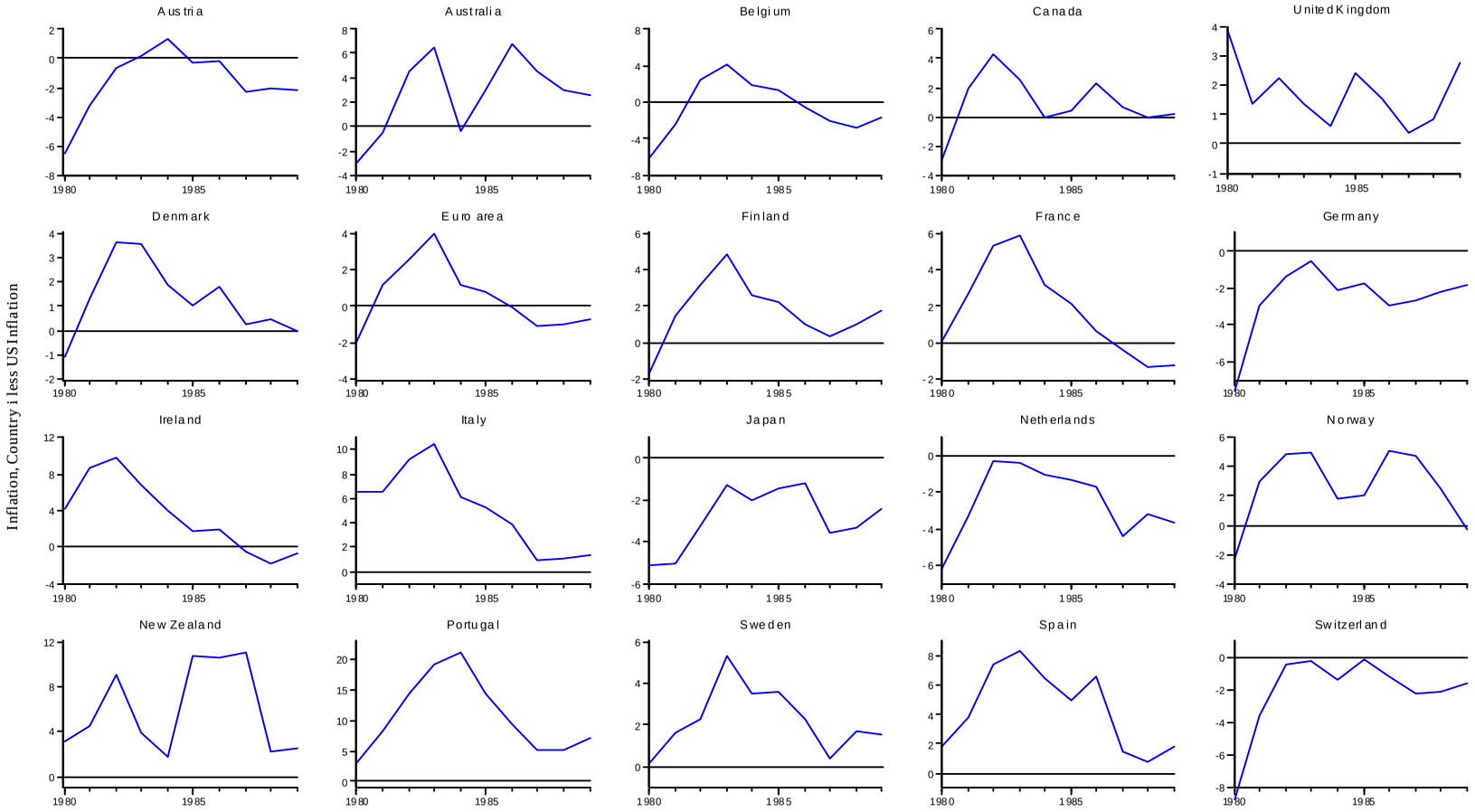
[13] There are other ways to bring in a role for volatility but these will not be considered here any further. The components of economic distance were previously described. A plot of economic distance is relegated to an appendix. it is interesting to note that while economic distance has diminished between the US and the other OECD economies in our data, the same is not necessarily true of emerging markets (eg China; results not shown).

Figure 3.1 **Inflation differentials vis-a-vis US inflation: 1990–2006**



Note: The differential is defined as the inflation rate in country I less inflation in the US. Inflation is here defined as in Figure 1.1.

Figure 3.2 **Inflation differentials vis-a-vis US: 1980–1989**



Note: The differential is defined as the inflation rate in country I less inflation in the US. Inflation is here defined as in Figure 1.1.

Table 3.1 **Summary statistics**

Sample: 1960–1969	AU	AUD	BE	CA	DNK	FI	FR	GE	IR	IT	JP	NE	NO	NZ	PT	SE	SP	SW	UK
Mean	1.06	0.09	0.50	0.24	3.24	2.70	1.38	0.09	1.91	1.40	3.01	1.89	1.38	1.03	1.68	1.27	3.65	0.88	1.35
Std. Dev.	2.04	1.53	1.50	0.56	2.33	3.16	1.55	2.06	1.68	3.01	2.20	1.60	2.09	1.17	0.66	2.27	4.04	1.92	1.23
Observations	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

Sample: 1970–1979	AU	AUD	BE	CA	DNK	FI	FR	GE	IR	IT	JP	NE	NO	NZ	PT	SE	SP	SW	UK	EA
Mean	0.93	2.48	0.01	0.26	2.02	2.98	1.67	1.96	5.09	4.68	1.75	0.03	1.19	3.99	8.71	1.38	6.50	2.02	4.95	1.66
Std. Dev.	2.86	3.06	2.99	1.60	1.77	4.02	1.32	2.80	3.49	3.65	4.61	3.35	3.03	3.03	5.88	2.49	4.58	3.67	4.14	2.09
Observations	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9

Sample: 1980–1989	AU	AUD	BE	CA	DNK	FI	FR	GE	IR	IT	JP	NE	NO	NZ	PT	SE	SP	SW	UK	EA
Mean	-1.60	2.71	-0.60	0.91	1.29	1.68	1.70	-2.60	3.41	5.13	2.87	2.53	2.63	5.93	10.8	2.25	4.34	-2.15	1.75	0.48
Std. Dev.	2.20	3.18	3.08	1.95	1.50	1.75	2.58	1.90	4.03	3.35	1.44	1.91	2.45	3.89	6.23	1.56	2.78	2.53	1.09	1.82
Observations	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Sample: 1990–2006	AU	AUD	BE	CA	DNK	FI	FR	GE	IR	IT	JP	NE	NO	NZ	PT	SE	SP	SW	UK	EA
Mean	-0.65	-0.08	-0.75	-0.64	-0.78	-0.99	-1.01	-0.87	0.05	0.48	-2.31	-0.42	-0.62	-0.67	1.74	-0.43	0.90	-1.11	0.33	-0.44
Std. Dev.	0.83	1.23	0.48	0.86	0.89	0.95	0.58	1.22	1.39	1.14	1.00	1.05	0.81	1.00	2.51	2.28	0.87	1.14	1.23	0.54
Observations	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17

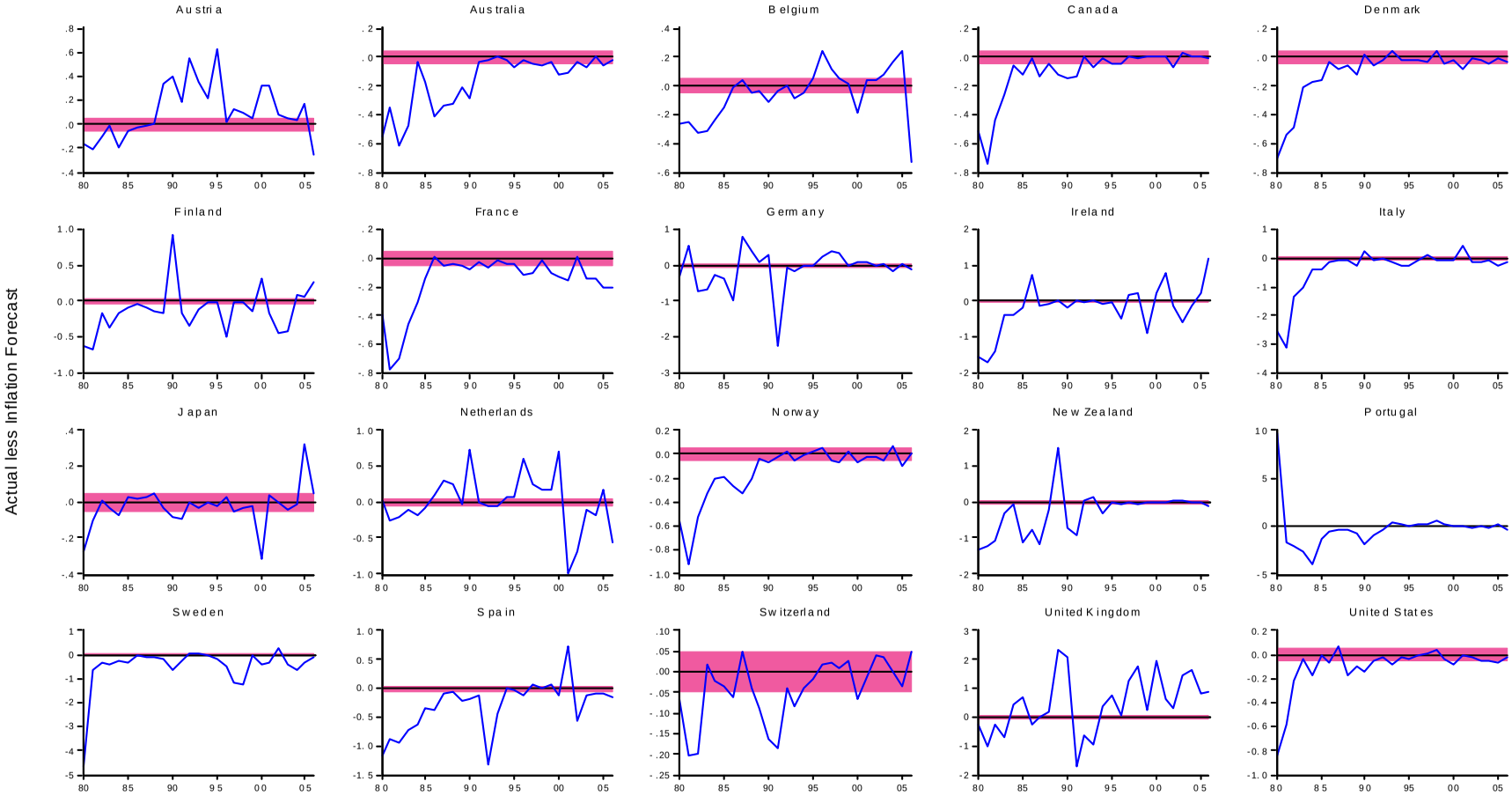
3.2.2 A measure of the perceived success monetary policy framework: inflation expectations

A measure of the success of institutional reforms, or the adoption of an alternative monetary policy strategy, is how credible these attempts are. An obvious means of assessing the credibility effects is to examine a proxy for inflation expectations. Unfortunately, comparable to data going back decades is difficult to collect. Figures 3.3 and 3.4 plot forecast errors from the IMF's World Economic Outlook since 1980 and, depending upon availability, forecast errors based on the poll of Forecasters in The Economist or the Consensus Forecasts (www.consensuseconomics.com). A band around these forecasts of ±0.5% is also shown. Admittedly, the size of the band is somewhat arbitrary but such a band translates, after 10 years, into a cumulative error of approximately 5%. This is judged to be sufficiently large so that failure to remain within this band over an extended period of time is likely to reduce the credibility of any regime. Notwithstanding the fact that the methodology used to generate these forecast can differ by source, we find that whereas forecast errors were large during the 1980s the tolerance band is clearly much more visible when data since the 1990s only are examined. Again, this is suggestive of a shift in the behavior and performance of inflation between the two decades. Perhaps just as interesting is that when the data over the past two decades are examined, as summarized in Figures 3.1 through 3.4, and in Table 3.1, there is considerable diversity in the inflationary experience, even among the relatively small group of 20 OECD economies.

3.2.3 Measuring the stance of monetary policy

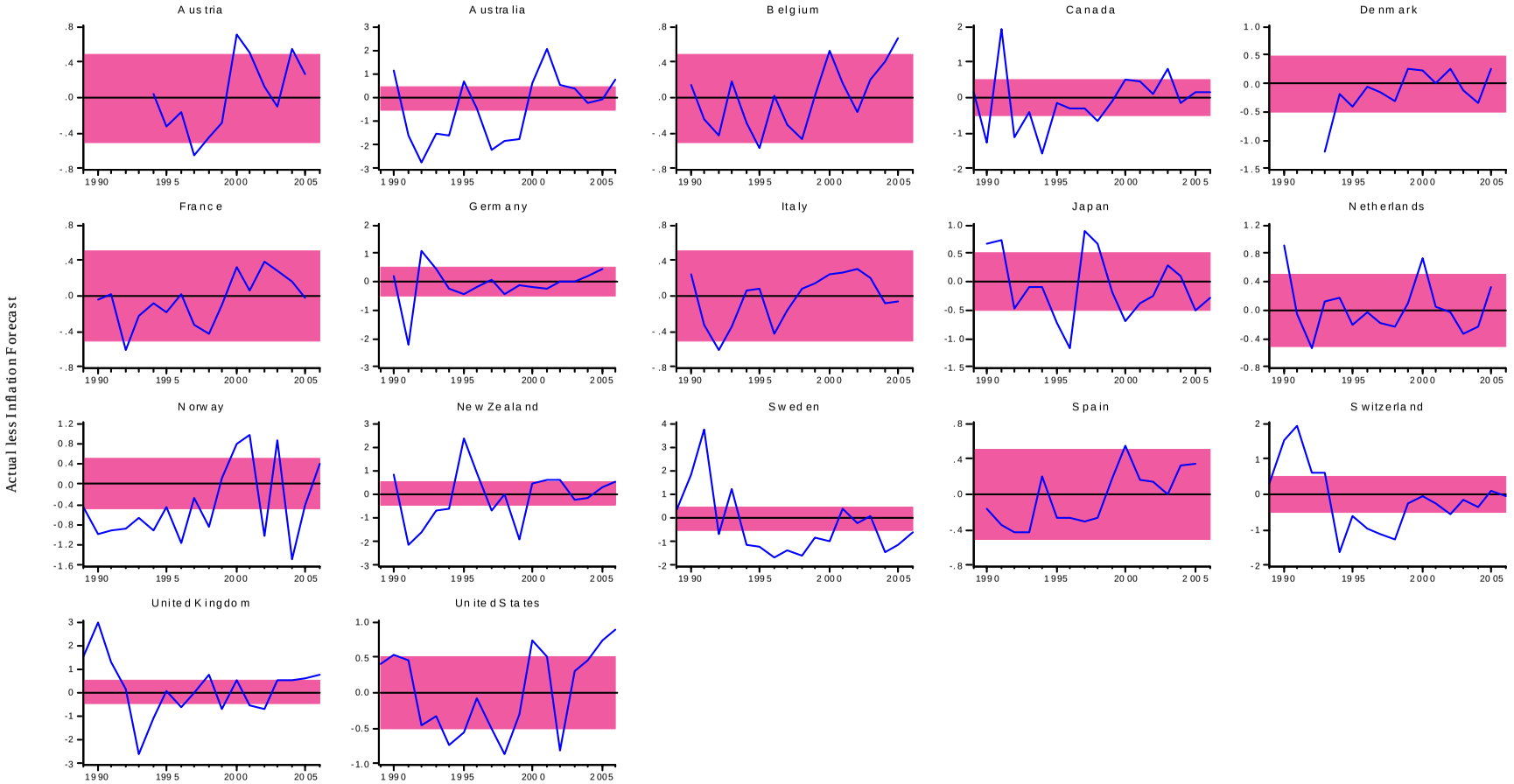
There are also differences in how monetary policies are carried out. One question is how best to proxy the stance of monetary policy in such a cross-sectional setting for over 2 decades worth of data. Two alternatives are considered. While it is standard practice to assume nowadays that an interest rate instrument is used to depict how central banks set the stance of monetary policy this was not always so. Indeed, when contrasting the conduct of monetary policy over two decades or more of data, it is less likely that an interest rate instrument will be suitable to determine how central banks implemented policy. Some central banks (viz., the ECB, and the Bank of Canada; see Armour, Atta-Mensah, Engert, and Hendry, 1996; Roffia and Zaghini, 2007) have, for some time, shown that the money gap is a useful predictor of inflation. Essentially, this amounts to finding the difference between a narrow monetary aggregate (eg M1) and the level of money predicted by a long-run cointegrating relationship that defines money demand. This means estimating an expression of the form

Figure 3.3 **Inflation forecast errors based on WEO estimates: 1980–2006**



Note: Actual inflation (as defined in Figure 1.1) less the inflation forecast. Sources of data are given in Figure 1.1, the text, and the Appendix.

Figure 3.4 **Inflation forecast errors: 1990–2006 based on consensus/economist forecasts**



Note: Actual inflation (as defined in Figure 1.1) less the inflation forecast. Sources of data are given in Figure 1.1, the text, and the Appendix.

$$m_t = \alpha_0 + \alpha_1 y_t + \alpha_2 i_t + \alpha_3 T + \varepsilon_t \tag{3.4}$$

where m is the logarithm of the chosen money supply measure, y is the logarithm of real GDP, i is a short-term interest rate, and T is a time trend which may or may not be necessary as a proxy for the effect of financial innovations, an unobserved variable (at least until perhaps well after the fact). If the estimates reveal that there is some cointegration present in the data then a linear combination of some of the variables is stationary. Quite often, for a variety of countries, received empirical evidence reveals a single cointegrating vector. In that case, ε_t is stationary. The money gap then is simply the error correction term found by lagging the error term in equation (3.4) one period. The appendix to the paper (not shown) plots estimates of the money gap for each country in the data set.[14]

If we now consider the measurement of the stance or stress of monetary policy (see equation (3.3)) based on a Taylor rule approximation we also face a few difficulties. One approach might be to estimate some forward-looking rule that appears to best fit each country's interest rate behavior. Of course, during the period under study it is likely that the exchange rate played a greater or lesser role over time in setting interest rates (eg see Taylor, 2007, 2008). Moreover, estimation of such a rule requires a fair amount of data and one also has to be mindful of the choice of instruments when estimating these rules as it an have an important influence on the results (eg Clarida, Gali and Gertler, 1998; Siklos and Bohl, 2008). Given that a version of Taylor's original formulation seems to capture reasonably well the rule a central bank would have followed, on average, we follow Poole's (2006) approach and rely on the following definition of the instrument rule, that is

$$\hat{i}_{it} = \rho_i + \gamma_{i\pi}(\pi_{i,t-1} - \pi^*) + 100 \cdot \gamma_{i\tilde{y}} \tilde{y}_{i,t-1} \tag{3.5}$$

where π_{t-1} is last period's inflation rate, π^* is a target for inflation, $\tilde{y}$ is an estimate of the output gap, while $\gamma_\pi, \gamma_{\tilde{y}}$, respectively, represent the weights the central bank attach to inflation rates that depart from the target and the output gap., and ρ is the sum of the target rate of inflation and an estimate of the 'equilibrium' or 'natural' real interest rate. All coefficients are estimated for country i. We follow Poole in assuming that $\pi = 2\%$, the equilibrium real interest rate is 1.5%, so that $\rho = 3.5\%$, $\gamma_\pi = 1.5$ to satisfy the Taylor principle, while two alternative values for the output gap weight are considered, namely $\gamma_{\tilde{y}} = 0.5, 0.8$.[15]

[14] Estimates of cointegrating relationships are not shown but are available on request.

[15] Poole (2006) considers two alternatives for the weight on the output gap because the smaller weight fits the data better, but results in interest rates that are too smooth while the correct amount of volatility in US interest rates is obtained by increasing $\gamma_{\tilde{y}}$.

Consequently, an indication that the stance of monetary policy is tight implies that the difference between the predicted interest rate according to the Taylor rule and the actual policy rate is positive while loose policies would result in a negative value in the expression

$$STRESS_{it} = i_{it} - \hat{i}_{it} \tag{3.6}$$

Since the construction of the forecast errors and economic distance variables were described above, additional discussion is not necessary. Central bank independence is defined by relying on several proxies, also previously discussed. Ordinarily defined as indices that range from zero to one they are, in the main, qualitative indicators of the degree of autonomy from undue political pressure that the monetary authority enjoys. The higher the value of the index the more independent the central bank is. Finally, it is also plausible that some of the determinants of inflation considered in this study will interact with each other. However, to prevent us from estimating an over-parameterized specification, only the interaction between the stance of monetary policy and proxies for central bank independence is considered. Since a great deal of the controversy over the impact of policies and institutions on inflation has revolved around the influence of central bank autonomy, and how the monetary authority actually implements policy, the implied interaction seems to us a natural one to consider.

4 Empirical results

Table 4.1 presents a series of panel unit root test results. These consistently show that the null of a unit root in the inflation differential cannot be rejected regardless of the sample or the test employed. Hence, it is unlikely that the results to be discussed below are an artifact of the non-stationarity of the dependent variable in question. The remaining variables are stationary by construction or were found to be so using similar testing procedures (not shown). While the tests employed are fairly general there have been a number of recent developments in panel unit root testing that could conceivably overturn the results shown in Table 4.1. However, tests for a subset of the panel used in Table 4.1 (not shown but also see Siklos, 2008) suggest that the findings of the stationarity in the inflation differential in the chosen panel of countries is robust to other assumptions about the degree of heterogeneity and other cross-country variations that could affect the panel unit root test statistics.

Table 4.1 **Panel unit root test: differential vis-à-vis US inflation**

Panels	1980–2006	1980–1998	1990–2006	1999–2006
All countries: LLC	-4.29 (.00)	-5.37 (.00)	-5.64 (.00)	NA
IPS	-6.10 (.00)	-5.35 (.00)	-5.70 (.00)	NA
EA & Non-EA countries: LLC	NA	NA	-4.42 (.00)	-7.01 (.00)
IPS	NA	NA	-4.25 (.00)	-2.62 (.00)

Note: All countries is the panel of countries listed in the appendix. EA & Non-EA countries are the euro area and the remaining countries in the sample that are not euro area members. Data are annual. NA means not applicable. LLC is the Levin, Lin, and Chu panel unit root test, IPS is the Im, Pesaran, and Shin panel unit root test. The LLC assumes a common unit root, while the IPS test is based on individual unit root behavior. In both cases then null is the unit root. The panels are not balanced.

Next, we turn to the benchmark OLS fixed effects panel. The results are provided in Table 4.2. Both country-specific and time-specific fixed effects cannot be rejected.[16] It is immediately clear that estimates are highly sensitive to sample choice. In particular, estimation over the full 1980–2006 period suggests that only economic distance has a somewhat weak impact on the inflation differential vis-à-vis the US with a rise in the former leading to an increase in the latter, as would be expected. Nevertheless, on closer inspection, one sees that the full sample masks a notable change in inflation dynamics between the 1980–1998 and 1999–2006 periods.[17] The earlier period reveals that a combination of the stance of monetary policy and the impact of accumulated forecast errors significantly influenced cross-country inflation differentials against the US. Presumably, worse than expected domestic inflation forecast performance over time, a proxy for past central bank performance, led to an improvement in actual relative inflation performance. Of course, we are unable to identify the extent to which this outcome can be explained by the reaction of the monetary authorities to this indicator of their performance but it does appear that the statistical insignificance of the other control variables, notably the stance of monetary policy and central bank autonomy, cannot explain inflation differentials in the 1980–1998 period. However, matters change when we examine the 1990–2006 sample since both the stance of monetary policy and the interaction of the stance of monetary policy and central bank autonomy contribute to explaining inflation relative to the US. More precisely, when nominal interest rates are higher than necessary, according to the

[16] Only the joint test of country and time-specific fixed effects is shown. However, separate testing does not change any of the conclusions. Both types of fixed effects, where relevant, were found to be necessary.

[17] Since it is not immediately clear when to date the effective start of European Monetary Union we also consider a separate sub-sample beginning in 1995 (see Mayes and Virén, 2005). Our conclusions are largely unchanged. An appendix provides the results for this sub-sample.

Table 4.2 **Panel OLS estimates**

Variables	1980–2006	1980–1998		1990–2006			1999–2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	1.12 (.93)	1.31 (.57)**	1.62 (.51)*	0.51 (.79)	0.17 (.62)	-0.92 (1.26)	-1.34 (.79)+	-1.09 (1.26)
Fcast errors	-0.17 (.16)	-0.21 (.07)*	-0.31 (.07)*	-0.12 (.09)	-0.17 (.08)**	0.12 (.08)	0.13 (.12)	0.12 (.09)
MP Stance	-0.02 (.14)	0.02 (.03)	-0.02 (.08)	-0.31 (.17)+	0.09 (.04)*	0.07 (.19)	0.02 (.03)	0.04 (.12)
CBI	-0.09 (1.93)	-1.09 (1.16)	0.58 (.98)	0.01 (.08)	0.90 (1.34)	-0.002 (.10)	0.49 (1.08)	0.21 (1.36)
Interaction	-0.40 (.28)	-0.07 (.08)	-0.38 (.17)**	0.02 (.01)+	-0.17 (.07)*	-0.01 (.01)	-0.05 (.06)	-0.09 (.15)
Distance	0.17 (.10)+	0.22 (.09)*	0.19 (.89)**	-0.01 (.08)	0.02 (.06)	-0.34 (.08)*	-0.31 (.11)	-0.34 (0.10)*
Fixed effects	9.62 (.00)	10.72 (.00)	8.78 (.00)	4.42 (.00)	4.16 (.00)	13.69 (.00)	14.23 (.00)	13.10 (.00)
Obs.	431	360	360	242	235	78	76	78
$\overline{R}^2$	0.68	0.68	0.68	0.57	0.56	0.82	0.82	0.82

Note: The Fixed effects test is for the Null that both cross-section and time-specific fixed effects are jointly insignificant (Separate testing of cross-section versus time-specific fixed effects did not alter any of the conclusions shown). The F-statistic is given with p-values in parenthesis. The explanatory variables are defined in the text. The 'Interaction' term refers to the product of the 'MP Stance' variable and the proxy for CBI. Proxies used for CBI in the results reported above are (columns number): (1), (2), (3), (8) Cukierman-Siklos; (4), (6) Dincer-Eichengreen; (5), (7) GMT; (6). Fcast errors for the 1980–1998 and 1980–2006 are based on WEO forecasts for inflation; for the 1990–2006, 1999–2006 based on Economist forecasts. MP Stance is proxied according to equation (7) in all columns except column (5) where the money gap is used. The panel is unbalanced. * signifies statistically significant at the 1%, ** 5%, + 10% level. Heteroskedastic robust standard errors are in parenthesis.

Table 4.3 **Panel GMM estimates**

Variables	1980–2006	1980–1998		1990–2006		1999–2006			
	(1)	(2)		(3)		(4)	(5)	(6)	(7)	(8)
Fcast errors	-0.32 (.10)+	-0.70 (.23)*		-0.73 (.24)*		-0.17 (.10)+	-0.10 (.08)	0.04 (.07)	-0.05 (.12)	-0.12 (.13)
MP Stance	-0.08 (.36)	-0.32 (.12)*		-0.17 (.31)		-0.15 (.21)	0.24 (.04)*	0.20 (1.60)	0.08 (.04)**	0.08 (.16)
CBI	5.08 (2.27)**	-6.74 (3.38)**		-1.24 (3.00)		-0.08 (.13)	3.08 (1.08)*	-0.06 (.23)	1.99 (.76)*	-4.52 (5.11)
Interaction	-0.34 (.30)	1.11 (.38)*		0.38 (.75)		0.02 (02)	-0.45 (.11)*	0.001 (.10)	-0.13 (.12)**	-0.46 (.22)**
Distance	-0.07 (.16)	.22 (.19)		0.10 (.17)		-0.11 (.06)+	-0.05 (.04)	-0.04 (.1)	-0.13 (.06)	-0.23 (.14)+
Obs.	410	333		339		242	235	106	76	
Intercepts	Coeff. (s.e.)	Coeff.	s.e.	Coeff.	s.e.	Coeff. s.e.	Coeff. s.e.	Coeff. s.e.	Coeff. s.e.	Coeff. s.e.
Australia	4.19 (1.21)*	4.37	1.63*	3.76	1.48*	1.45 1.43	-1.08 .78	-0.12 3.46	0.25 2.17	4.48 4.00
Austria	3.48 (1.56)**	2.07	1.25*	1.22	1.86	0.82 .87	-1.61 .78**	NA	NA	NA
Belgium	1.02 (.88)	2.60	1.37**	0.72	.92	0.25 .70	-2.40 .53*	NA	NA	NA
Canada	3.47 (1.27)*	2.27	1.46	2.14	1.61	0.94 1.65	-1.77 .73*	-0.30 3.20	-0.98 1.13	3.04 3.21
Denmark	3.08 (1.16)*	3.07	1.26**	2.19	1.29+	0.44 .82	-1.89 .57*	-0.07 1.43	-1.43 0.41*	2.44 2.56
Finland	3.97 (1.30)*	2.97	1.07*	2.92	1.31**	0.84 1.61	0.29 .78	NA	NA	NA
France	3.22 (.97)*	3.72	1.31*	2.71	1.08*	0.28 .96	-2.16 .57*	NA	NA	NA

Intercepts	Coeff. (s.e.)	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.
Germany	4.21 (2.19)+	3.96	1.92**	2.84	2.52	1.78	1.78	-1.42	1.22	NA		NA		NA	
Ireland	6.21 (1.19)*	5.64	2.22*	6.37	1.48*	1.47	1.46	-1.90	.91**	NA		NA		NA	
Italy	7.54 (1.27)*	10.25	2.25*	9.83	2.04*	3.74	1.86**	1.36	.84	NA		NA		NA	
Japan	0.11 (1.20)	-0.36	1.04	-1.49	1.47	-1.02	1.43	-3.70	.60*	-2.25	2.31	-3.43	.97*	0.33	3.15
Netherlands	1.65 (1.51)	0.77	1.23	-0.10	1.74	1.38	1.15	-1.75	.65*	NA		NA		NA	
New Zealand	7.75 (2.06)*	9.58	2.56*	8.27	2.31*	2.19	2.26	-1.02	1.02	-0.26	4.01	-0.68	1.85	5.18	5.22
Norway	3.47 (1.00)*	4.83	1.75*	3.68	1.30*	0.97	1.27	-1.61	.62*	-1.50	2.84	-0.41	1.08	2.27	1.83
Portugal	15.49 (2.88)*	21.99	6.58*	24.10	5.97*	8.31	3.87**	3.70	2.88	NA		NA		NA	
Spain	6.87 (1.45)*	8.42	1.78*	6.92	1.59*	3.47	1.78**	0.53	.77	NA		NA		NA	
Sweden	6.36 (1.45)*	5.86	2.65**	7.08	1.61*	2.55	2.84	-1.21	1.38	-1.31	4.54	-1.62	2.16	4.58	5.67
Switzerland	2.06 (1.47)	1.33	1.88	0.29	1.48	0.11	1.50	-2.61	.89*	-1.62	2.64	-2.45	1.38+	2.98	4.39
United Kingdom	7.65 (1.41)*	9.65	2.64*	8.65	2.07*	4.12	2.95	0.36	1.66	0.04	3.69	-0.70	1.64	3.81	3.84
Euro area	NA	NA		NA		NA		NA		0.13	2.59	-1.66	.53*	3.60	4.03

Note: See notes to Table 4.2. GMM (Arellano-Bond 2 step estimator) uses lags of the regressors as well as the voice and accountability, political stability, and quality of government indicators from the World Bank governance indicators dataset, the exchange rate indicators from Levy-Yeyati and Sturzenegger, and a dummy variable for the number of years a country has adopted an explicit inflation target, where applicable. A fixed bandwith (Newey-West), Bartlett kernel, heteroskedasticity adjusted standard errors. NA means not applicable. The panel is unbalanced. In columns (6) and (7) an interaction term (Stance*CBI) is also added but all the coefficients were statistically insignificant, even at the 10% level and are omitted.

hypothesized Taylor rule (columns (4)), the predictable relative tightening of policy reduces the inflation differential. In the case where the stance of policy is proxied by a money gap, a rise increases the differential. This is to be expected since a positive money gap indicates a loosening of monetary policy and, hence, is expected to be relatively inflationary. Interestingly, the signs on the interaction coefficient can be interpreted as suggesting that the combination of a tighter (looser) monetary policy stance and greater central bank autonomy permits a slightly higher (lower) inflation differential. This could be considered as a little bit of evidence that there is a credibility bonus from the awarding of central bank independence or the provision of greater central bank transparency.

Finally, when we examine the most recent sample (1999–2006) only economic distance has a statistically significant impact on the inflation differential. It is conceivable that the bonus provided by institutional factors as well as the achievement of low and stable inflation in the panel of countries considered removed a significant role for the other factors considered.

As previously discussed, there is a sense in which the relationship between the inflation differential and the various determinants considered is endogenous. Consequently, Table 4.3 presents estimates of a panel based on GMM estimation where, in addition to the usual selection of lags as variables as instruments a variety of other variables that are expected to be correlated with the inflation differential but uncorrelated with the endogenous variables are added. These include a variety of governance indicators created by the World Bank as well as exchange rate and inflation targeting dummy indicators (see notes to Table 4.3). Not surprisingly, the change of estimation strategy influences the results. There are three notable differences between the results in Tables 4.2 and 4.3. First, economic distance vis-à-vis the US is no longer a reliable explanatory variable for relative inflation rates, regardless of the sample period considered. Second, the cumulative impact of inflation forecast errors have a much larger impact in the 1980–1998 sample than when OLS is used. Third, various proxies for central bank autonomy and transparency are more robustly related to the inflation differential when allowance is made for the endogeneity of the relationship between the two indicators. Perhaps most interesting of all is that while the central bank institutional indicator has a large negative impact on the US inflation differential in the early sample (1980–1998) the sign for this variable turns positive in the post 1990 period. The interaction with the stance of monetary policy offsets this reaction somewhat but does not eliminate it entirely. While the results are somewhat sensitive to the choice of different central bank indicators another interpretation is simply that, after an initial beneficial impact on inflation, the link between the inflation differential and central bank autonomy need not be permanently negative, a result that others have reported, as previously discussed. Finally, it is worth briefly commenting on the country-specific intercept terms. It is interesting that while these are almost always statistically significant for the full

sample, suggesting a positive inflation differential exists against US inflation, these same intercepts become largely insignificant, or becoming negative and significant, especially in the post 1999 period. This outcome simply captures statistically the earlier noted stylized fact, namely the dramatic convergence in relative inflation performance across the OECD countries examined since the late 1990s.

5 Conclusions

This paper has considered whether various determinants of the quality of monetary policy introduced in 20 OECD countries since the 1980s has significantly affected inflation vis-à-vis the US. The US is chosen as the benchmark not only for practical reasons but also because its monetary policy over period considered (1980–2006) is often viewed as having set the standard for other central banks.[18] In spite of the problems that arise when panels are estimated with fixed effects – these have the tendency to render it difficult to find any meaningful influences from other determinants of inflation (eg see Rose, Fatas, and Mihov, 2005) – this study finds that institutional factors have played a role in influencing inflation performance relative to the US experience. Nevertheless, the impact is a more nuanced one than previously imagined with the bonus created by the introduction of institutional reforms such as greater central bank autonomy or transparency a feature of the 1980s and early 1990s. By the late 1990s it becomes much more difficult to discriminate between the inflation performance of the US and its OECD counterparts.

Owing to the selection of countries, samples, estimation techniques employed, not to mention the various institutional and non-institutional proxies used to measure the quality of monetary policy over time, ours is not the last word on the subject. In particular, there is a need to examine more carefully relative inflation performance since the late 1990s to understand better whether a form of globalization, or some other determinant, can explain the notable convergence in inflation performance across countries. Moreover, considering the non-linearity in the dynamics of inflation differentials over time, a characteristic of interest rate differentials over the same period, may also prove to be a useful avenue to follow in future research. Finally, notwithstanding the considerable limitations on data availability, expanding the panel of countries to include emerging market

[18] US policy can be regarded as a standard for correcting the problem of high inflation and then keeping it under control. German (or Swiss) policy on the other hand could be regarded as a standard for inflation control over the period as a whole. The creation of the euro area makes Germany a more difficult standard to follow over our data period. However, as pointed out previously, subject to sample limitations, the results generally hold when the ECB is used as the benchmark.

economies, among others, may also yield important insights into the evolution of inflation and its connection with the implementation of monetary policy. Needless to say, these all represent fruitful avenues for future research.

Over the last two years there has been a burst of inflation world-wide and a financial crisis leading to a strong economic downturn. This, in turn, will provide new data for a more robust test of the model specified in this study. In a sense any reasonable monetary policy will be able to cope in a period when there is relatively limited stress. The challenges of this more stressful period may well show that some of the characteristics of specific monetary policies perform differently from others. There has, for example, been a clear difference in stance thus far between the US and the euro area. Interestingly, with the possible exception of the UK, differences in policy stances between the inflation targeting economies and the US have also emerged but somewhat less between exchange rate targeting small open economies and our chosen benchmark.

The extent to which the present downturn is indeed a global one will provide yet another form of globalization that will require empirical scrutiny in future.

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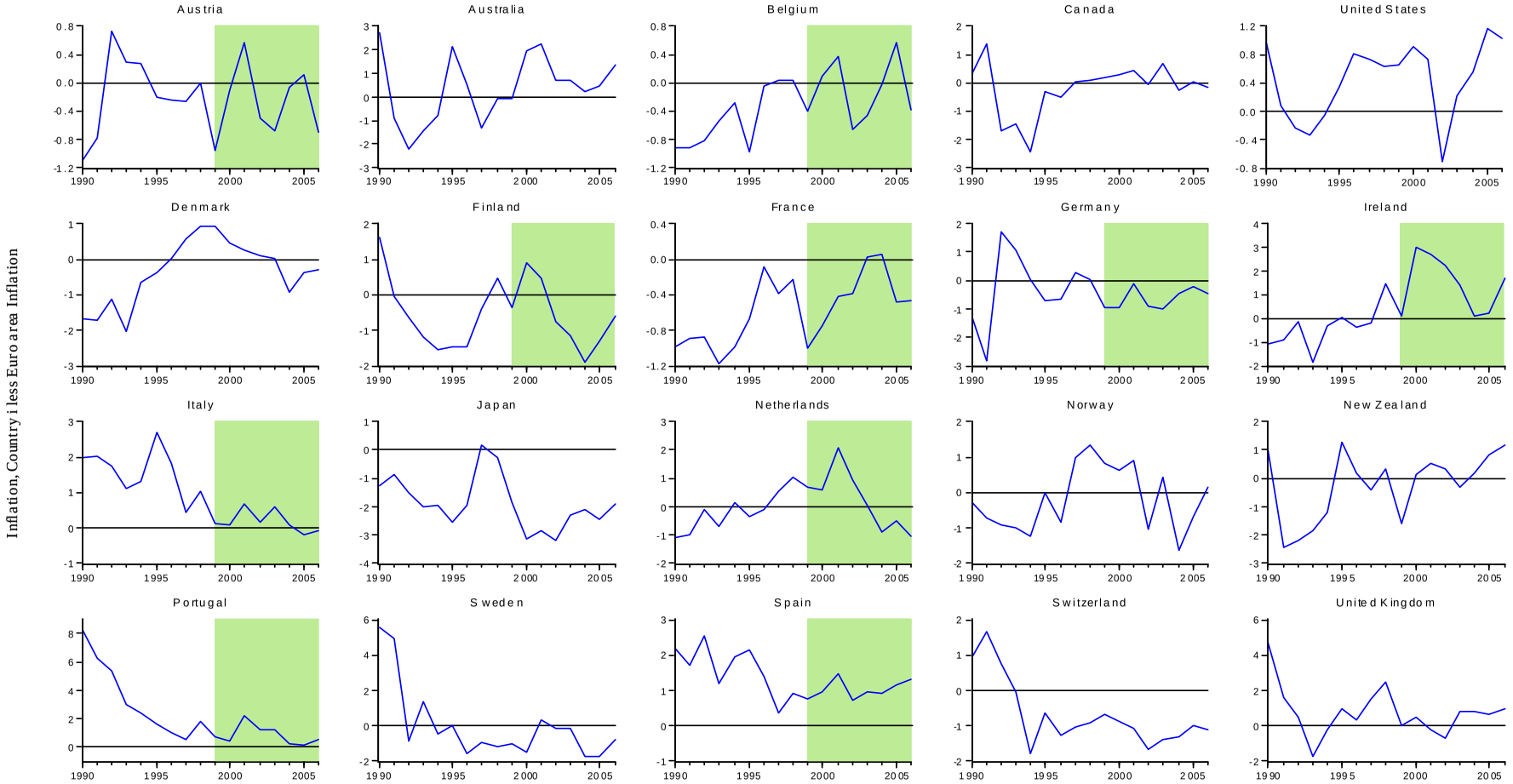
Data appendix

Series Name	Symbol
A) Quantitative	
Price level (CPI), 2000=100	CPI
Real GDP, 2000=100	RGDP
Real exchange rate, CPI based, 2000=100	RER
Nominal exchange rate, DCU/US	NER
Nominal short-term interest rate, %	R
Nominal long-term interest rate, %	RL
Monetary Aggregate in DCU	M
Foreign exchange reserves, millions US$	RES
WEO inflation forecasts, %	WEO
Consensus/Economist forecasts, %	INFC1
Commodity Prices (oil, food, non-fuel)	PCOM
Economic distance	ECONDIST
Population, millions	POP
B) Qualitative	
Exchange rate regime type	ERR
Central bank governors' terms	GOV
Central Bank independence index	CBI
Political stability index	PS
Voice and accountability index	VA
Central bank accountability	ACC
Central Bank transparency	DIS
Index of economic freedom	FREE
Index of monetary freedom	MFREE
C) Country Codes	
Australia	AUD
Austria	AU
Belgium	BE
Canada	CA
Denmark	DNK
Euro Area	EA
Finland	FI
France	FR
Germany	GE
Ireland	IR
Italy	IT
Japan	JP
Netherlands	NE
New Zealand	NZ
Norway	NO
Portugal	PT
Spain	SP
Sweden	SE
Switzerland	SW
United Kingdom	UK
United States	US

Note: Data sources are provided in the text. Additional data sources include World Bank (2006), and Kaufmann et al (1999, 2007).

Figure A1 **Inflation differentials vis-a-vis Euro area: 1990–2006**



Note: The shaded area highlights the period since the euro area was created (1999 with the introduction of the single currency in 2001).

Figure A2 **Money gap: 1990–2006**

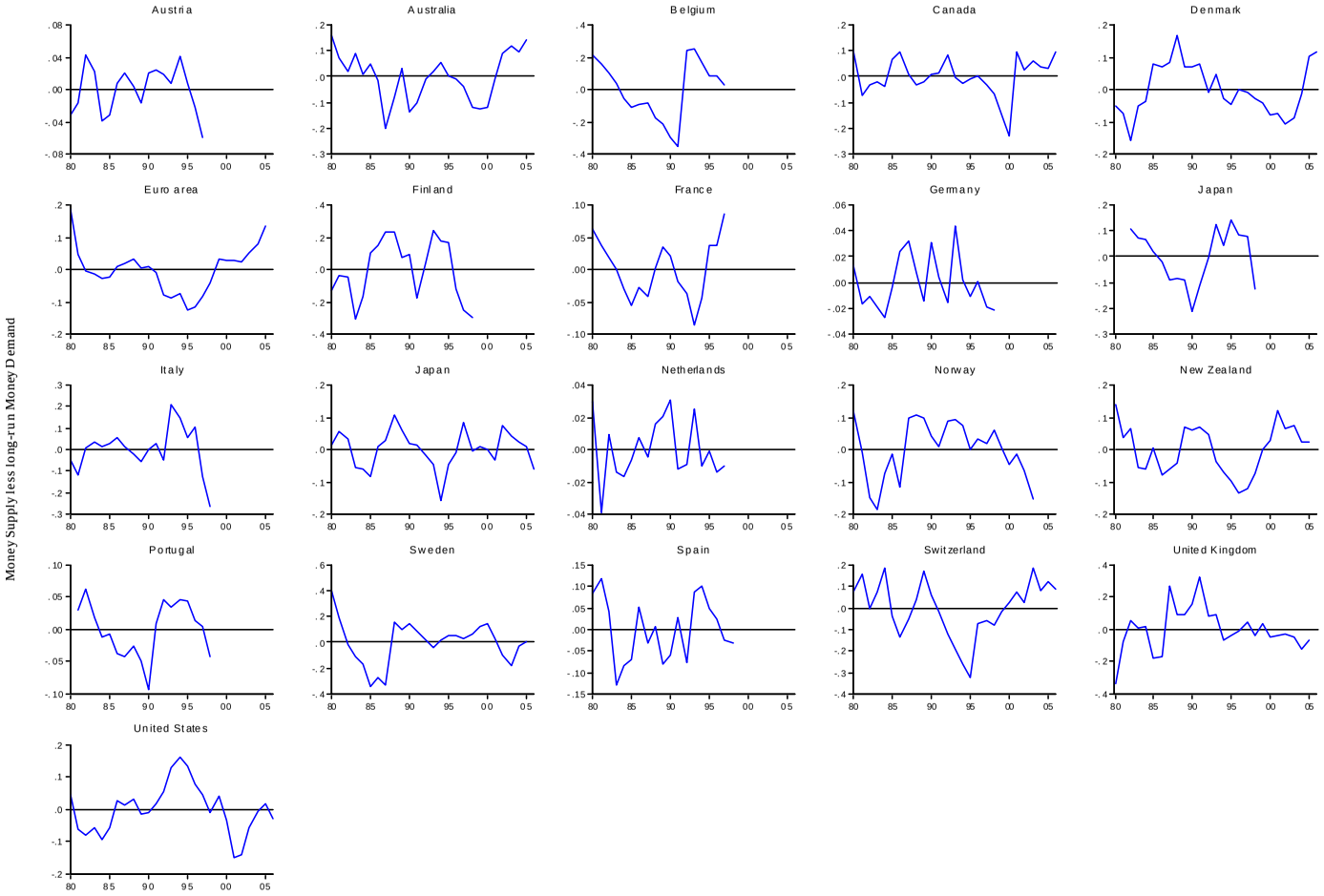
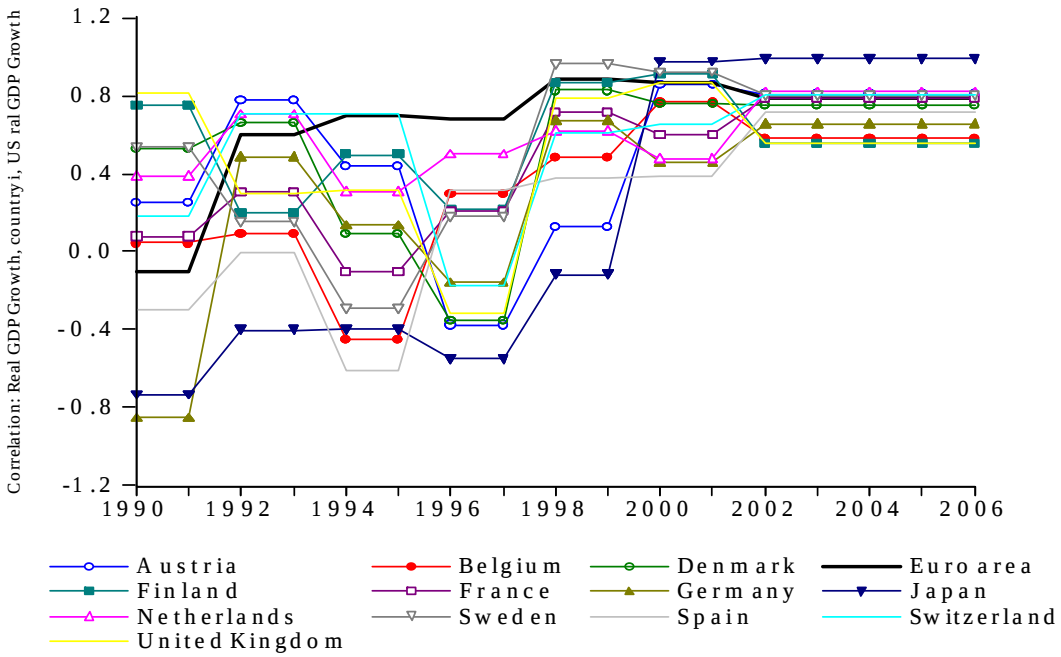


Figure A3 **Pair-wise correlations in real GDP growth vis-a-vis US**



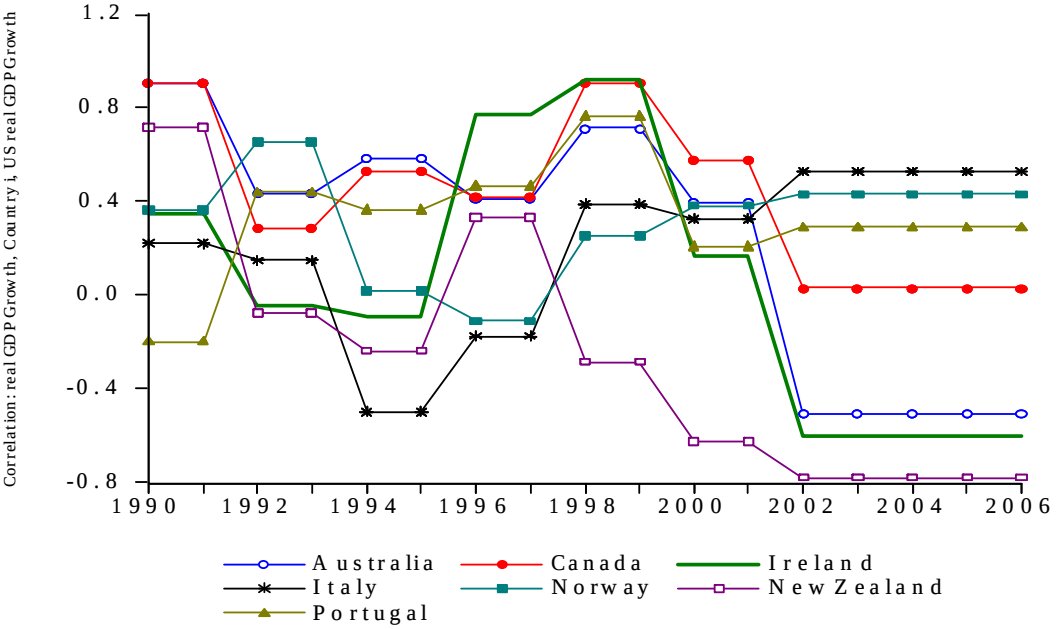
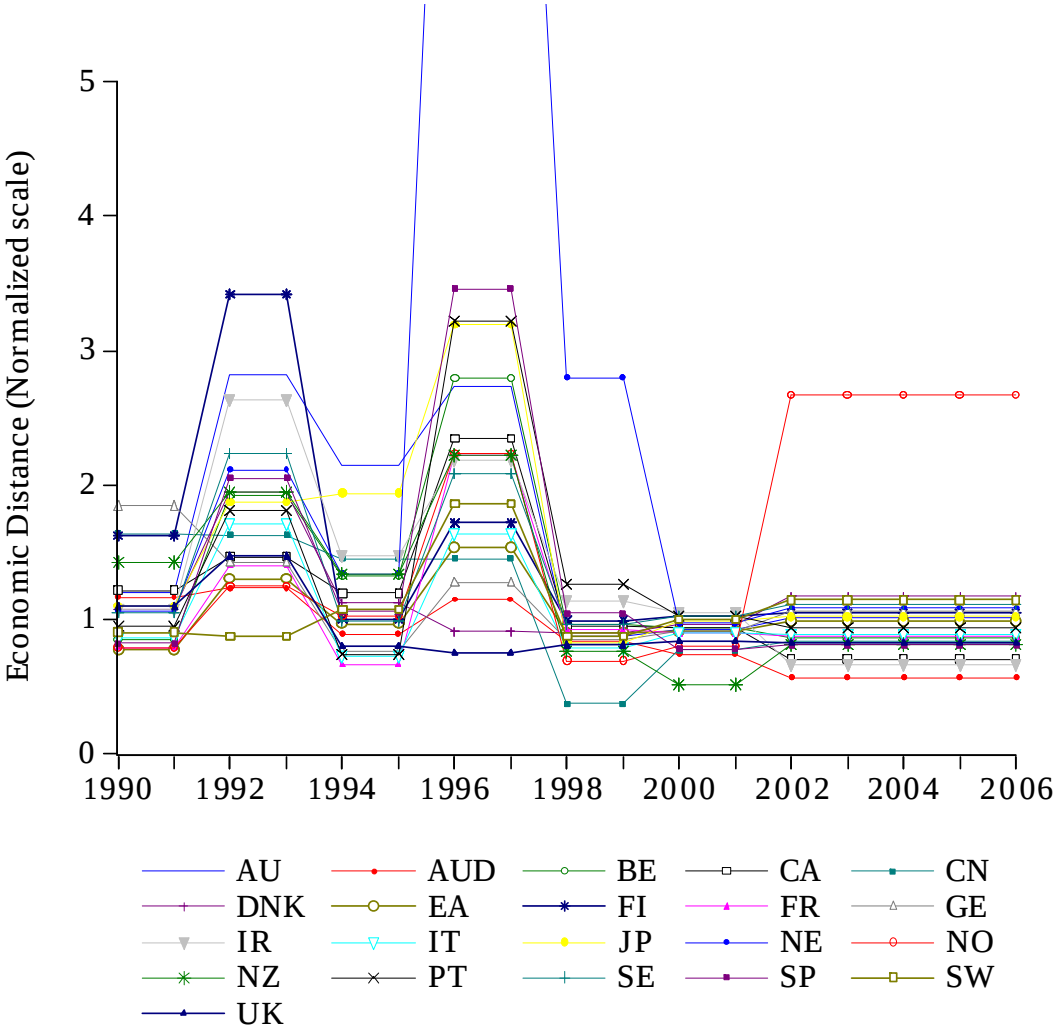


Figure A4



Note: Country codes are defined in the Appendix.

Table A1 **Panel OLS estimates**

Variables	1995–2006 (1)	1980–1994 (2)	1995–2006 (3)	1995–2006 (4)
Constant	-1.02 (.74)	0.59 (1.06)	-0.91 (.52)	-0.59 (.60)
Fcast errors	-0.01 (.03)	-0.35 (.17)**	0.002 (.03)	0.003 (.03)
MP Stance	0.05 (.19)	0.01 (.14)	0.03 (.04)	0.04 (.17)
CBI	0.80 (1.54)	1.42 (2.55)	0.001 (.05)	-0.23 (1.33)
Interaction	-0.05 (.35)	-0.40 (.31)	-0.01 (.05)	-0.005 (.05)
Distance	-0.004 (.35)	0.76 (.46)+	-0.01 (.05)	-0.03 (.24)
Fixed Effects	7.56 (.00)	7.79 (.00)	7.70 (.00)	7.97 (.00)
Obs.	147	284	242	147
$\overline{R}^2$	0.60	0.69	0.69	0.69

Note: The Fixed effects test is for the Null that both cross-section and time-specific fixed effects are jointly insignificant (Separate testing of cross-section versus time-specific fixed effects did not alter any of the conclusions shown). The F-statistic is given with p-values in parenthesis. The explanatory variables are defined in the text. The 'Interaction' term refers to the product of the 'MP Stance' variable and the proxy for CBI. Proxies used for CBI in the results reported above are (columns number): (1), (2) Cukierman-Siklos; (3), Dincer-Eichengreen; (4) GMT; (6). Fcast errors for the 1980–1998 and 1980–2006 are based on WEO forecasts for inflation; for the 1990–2006, 1999–2006 based on Economist forecasts. MP Stance is proxied according to equation (3.6) in all columns except column (5) where the money gap is used. The panel is unbalanced. * signifies statistically significant at the 1%, ** 5%, + 10% level. Heteroskedastic robust standard errors are in parenthesis.

Table A2 **Panel GMM estimates**

Variables	1980–1994	1995–2006			1995–2006	
	(1)	(2)		(3)	(4)	
Fcast errors	-0.67 (.27)	-0.01 (.04)		-0.04 (.03)*	0.11 (.09)	
MP Stance	-0.07 (.34)*	0.44 (.21)**		0.61 (.22)*	0.30 (.39)	
CBI	-2.50 (3.85)	1.50 (1.85)		0.11 (.08)	-0.84 (1.01)	
Interaction	0.13 (.83)	-0.57 (39)		-0.12 (.06)*	-0.19 (.55)	
Distance	0.04 (.51)	-0.12 (.04)*		-0.05 (.02)*	-0.15 (12)	
Obs.	263	147		147	105	
Intercepts	Coeff. (s.e.)	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.
Australia	4.53 (1.18)*	-0.49	0.70	-1.1.6	0.87	-1.28	1.40
Austria	1.77 (2.59)	-1.18	1.12	-0.60	.34+	NA	
Belgium	0.78 (1.49)	-0.80	.42+	-0.71	.27+	NA	
Canada	2.95 (2.29)	-1.07	.79	-6.44	.85+	-0.65	.90
Denmark	2.78 (1.81)	-0.94	.79	-0.66	.44	0.13	.64
Finland	3.59 (2.07)+	-2.39	.71*	-2.67	.99+	NA	
France	3.41 (1.59)**	-1.24	.56	-1.29	.48*	NA	
Germany	2.97 (2.91	-1.57	1.32	-1.40	.96	NA	
Ireland	7.18 (3.19)*	-0.91	.97	-1.01	.84	NA	
Italy	10.24 (1.98)*	0.53	.67	0.45	.66	NA	
Japan	-1.06 (1.83)	-2.83	.74*	-3.18	.82*	-2.49	.81*
Netherlands	0.05 (1.96)	0.49	1.03	0.23	1.11	NA	
New Zealand	8.80 (2.27)*	-1.21	1.49	-1.18	1.18	-1.84	1.55
Norway	4.09 (1.69)*	-0.91	.36*	-1.23	.63	-0.83	1.05
Portugal	24.55 (5.71)*	0.48	1.62	1.39	1.09	NA	
Spain	7.33 (1.64)*	-0.003	1.50	0.35	.73	NA	
Sweden	7.97 (1.75)*	-2.19	1.15	-2.20	1.02*	-2.57	1.51*
Switzerland	1.08 (2.16)	-2.34	1.19**	-2.22	.67	-1.76	1.27

United Kingdom	7.65 (1.86)*	-0.47	1.28	-0.41	1.30	-0.66	1.30
Euro area	NA	NA		NA		0.34	.81

Note: See notes to Table 4.2. GMM (Arellano-Bond 2 step estimator) uses lags of the regressors as well as the voice and accountability, political stability, and quality of government indicators from the World Bank governance indicators dataset, the exchange rate indicators from Levy-Yeyati and Sturzenegger, and a dummy variable for the number of years a country has adopted an explicit inflation target, where applicable. A fixed bandwith (Newey-West), Bartlett kernel, heteroskedasticity adjusted standard errors. NA means not applicable. The panel is unbalanced. In columns (6) and (7) an interaction term (Stance*CBI) is also added but all the coefficients were statistically insignificant, even at the 10% level and are omitted.

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