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DOES INFLATION TARGETING MAKE A DIFFERENCE?

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Resumen

Los países que han seguido metas inflacionarias (PMIs) han sido muy exitosos en alcanzar sus metas de inflación (MIs). La razón de sacrificio del producto industrial durante la estabilización de la inflación y la volatilidad del producto industrial han sido frecuentemente reducidos después de la adopción de la MI. Los PMIs han reducido consistentemente los errores de predicción de la inflación después de la aplicación del esquema. La influencia de shocks de precios y producción en el comportamiento de las brechas de inflación y producto ha cambiado más intensamente entre PMIs que en países industriales sin MIs, durante los años noventas. La MI ha tenido un papel importante en el fortalecimiento del efecto de expectativas inflacionarias tipo forward-looking, debilitando en consecuencia el peso de la inercia inflacionaria pasada. La aversión de los banqueros centrales a la inflación no es en promedio diferente en PMIs que en países sin MIs, pero ha aumentado en aquellas economías con mercados emergentes que adoptaron el esquema. Los PMIs han gradualmente cosechado una ganancia de credibilidad, permitiéndoles alcanzar sus metas con menores cambios en tasas de interés en las postrimerías de los años noventa que los requeridos a inicios de esa década. La experiencia de una década de MI en Chile, hacia una tasa de inflación estacionaria baja, muestra que una gradual aplicación del esquema de MIs ayudó a reducir gradualmente las expectativas inflacionarias y la tasa de inflación y permitió una razón de sacrificio que fue menor que bajo una estrategia contrafactual más agresiva.

Abstract

Inflation targeters (ITers) have been very successful in meeting their inflation targets (ITs). Industrial output sacrifice during inflation stabilization and industrial output volatility has frequently been lowered after IT adoption. ITers have consistently reduced inflation forecast errors after IT adoption. The influence of price and output shocks on the behavior of inflation and output gaps has changed much more strongly among ITers than in non-targeting industrial countries in the course of the 1990s. IT has played a role in strengthening the effect of forward-looking expectations on inflation, hence weakening the weight of past inflation inertia. Central bankers' aversion to inflation is on average not different among ITers in comparison to non-inflation targeters (NITers) but has risen in emerging-country ITers. ITers have gradually reaped a credibility gain, allowing them to achieve their targets with smaller changes in interest rates in the late 1990s than those required in the early 1990s. Chile's decade-long IT experience toward low stationary inflation shows that gradual phasing in of IT helped in reducing inflation expectations and inflation gradually, and resulted in lower output sacrifice that under a counterfactual more agressive strategy.

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1. Introduction

Inflation targeting (IT) is the new kid on the block of monetary regimes. Since IT was first adopted by New Zealand and Chile in 1990, a growing number of industrial and developing countries followed, anchoring their monetary policy to explicit targets for inflation. Recently the Deputy Chairman of the Federal Reserve System has suggested to introduce IT in the U.S. (Meyer, 2001).

Does adoption of IT make a difference? The experience with IT is certainly very recent, and while IT countries have reduced their inflation levels, more careful evidence provides a more cautious picture. Bernanke, Laubach, Mishkin, and Posen (1999) show that adoption of IT did not make a difference regarding the cost and speed of price stabilization. Cecchetti and Ehrmann (2002) show evidence that, on average, IT countries exhibit degrees of inflation aversion that are not higher than those of non-targeters. Mishkin and Schmidt-Hebbel (2002) provide evidence that countries that countries under IT exhibit some structural differences with countries under alternative monetary frameworks.

However a large number of questions on the results of inflation targeting remain open. First, how successful have countries been in reducing inflation? Second, how costly has been disinflation under IT? Third, does IT improve the ability to predict inflation? Fourth, does the behavior of the macroeconomy change under IT? Fifth, does IT change central bank aversion toward inflation? Sixth, does IT change central bank behavior? Seventh, what is the transmission mechanism of IT? This paper addresses the latter questions by conducting a wide empirical search of the features and effects of IT, by comparing the performance of countries with and without inflation targets, and by carrying out a case study of Chile, the country with the most extensive experience among emerging-market economies.

Section 2 introduces the sample of ITers used in this paper and compares their performance to that of other country groups, focusing on their success in meeting inflation targets, sacrifice ratios, and output volatility. Section 3 investigates if IT improves the ability to predict inflation by studying differences in VAR structures between inflation targeters (ITers) and non-inflation targeters (NITers). Section 4 studies if the behavior of the macroeconomy changes under IT. Section 5, drawing on the methodology of Cecchetti and Ehrmann (2000), analyzes if central banks' degree of aversion toward inflation is different for ITers and NITers. Section 6 studies if IT changes central bank behavior. Section 7 studies the experience of Chile, the emerging-market economy that introduced IT in 1990. Section 8 summarizes the main conclusions.

2. Are inflation targeters different from non-targeters?

Much recent work describes the design features and general results of inflation targeting (IT) in the small but quickly growing number of countries that have adopted inflation targeting (IT) since 1990.[1] In this section we complement the preceding work by describing the sample of ITers and comparing their performance to that of other country groups. We focus in particular on their inflation performance and success in meeting their targets, as well as their output sacrifice and output volatility.

2.1 Who targets inflation?

IT is based on the central bank's commitment to attain a publicly announced quantitative inflation target over the relevant policy horizon. Its two crucial prerequisites are absence of fiscal dominance and absence of conflict with other nominal policy objectives. Central bank independence, policy transparency, and central bank accountability to political bodies and society at large strengthen exercise of "constrained discretion" under IT (Bernanke et al. 1999).

While there is broad consensus in the literature about the latter general definition of IT, it is more controversial to apply this definition to come up with an empirically relevant

[1] See in particular Leiderman and Svensson (1995), Mishkin and Posen (1997), Bernanke et al. (1999), Kuttner and Posen (1999), Haldane (1999), Mishkin (2000), Mishkin and Savatano (2000), Schaechter et al. (2000), Agénor (2002), and Mishkin and Schmidt-Hebbel (2002).

sample of IT experiences. The reason for disagreement on sample selection and IT dating is that IT adoption has been more evolutionary than revolutionary. Most countries have adopted gradually all bells and whistles of this new monetary framework, learning over time and from other countries what defines a "full-fledged" IT framework.

According to Schaechter, Stone, and Zelmer (2000), there have been 13 "full-fledged" IT experiences in the world until February 2000: Australia, Brazil, Canada, Chile, Czech Republic, Finland, Israel, New Zealand, Poland, South Africa, Spain, Sweden, and United Kingdom. Of the latter, Finland and Spain abandoned IT in January 1999 when they joined the European Monetary Union (EMU). We follow Schaechter et al. in their country classification (but not always in dating the start of IT experiences). However we add two recent newcomers (Korea and Thailand) to their 13 countries, hence including 15 "full-fledged" IT country experiences until August 2000.

For our empirical analysis conducted for the 1980-1999 period, we introduce 3 country groups (Table 1). Group 1 is comprised by 9 countries that had IT in place dating back at least to 1995 (called ITers). This group is divided into two sub-samples: two emerging countries that are inflation-transition ITers (in the sense that they started IT at inflation levels substantially above stationary levels: Chile and Israel), and seven industrial countries that are stationary ITers (in the sense that they started IT at inflation levels close to stationary levels): Australia, Canada, Finland, New Zealand, Spain, Sweden, and the United Kingdom.

Group 2 is comprised by four emerging economies on their way to IT during the 1990s, i.e. countries that have adopted IT either recently and/or have, as of today, a partial IT framework in place. They are Colombia, Korea, Mexico, and South Africa. From the vantage point of their transition toward inflation targeting during the 1990s we call them potential inflation targeters (PITers).[2]

[2] Due to data problems we have omitted from this group three full-fledged inflation targeters that were, for example, included in the IT country samples in Schaechter et al. (2000) and Mishkin and Schmidt-Hebbel

Group 3 – a set of control countries – is comprised by 10 industrial economies that are not ITers: Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Switzerland, and the US. These countries have no explicit inflation target in place or, in the case of EMU members, have adopted the euro after targeting their exchange rates to the deutschmark for most of the 1990s.[3] We label this control group as non-inflation targeters (NITers).

Figure 1 depicts adoption dates and inflation rates at adoption of 21 countries that have had IT experiences as of August 2001: our 13 sample countries, 4 countries that were omitted from our sample (Brazil, Czech Republic, Peru, and Poland), and 4 recent IT adopters (Iceland, Norway, Thailand, and Switzerland).[4] The following facts are apparent from inspection of Figure 1.

Among the 19 countries that have IT in place as of August 2001, 8 are industrial countries and 11 are emerging economies. Suince 1998 some 4 countries per year adopt IT. A salient feature of the international IT experience is that many emerging countries adopted IT when they were still at inflation levels well above stationary inflation rates. In Chile and Israel inflation stood at 29% and 19%, respectively, when adopting IT in the early 1990s. In the more recent cases of IT adoption, Colombia and Mexico had initial inflation rates of 10% and 18%, respectively, Korea had initial inflation close to 5%, while in Brazil and South Africa initial inflation was close to 3%.[5] The subsequent success of emerging countries in bringing inflation toward low stationary levels is prima facie evidence that IT

(2002). Brazil was not included because of its hyperinflation experience in the 1980s and early 1990s while the Czech Republic and Poland were omitted due to lack of information for the 1980s..

[3] In our empirical analysis carried out though 1999, Switzerland (which adopted IT in December 2000) and Norway (which adopted IT in March 2001) are part of our control group of NITers.

[4] Starting dates are defined by the first month of the first period for which inflation targets have been announced previously. For example, the starting date for Chile is January 1991 (the first month of calendar year 1991, for which the first inflation target was announced in Sep. 1990). The initial inflation level is defined as the year-on-year CPI inflation rate of the last quarter before the first month of inflation targeting.(For instance 1990.4 in the case of Chile).

[5] Inflation attained one quarter before adopting IT.

can be successfully adopted to reduce inflation from (low) double-digit levels toward low single-digit rates, as discussed next.

2.2 How successful have countries been in reducing inflation and meeting their targets under IT?

We measure IT success in three simple dimensions: the reduction of inflation shortly before and after adopting IT, the speed at which inflation was brought down from the start of IT through the attainment of stationary inflation, and the average deviation of inflation outcomes from target levels.

A general feature of IT is that countries prepare in adopting IT by reducing inflation around the date of IT adoption (noted as year t in Table 2). This feature is generally observed in industrial and emerging, transition and stationary, ITers and PITers. Depending on the selected period, 13 ITers have reduced inflation rates on average by measures that range from 5.3% (between years t-2 and t+1), and 8.2% (between years t-3 and t+1). Our sample of ITers has reduced inflation on average by 5.9% (3.4%) in the period that ranges from 3 (1) years before and 1 year after IT adoption. Similar results are observed in the sample of PITers, where inflation was reduced on average by 13.3% (7.8%).

Now let's consider the speed of convergence to stationary inflation among ITers (Table 3). ITers have reached stationary inflation levels in 10 quarters on average. Among the 9 ITers, Chile and Israel had the longest transition periods (36 and 24 quarters, respectively) – not surprisingly, considering their high initial inflation rates. Australia and Sweden were on the other extreme, as they adopted IT when they had already attained stationary inflation.

ITers have been successful in meeting their targets (Table 4). On average – as measured by their average relative deviation of actual annual inflation from target inflation – ITers have missed only 12 basis points, a figure that rises to 66 basis points when considering the average absolute deviation. Among the 9 ITers, the UK, Chile, and Canada are closest on target while Israel, Sweden, and Finland score the highest deviations. Similar results are obtained when scaling relative and absolute deviations to annual inflation rates – a necessary correction to take care of large country differences in inflation levels during transition to stationary inflation. Using this alternative measurement, Israel and Spain join Canada, Chile, and the UK as the countries that were most on target, while Finland, Australia and now Sweden show the largest deviations.

2.3 How costly has been disinflation under IT?

It is straightforward to compute sacrifice ratios – i.e. percentage output losses per percentage unit of inflation reduction – as measures of the costs of disinflation under IT. For the period that ranges from 3 years before to 1 year after IT adoption – as represented in Table 2 – sacrifice ratios are computed for GDP and industrial production, and for ITers and PITers (Table 5). [6] Among the 9 ITers, the sacrifice ratio amounted to an average of 0.60 (using GDP), 6.6 (using industrial output) and 3.1 (using industrial output but excluding Chile and Spain, two large outliers). Among 5 PITers, the sacrifice ratio was on average a (negative) -0.4 when using GDP and -0.2 when using industrial production. Country dispersion is moderate when using GDP and high when using industrial production, ranging from –2.3 to 2.5 and –4.2 to 23.3 respectively.

An alternative way is to compare sacrifice ratios for disinflation periods under IT to sacrifice ratios before adopting IT in the same country group, and to comparable sacrifice ratios among PITers and NITers (Tables 6a and 6b). While there is large country variation, there does not seem to be a clear difference in GDP-based sacrifice ratios before and after IT adoption among the set of 9 ITers. Excluding outliers, average sacrifice ratios before and after IT adoption are -0.2 and 0.1, respectively. These figures are compared to the average

[6] Sacrifice ratios are computed as ratios of the sum of deviations of potential from actual output divided by the reduction in CPI inflation. They were based on annual frequency for GDP-based measures and quarterly data for industrial output based measures. Average sacrifice ratios based on industrial output are calculated with and without two large outliers (Chile and Spain).

sacrifice ratio of 0.5 recorded by NITers during disinflation periods in the 1990s and are substantially larger to the average figure of –2.2 observed among PITers (Table 6a).

However using industrial production a different result emerges. On average, sacrifice ratios after IT adoption were highly negative (-1.2) among ITers, and hence much lower than those recorded by the same country group before IT adoption (0.5), and also lower to the average sacrifice ratios observed among NITers (1.2) and PITers (-1.0). This result represents preliminary evidence suggesting that IT contributed in lowering output costs of inflation stabilization, at least when considering higher-frequency measures of industrial output (Table 6b).

A related result is referred to output volatility. We compare the volatility of industrial output before and after IT adoption in 9 ITers and only 1 PITer (Table 7). Output volatility fell in 8 of the 9 countries and in 6 of them the reduction in the standard deviation of industrial output was significant at least at the 10% level. Output volatility among ITers is similar to that observed among NITers during the 1990s.

3. Does inflation targeting improve the ability to predict inflation?

In countries that have introduced IT to converge to steady-state levels of inflation, inflation targets carry information on the monetary stance of the central bank. The announcement of the inflation target should be news for the market and inflation expectations should be affected by the target set by the bank. The inflation target signals how aggressive disinflation is during the relevant period, acting as a coordination mechanism and a commitment device. As a coordination mechanism, central bank announcement of the inflation target could contribute to lower the inflation forecast error since agents benefit from lower uncertainty regarding the parameters of the economy in which they are operating. In countries close at steady-state inflation, the target carries less information than in those converging to steady-state inflation. However the credible commitment of the monetary authority to a numerical target may also contribute to better coordination among agents and markets. For example, announcing inflation targets may reduce the reaction of agents to inflation news or the dependence of specific prices on formal or informal indexation mechanisms, aligning expectations closer to central bank actions.

Next we estimate country VAR models, show differences in VAR structures between ITers and NITers, and report how one-step-ahead inflation forecast errors (constructed from the country VARs) have evolved over time in the three country groups. For the three groups of countries we have put together a database of quarterly 1980-1999 variables for five relevant macroeconomic variables: industrial production (IP)[7] , money (M), consumer prices (CPI), interest rates (IR), and the nominal exchange rate (NER). To avoid estimating different cointegration structures for different countries, we specify all variables (except the interest rate) as deviations from a potentially non-stationary trend measured by the standard Hodrick-Prescott filter.[8]

We assume that the structure of the economy can be adequately described by a non-structural vector autoregressive simultaneous equation system. We run a comprehensive model, common to all economies, described by the stationary components of their mayor macroeconomic variables. The unrestricted VAR is based on five endogenous variables ordered from more to less endogenous: CPI, IP, M, NER, IR.[9] We also include two exogenous variables: international interest rates and oil prices. The inflation equation of the VAR is used to generate a one-periodahead out-of-sample forecast of inflation, which is our proxy of inflation expectations. In order to make robust inferences, we estimate two types

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[7] We use industrial production to construct a measure of the production gap due to availability of quarterly data for some of our emerging market economies.

[8] The filter is estimated with a 1600 penalty parameter on the second derivative of the trend. Each variable is measured as the logarithmic deviation from trend, allowing to focus on the relationships between the stationary components of the set of macroeconomic variables. In the case of IP the resulting series is an approximation of the gap between actual and potential output and in the case of inflation the resulting series is a deviation from trend inflation.

[9] Hence the short-term interest rate is the most exogenous variable. We assume this rate is closely aligned with the policy interest rate of the central bank.

of VARs: one is for a seven-year moving window and the other is a recursive estimation based on additional sample information.

As discussed above, we take central banks' declared IT starting dates at face value. This may be unsatisfactory since a true IT regime requires high credibility that, however, is only built up over time. We do not attempt to measure credibility in this paper. However, since all statistics that we generate are dynamic in the sense that they are generated from rolling or recursive VARs, we allow economic structures to change over time as we add more periods under an IT regime.[10]

Our VAR results are used for generating inflation deviation forecasts for each country, based on the rolling or recursive estimations.[11] We use four lags in the estimations, which come from the rolling and recursive estimations using the Akaike, Schwartz, and Hannan-Quinn information criteria for each country.[12]

To assess the effect of the IT regime on the formation of inflation expectations we generate the square of the forecast errors from the aforementioned VARs and average them across ITers and NITers. In order to control for the fact that high inflation forecast errors could be related to high inflation levels we divide by the trend level of inflation hat we have estimated before aggregating by country.[13]

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[10] It is conceivable to conduct robustness tests for alternative IT starting dates or to test if the results hold when countries shift from PIT to IT categories at different dates. This would be equivalent to test for the date at which e countries become full-fledged ITers, with full credibility in the new regime. However, such dating is nearly impossible to establish, requiring a nearly infinite number of dating combinations for the large number of countries and potential dates to be included in our sample.

[11] The dynamic properties and hence the importance of characteristics such as the ordering of the endogenous variables become relevant in the following sections.

[12] The Kullback-Liebler distance is a measure of the distance from the maximum likelihood fit of the model, and is calculated as the sum (the integral) of the deviations of the maximum likelihood function evaluated at the estimated parameters from the true fit. This measure is usually used to evaluate the fit of a time-series model and is usually approximated by the Akaike Information Criteria (AIC). It can be shown that the AIC is inconsistent in the sense that it picks larger than optimal lags. There are many ways of correcting this, usually consisting in penalizing the number of lags in the statistic. We use two of these: the Schwartz (SIC) and the Hannan-Quinn information criteria (HQIC).

[13] With this exercise we are clearly not able to identify the effect of inflation targeting on credibility and the ability of the markets to predict inflation outcomes. This would require an identification strategy that could be consistently applied to all sample countries. We do not develop such a strategy and limit ourselves to a simple

In Figures 2a and 2b we depict average quadratic inflation forecast errors for different samples of ITers and NITers. In panels I, III and V of each figure we define the group of ITers by including each ITer only in the periods in which they had IT in place; in all other periods years they are included among NITers. However in panels II, IV and VI we define the group of ITers by including every country that had IT in place during some period in 1990-1999. Panels I and II are defined for the full country sample. Panels III and IV are identical to panels I and II but for Mexico and Korea, that were excluded because of high volatility during the sample period. Panels V and VI represent an even smaller sample of only industrial countries, hence excluding Israel and Chile. In all six panels the continuous lines depict ITers and the dotted lines represent NITers.

The results suggest a positive effect of IT on the accuracy of inflation forecasts. We observe consistently that countries that adopted IT have converged to levels of accuracy similar to that observed in the control group of NITers. This convergence occurred towards 1994 and is on top of the improved accuracy observed in the group of NITers. The result of panel VI suggests that this convergence process has been important for non-industrial country ITers, such as Israel, Chile, and Mexico. The results suggest that the bonus of higher accuracy (and presumably more credibility) has been reaped by countries converging to steady-state inflation levels rather than steady-state inflation targeters. Hence ITers have achieved during the last decade a significant convergence of inflation expectations to their actual inflation rates over the last decade. The similarity of results reported in Figures 2a and Figure 2b supports the robustness of this conclusion.

Most of the time-series structure of the inflation errors has been removed from the VARs on which the quadratic inflation deviation forecast errors are based. However, we still find that some time-series structure remains in the inflation series for some countries, as indicated by correlograms. Since we are not able to address this problem by including more lags, we resort to filtering the resulting forecast errors by the time-series structure

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correlation exercise between inflation forecast errors and adoption of IT. However we test for robustness suggested by the correlograms, recalculating the group averages of quadratic inflation deviation forecast errors for ITers and NITers. The corresponding results (Figures 3a and 3b) show that the preceding result of panels I to V are maintained while the result of panel VI provides evidence of inflation expectations convergence. While in the previous panel VI (in Figures 2a and 2b) industrial-country ITers exhibited a similar reduction of forecast errors than NITers over the 1990s, now panel VI (in Figures 3a and 3b) shows a clear convergence of ITers to NITers, as the latter had already low forecast errors since the beginning of the 1990s.

In order to test the robustness of our results for one-quarter forecasts, we generated similar statistics to those reported in figures 2 and 3 for two to six-quarter forecasts. Our unreported results are similar to those shown above, confirming that the improvement in inflation predictability of inflation for the overall sample that includes emerging economies, for forecasts up to six quarters ahead. For the results of panel VI in figures 2 and 3, corresponding to the sample of industrialized ITers, the result continues to stand for two-quarter-ahead forecasts of inflation. However for longer inflation forecasts (3 to 6 quarters) it does not hold, since inflation forecast errors for both ITers and NITers are very similar. This may reflect the larger gains of IT adoption that accrue to emerging economies, in comparison to those reaped by mature industrialized economies that adopt IT among the menu of available monetary regimes.

4. Does the behavior of the macroeconomy change under IT?

In order to assess if IT has changed the structure of economies and their response to shocks, we report dynamic variance decomposition results based on the country VARs estimated in the preceding section. We report the average share of the orthogonalized innovation of one variable in the variance of another variable using estimated VAR

below by changing country samples and the definition of ITers.

parameters and the orthogonalized components of each of the endogenous variables.[14]

We simulate dynamic variance decompositions for the rolling country VARs reported in the preceding section.[15] We report aggregate results for our samples of ITers and NITers, for two different country samples: the full sample of 23 countries listed in Table 1 (Figure 4a) and the smaller sample comprised by the 17 industrial countries only[16] (Figure 4b).

The latter figures show the shares of orthogonalized innovations in inflation and the output gap in the variance of inflation innovations, considering both own and cross innovations. Each figure reports separately the dynamic variance decomposition effects for the four different lags included in the VARs. The results for rolling VARs are reported for fixed windows of 40 quarters (depending on availability of data per country VAR), starting with 1980.1 – 1989.4 (reported as the first observation in each figure) and ending with 1990.1 – 1999.4 (reported as the last observation).

The results show revealing commonalties and differences across country groups and over time. An innovation in the first inflation lag (reflecting first-order inflation persistence) shows some increase over time but not much difference across country groups of ITers and NITers. However the role of innovations in higher-order lags in inflation on inflation has fallen on average among ITers but increased among NITers – for both sample definitions corresponding to Figures 4a and 4b. This is suggestive of the role of IT in partly

[14] The variance decomposition presents a dynamic simulation of the estimated system where a shock to an endogenous variable is separated into the orthogonal component shocks to the endogenous variables of the VAR. As usual the orthogonalized errors are constructed decomposing the estimated errors according to a Cholesky decomposition of the variance-covariance matrix. The variance decomposition provides information about the relative importance of each random innovation to each variable in the VAR, describing the reduced-form effects and tradeoffs that are present in an economy. If the VAR model is an adequate description of the economy, it will provide the reduced-form response of the macroeconomy that combines the interplay of private and public sector actions, including monetary policy reactions of the central bank.
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[15] Since in section 3.1 we did not find major differences between the results from rolling VARs and recursive VARs, here we perform the exercise on rolling VARs only, in order to maximize observed changes in economic structure.

[16] The 23 countries listed in Table 1 less Chile, Colombia, Israel, Korea, Mexico, and South Africa.

substituting forward-looking inflation expectations (influenced by the official inflation target) for the backward-looking roots of the inflation process.

We do not find differences between ITers and NITers regarding the cross-effects of inflation shocks on output gap variances. In both country groups the effects are small and tend to fall during the 1990s. Regarding the opposite cross effect – from inflation innovations to output gap variances – more significant differences emerge between both country groups. Among ITers a large reduction in the role of inflation innovations on output variance took place in the 1990s towards levels closer to those of NITers.. Hence IT may have contributed to anchor inflation expectations, helping in isolating the output gap to inflation innovations.

A third and final difference among country groups is observed regarding lagged output gap innovations on the current output gap variance. On average, output persistence – at every lag – has increased by a sizable amount among ITers throughout the 1990s, toward levels comparable to those of NITers, whose output persistence did not change much during the decade.

The effect of innovations in the nominal exchange rate on inflation variance can be interpreted as the reduced-form passthrough from devaluation to inflation. No major differences were observed at the aggregate level of country samples – nor over time – regarding the latter innovations.[17]

Finally, no major differences between ITers and NITers are observed regarding the effects of innovations in or on other variables, with the exception of the effects of innovations on interest rates, that are discussed in section 6.

[17] However some interesting results were obtained at the country level for the two transition ITers that have converged during the 1990s to steady-state inflation: Chile and Israel. They show a decline in the share of exchange-rate innovations in inflation variance during the 1990s (reported in Corbo, Landerretche, and Schmidt-Hebbel 2000). This result supports the notion that the devaluation-inflation passthrough has declined in both countries during the 1990s, as a result of recent (Chile) or ongoing (Israel) convergence toward a flexible exchange-rate regime and achievement of stationary inflation in both countries.

5. Does IT change central bank aversion towards inflation?

Cecchetti and Ehrmann (2002), henceforth CE, have developed a useful and simple model to derive and measure the aversion of central bankers to inflation variability relative to their aversion to output variability. By maximizing a standard quadratic loss function subject to linear aggregate supply and aggregate demand equations, they derive the following equation that relates the relative aversion to inflation variability (α) to the slope of the aggregate supply curve (γ) and the variance of inflation (σ^2_π) and output (σ^2_y):

(5.1) $$\frac{\sigma_y^2}{\sigma_\pi^2} = \left[\frac{\alpha}{\gamma(1-\alpha)}\right]^2$$

Using equation (5.1) and country data for inflation and output variances and estimating aggregate supply slopes from impulse response functions that derive the output effects of supply shocks, CE calculate the inflation-aversion coefficient (α). From their country-by-country results, based on quarterly data for the 1980s and 1990s for 9 ITers and 14 NITers, CE conclude that, on average, the inflation aversion of ITers is not higher than in the control group of NITers. However, by using rolling regressions for shorter sub-samples, they also find that inflation aversion has increased significantly in most ITers shortly before, during, or after adoption of IT.

Next we redo CE's calculation for our samples of ITers and NITers, departing in 4 important ways from their empirical procedures. First our sample differs from theirs in country composition and time coverage. Regarding the latter, our quarterly sample extends from 1980 through 1999, which is longer than theirs. Second, CE define the deviation of inflation (and the corresponding variance) with regard to a constant 2% annual inflation rate, while we define it as the deviation from an estimated HP trend (as discussed in section 3) (for NITers) or the deviation from inflation target levels (for ITers). This has important consequences for the time-varying measures of inflation variance, as discussed below. Third, we reestimate output supply slopes from impulse response functions based on the country VARs run in section 3 and add alternative estimates based on simple Phillips-curve estimations. Finally, we reestimate inflation and output variances from our country samples.

Our results of cumulative impulse responses of output to interest rate shocks at quarterly leads, ranging from 1 to 13 quarters, show a wide range of period and country responses, from large positive to large negative supply slopes. The time averages over the 13 lead responses for each country (excepting the 5% tails of the cross-country time-series distribution) vary between -7.2 (France) and 10.7 (Netherlands). We rescale linearly the latter ordering to obtain a ranking of output slope coefficients in the range spanned from 0.1 to 6.0.

As an alternative to the previous results we estimate supply slope coefficients from the two following variants of the simple Phillips curve:

(5.2) $$ygap_t = \boldsymbol{d}_0 + \boldsymbol{d}_1(\boldsymbol{p}_t - \boldsymbol{p}_{t-1})$$

or

(5.2') $$ygap_t = d_0 + d_1(p_t - E_{t-1}p_t)$$

where last period's expectation of current inflation is obtained from our out-of-sample inflation forecasts reported in section 3.

Two measures for the output gap (ygap) were derived, based on the deviations from HP trend levels of GDP and industrial output, as discussed in section 3. The combinations of equations and output measures were estimated by ordinary and two-stage least squares.[18] The sample period extends from 1980 to 1999, using quarterly data. The eight slope coefficients for the corresponding combinations of equations, output measures, and estimation techniques vary widely by estimated equation and country. Averages for each country for the eight estimations (outliers were defined as observations in the 5% tails)

[18] For the two-stage least squares estimations the interest rate was used as the instrument for the inflation deviation, in order to be consistent with the VAR impulse response estimates.

were again linearly rescaled, obtaining slope coefficients in the 0.10 – 6.0 range.

The first four columns in Table 8 report supply slope coefficients according to four available measures: the original average cross-country CE measure (2.83), the original country CE measure for those countries included by CE or 2.83 for the excluded countries, our first country measure from VAR impulse responses, and our second country measure from Phillips curves. There is much output slope variation across countries. Across our three country groups, the variation is smaller. However it is interesting to note that gammas appear to be on average consistently (i.e., in columns 2 through 4) higher in ITers than in PITers and NITers.

Finally we report country inflation aversion coefficients in columns 5-8 of Table 8, based on the gammas shown in the corresponding columns 1-4 and on country output and inflation variances, by applying equation (5.1) from CE. Our estimates for alpha are much higher on average than CE's figures, reflecting the fact that our inflation variance is much lower, as discussed above. Across different measures and countries, the average alpha is close to 0.91. There are no differences in alphas between ITers, PITers, and NITers – confirming the earlier CE result.

Next we investigate if the relative aversion to inflation has changed over the 1990s. Like CE we focus on time-varying country estimates of inflation aversion coefficients from rolling 5-year windows. In order to minimize contamination from mismeasurement of output supply coefficients, here we use a common gamma for all countries (2.83 obtained directly from CE). We also focus our discussion on the time pattern of alphas starting about 1990 (hence starting with 5-year windows before 1991) because much noise characterized policies and outcomes until the mid-1980s.

In many countries – across various groups – inflation aversion rose during the 1990s. Among ITers, revealed inflation aversion rose significantly in Finland, Sweden, Chile, and Israel. Also among many NITers inflation aversion increased significantly in the 1990s, as occurred in Denmark, France, Germany, Netherlands, Norway, Switzerland, and the U.S. Among PITers such a trend is not observed – moreover, alphas declined in Brazil and Mexico during the 1990s. Many of these country results differ significantly from those reported by CE.

We report aggregate dynamic inflation aversion coefficients (alphas) for four country groups and our four alternative estimates for output supply coefficient gamma, based on 5-year estimation windows and our inflation variances. The country group results in Figure 5 are quite robust across different gamma estimates (i.e., different panels). They show that the average alpha of the sub-group of industrial-country ITers does not exhibit any time trend during the 1990s, although there are cyclical swings. However inflation aversion exhibits an upward trend in the two transition ITers – Chile and Israel – since 1990. While in the mid-1990s there is a temporary decline in alpha – largely reflecting a strong temporary decline in Israel – the average alpha is 4 percentage points higher in the late 1990s than around 1990.

Another country group that exhibits a trend rise in inflation aversion during the 1990s is the NITers, also by a magnitude close to 4 percentage points. The only group that shows a trend decline in their inflation aversion is the PITers, by an average total reduction of some 2 percentage points.

Hence regarding time trends of aversion coefficients, our results are strikingly different from CE's. Only transition ITers (Chile and Israel) show a trend increase in their alphas during the 1990s. In this the behave similarly to other industrial-country NITers, not to other ITers.

6. Does IT change central bank behavior?

Here we analyze if ITers differ from NITers regarding the behavior of central banks in setting their policy instrument – the interest rate. We approach this question from two different angles. First we report the results of inflation and output innovations on the variance of interest rates, based on dynamic variance decompositions performed on the rolling VARs estimated in section 3. Then we report econometric results for simple Taylor policy rules to infer about the weights of inflation and output gaps in the evolution of short-term interest rates.

We present the dynamic variance decomposition for the gap and inflation pressure on the interest rate in Figure 6. The two top panels are for the full samples of ITers and NITers and the two bottom panels are for the industrial-country sub-samples of ITers and NITers. The most interesting result is that ITers have been able to lower the reaction of the interest rate to innovations in both inflation and the gap during the 1990s. This result is robust to inclusion or exclusion of non-industrial countries in the groups of ITers and NITers. It suggests that ITers have gradually reaped a credibility gain that allows them to achieve their inflation targets with gradually smaller changes in interest rates. Among NITers, however, the impact of inflation innovations on interest rates has not declined in the 1990s while there is some decline – at the first and second lags – of the effect of output gap innovations on interest rates among NITers.

Next we estimate a simple Taylor rule consistent with a reduced-form partial-adjustment equation for the reaction of the central bank to inflation and output gaps.[19] This equation is consistent with a central bank that determines its policy rate (r) as a weighted average of the one-period lagged rate and the optimal rate, and the latter is a function of both contemporaneous gaps, giving rise to the following reduced-form equation:

(6.1) $$r_t = \boldsymbol{\delta}_0 + \boldsymbol{\delta}_1 r_{t-1} + \boldsymbol{\delta}_2 \boldsymbol{\pi} gap + \boldsymbol{\delta}_3 ygap$$

where πgap (the inflation gap) is the difference between actual and target inflation for ITers and between actual and trend inflation for NITers, and ygap (the output gap) is the difference between actual and trend industrial output. Expected coefficient signs are positive.

Quarterly data for the 1990-1999 period are used for each country. Country-by-

[19] On the robustness of simple Taylor rules see Taylor (2000).

country OLS results for equation (6.1) are reported in Table 9. The only result that is common across most countries is that the lagged quarterly interest rate coefficient is numerically close to 1 in most countries, reflecting a high degree of monetary policy inertia. Hence there are proportionally large differences between short and long-term effects of the inflation gap and the output gap on interest rates. While most gap coefficients are positive, as expected, they exhibit large cross-country variation in their sizes and not many are significantly different from zero.

In all countries, except Chile, the interest rate is a nominal rate. In all countries with nominal interest rates, the coefficient of the short-term inflation gap is smaller than 1, signaling that central banks raise nominal interest rates by less than a contemporaneous increase in inflation. In the case of Chile, the smaller-than-1 estimated coefficient is consistent with a coefficient of 1 plus the estimate under nominal interest rates. These results are similar to previous findings on Taylor rule estimations for various countries (Restrepo 1998, Taylor 2000, Corbo 2002).

The long-term inflation gap coefficient is positive and significantly different from zero in 3 ITers (UK, Australia, and Israel), 4 NITers (the US, Netherlands, Japan, and Portugal), and 3 PITers (Brazil, Colombia, and Korea). Country output gap coefficients are positive in most countries, and positive and significantly different from zero in 10 countries. Among the three groups, ITers exhibit on average the largest inflation gap coefficients relative to the output gap coefficients.

Next we perform rolling estimations of country Taylor rules for 10-year windows. The regressions are performed for the same samples of total ITers and NITers for which the variance decompositions for interest rates were reported in Figure 6. The inflation and output gap coefficients have declined consistently among ITers – but this is due to the inclusion of transition ITers Chile and Israel in the full sample of ITers (Figure 7a). When excluding the latter countries and therefore restricting the IT sample to industrial countries, both coefficients do not exhibit a downward trend in the 1990s (Figure 7b). The same lack of any trend is observed among NITers. Hence these results confirm that transition ITers (Chile and Israel) have gradually established credibility, requiring initially larger changes in interest rates in response to inflation or output shocks than since the mid-1990s, when they had established IT more firmly and inflation was lower.

7. Does the introduction of IT make a difference? A case study of Chile [20]

Chile was the first developing country to start IT and is the first that has completed its transition toward a full-fledged inflation targeting framework, as well as its convergence to stationary inflation. Hence this country experience could be of special interest. Using a small dynamic macroeconomic model for Chile, we study if IT has contributed to reduce inflation and made a difference in the speed and cost of price stabilization. It is also of interest to investigate the main channels through which IT could contribute to reduce inflation.I this framework, IT affects inflation dynamics through its effect on inflation expectations. The latter variable, in turn, affects price and wage dynamics.

The model extends the one developed by Corbo (1998) by introducing inflation expectations (measured as the difference between nominal and real interest rates on similar instruments) that enter explicitly the wage and inflation equations. Furthermore, inflation expectations are specified as a linear combination of a four-quarter moving average of preceding inflation, the inflation target, and the inflation forecast error.

The full model is given by the following equations:

[20] This section draws on Corbo and Schmidt-Hebbel (2000).

$$(7.1)\quad p_t^S = a_0 + a_1 w_t + a_2 \hat{e}4_t + a_3 gap_{t-1} + a_4 D2 + a_5 D3 + a_6 D4 + a_7 p_t^E + a_8 p_t^*$$

$$(7.2)\quad w_t = b_0 + b_1 p_t^E + b_2 p_{t-2} + b_3 D2 + b_4 D3$$

$$(7.3)\quad gap_t = g_0 + g_1 gap_{t-1} + g_2 tot_t + g_3 prbc_{t-2} + g_4 KPIB_t \times D96$$

$$(7.4)\quad desem_t = d_0 + d_1 gap_t + d_2 desem_{t-1} + d_3 D2 + d_4 D3 + d_5 D4$$

$$(7.5)\quad gdcc_t = c_0 + c_1 gap_t + c_2 gdcc_{t-1}$$

$$(7.6)\quad \hat{e}_t = f_0 + f_1 p_{t-1} + f_2 p_{t-1}^* + f_3 \Delta RIN_t + f_4 DESV_t + f_5 KPIB_t \times D96$$

$$(7.7)\quad p_{t+1}^E = m_0 + m_1 Tar_{t+4} + m_2 \left[(p_t + p_{t-1} + p_{t-2} + p_{t-3})/4\right] + m_3 \left[(p_t + p_{t-1} + p_{t-2} + p_{t-3})/4 - p_{t-4}^E\right]$$

$$(7.8)\quad p_t = l_0 + l_1 p_t^S + l_2 D3 + l_3 D4 + l_4 A93 + l_5 A94 + l_6 A96 + l_7 A98$$

where:

$p_t^S =$ core inflation, quarterly rate of change,

$p_t =$ headline CPI inflation, quarterly rate of change,

$p_{t+1}^E =$ expected rate of headline CPI inflation, quarterly, for period t+1 based on information available at period t,

$w_t =$ quarterly rate of change of the wage rate,

$\hat{e}_t =$ quarterly rate of change of the nominal exchange rate, in Chilean pesos per US dollar,

$\hat{e}4_t =$ 4-quarter moving average of $\hat{e}_t$,

$p_t^* =$ external inflation in US dollars, quarterly rate of change,

$gap_t =$ gap between the seasonally adjusted quarterly GDP and its trend, as a percentage of the trend, measured by applying the Hodrick-Prescott filter,

$tot_t =$ 4-quarter moving average of the log of the terms of trade,

$prbc_t =$ real interest rate of Central Bank debt paper of 90-day maturity (PRBC-90), annual rate,

$KPIB_t =$ capital inflows as percentage of nominal GDP,

$desem_t =$ quarterly unemployment rate,

$gdcc_t =$ current account deficit of the year ending in quarter t, as percentage of nominal GDP,

$\Delta RIN_t =$ quarterly change in Central Bank foreign reserves, in US dollars,

$DESV_t =$ difference between the log of the market nominal exchange rate and the log of the central parity of the exchange rate band,

Tar_t = quarterly inflation rate implicit in the inflation target announced by the Central Bank[21],
D2, D3, D4= seasonal dummies for the second, third, and fourth quarter, respectively,
D96= dummy variable that takes a value of 1 from the first quarter of 1996 to the sample end (the third quarter of 2000), to control for the sharp change in capital inflows,
A93, A94, A96, A98= dummy variables that take a value of 1 for 1993, 1994, 1996, and 1998, respectively, for specific supply shocks that could affect the difference between core and headline CPI inflation.

Equation (7.1) for core inflation is specified as the weighted average of inflation equations for tradable and non-tradable goods and services, including also expected inflation. Equation (7.2) for wage inflation includes lagged inflation (reflecting backward indexation schemes in wage contracts) and expected inflation (reflecting forward-looking wage contracts). Equation (7.3) for the output gap is a function of its own lag, the terms of trade, the lagged value of the real interest rate, and capital inflows. Equation (7.4) relates the unemployment rate to the output gap (Okun's law). Equation (7.5) for the current account deficit to GDP ratio is a function of the output gap and its lagged value. Equation (7.6) describes the nominal exchange rate devaluation within the exchange-rate band that was in place until late 1999. Equation (7.7) relates expected inflation to the forward-looking inflation target, a moving average of lagged inflation levels, and an inflation forecast error term. Equation (7.8) relates actual inflation to core inflation, introducing also seasonal dummies and annual dummies for particular weather and oil-related shocks. Model estimation results are reported in Table 10.

We now proceed to compare simulated values (obtained from the model's dynamic simulation) and actual values for core inflation. In the first simulation we take the actual real interest rate as given. The simulated values (noted as Benchmark 1 values) and observed values for core inflation during 1993-1999 are depicted in Figure 8. Model simulations are close to actual values.

[21] Computed by linearizing the annual inflation target announced as December-to-December rate of change.

Using the Benchmark 1 values, we proceed now with the first counter-factual simulation, showing the path of core inflation that would have been obseved if the inflation target had not been made public and therefore had not affected expectations.[22] Hence we simulate the dynamic response of the Chilean economy if inflation expectations in the 1990s had been formed in the way they were formed in the 1980s. The comparison of simulated values (called Non-Target Expectations) with Benchmark 1 values is presented in Figure 9. Simulated values are almost always above benchmark values. These results support the hypothesis that introducing explicit inflation targets helped in reducing inflation. The mechanism at work is the effect of the inflation target on inflation expectations, and of the latter on wage inflation and core price inflation.

A clearer picture emerges when comparing the cumulative sum of quarterly inflation rates over four quarters, obtained by the Non-Target Expectations Simulation, to the Benchmark 1 values (Table 11). The comparison suggests a clear break in 1996, when Benchmark 1 inflation levels (based on inflation expectations influenced by the inflation target) started to fall well below conterfactual simulation values.[23] This provides support to the notion that the inflation target affected actual inflation only some time after introducing IT, probably due to the fact that at early stages of IT the public was still uncertain about the Central Bank's commitment to attain the target.

Next we address the issue of macroeconomic effects of alternative stabilization paths. Here we run two counter-factual simulations for the speed and intensity of price stabilization in the 1990s: a more gradualist disinflation path (termed Gradual Target) and a more aggressive path (termed Cold-Turkey Target). The gradualist strategy considers a target reduction by only half of a percentage point (50 basis points) per year starting in

[22] For this purpose, we first estimate an equation for inflation expectations for the period before the introduction of IT (until the fourth quarter of 1990) and use this equation to model inflation expectations in the 1990s.

[23] This break also coincided with the September 1995 Central Bank announcement of a more aggressive target of 6.5% for 1996 (for 1995 the target had been set at 9% and actual inflation attained 8.2%).

1994. The cold-turkey stabilization considers a quicker target reduction, to attain a stationary inflation level of 3% in 1996 and beyond (Table 12).

When altering the targets, the policy interest rate has to be changed accordingly. Therefore the structural model presented above is extended to include the following policy reaction function for the Central Bank:

$$(7.9) \quad prbc_t = (1 - r) \times \left(y_0 + y_1\left(p4^S_{t+3} - Tar4_{t+3}\right) + y_2 gdcc_{t+2}\right) + r\, prbc_{t-1} + y_3 D983$$ [24]

This policy reaction function is consistent with Corbo (2002), that extends previous work by Taylor (1993) and Clarida et al. (1999) for countries that follow a policy aimed at achieving a gradual reduction in inflation. In this equation, the policy interest rate is specified as a function of the gap between expected inflation and target inflation, the gap between the current account deficit ratio to GDP and a target ratio (which is set at 4.5% of GDP), and the lagged value of the policy rate.[25]

The amended model (that now includes the policy reaction function) is run to provide a new set of benchmark results (Benchmark 2) for core inflation, that are compared to actual core inflation in Figure 10. Now the simulated Benchmark 2 levels are closer to the actual values than the ones obtained by the Benchmark 1 run. Hence by endogenizing the policy interest rate, the latter is adjusted when the inflation forecast differs from the target level, helping to bring actual inflation closer to the target.

The counter-factual simulation results for core inflation under the gradualist strategy (termed Gradual Target), the cold-turkey approach (termed Cold-Turkey Target), and the benchmark case (Benchmark 2) are reported in Figure 11. Unsurprisingly core inflation

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[24] In this equation, $p4^S_t$ is the four-quarter cumulative sum of quarterly core inflation rates, $Tar4_t$ is the four-quarter cumulative sum of quarterly target inflation rates, and D983 is a dummy variable (equal to 1 in the third quarter of 1998).

[25] The right-hand side variables in this equation are potentially endogenous. Hence we reestimate this equation using generalized method of moments (GMM) in order to obtain consistent and efficient coefficient estimates, reported in Table 10.

under the gradualist (cold-turkey) approach is well above (below) Benchmark 2 values. In the case of the cold-turkey target, the convergence of the simulated values toward target values is initially slow, confirming that inflation exhibits substantial inertia and that the selection of a hard target could have resulted in higher unemployment and only a small gain in terms of lower inflation.

The unemployment paths for both counter-factual strategies and the Benchmark-2 case are depicted in Figure 12. The gradual (cold-turkey) strategy results in lower (higher) unemployment - a result of slow (quick) adjustment of inflation expectations toward target levels. To throw further light on the cost of disinflation we also compute the sacrifice ratio for the reduction of inflation, comparing the cumulative sum of unemployment increases to the cumulative sum of the gains in inflation reduction. The corresponding sacrifice ratio of the cold-turkey approach is 1.26. By contrast, under a gradualist strategy the sacrifice ratio is only 0.95, showing that alternative disinflation speeds entail asymmetric employment and output costs.

As a robustness check of our results, we use an alternative measure of inflation expectations (instead of the difference between nominal and real interest rates). For this purpose we re-estimate equations (7.1), (7.2), and (7.7) using the Consensus Forecast measure of inflation expectations for Chile.[26] Then we run again the benchmark and the two counter-factual simulations. The results, reported in Figures 13 and 14, are fairly similar to those shown in Figures 11 and 12. Now the sacrifice ratios are –1.26 for the cold-turkey strategy and –0.99 for the gradualist approach. This confirms the robustness of our results to alternative measures for inflation expectations.

Finally it could be claimed that our comparison between cold-turkey and gradual strategies to disinflation conducted above does not represent properly the cold-turkey case because inflation expectations do not adjust at once to target levels.[27] That is, inflation

[26] We thank Consensus Economics for providing this data.
[27] We thank Alejandro Werner for suggesting this exercise.

expectations do not embody full credibility of the inflation target because they are still determined by equation (7.7). Hence to take into account a fully credible cold-turkey approach (using the Consensus-Forecast measure of inflation expectations) we impose the restrictions ì$_0$ = ì$_2$ = ì$_3$ = 0 and ì$_1$ = 1 on equation (7.7). The simulation results for this amended model based on the restricted version of equation (7.7), and run only for the cold-turkey case, are reported in figures 15 and 16. The reduction of inflation would have been somewhat quicker than in the case of partial credibility while the unemployment cost is not too different under full credibility. The sacrifice ratio for this case is –0.53 instead of the –1.26 obtained under partial credibility and is even lower than the –0.99 obsrved in the case of the gradualist approach under partial credibility. Therefore we conclude that the actual sacrifice ratio of the cold-turkey approach is bounded between –1.26 and –0.53.[28]

8. Conclusions

This paper has conducted a wide empirical search on the rationale and consequences of adopting IT. By comparing policies and outcomes in full-fledged IT countries to two control groups of PITers and NITers, we have identified in which ways IT makes a difference.

ITers have been very successful in meeting their targets. Output sacrifice ratios measured by industrial production were lower after IT adoption among ITers than among PITers and NITers during the 1990s. Volatility of industrial output fell in most ITers after IT adoption, to levels similar to those among NITers.

ITers have consistently reduced inflation-forecast errors (based on country VAR models) after IT adoption, toward the low levels prevalent in non-targeting industrial countries.

[28] It should be mentioned that in the price and wage equations, the actual values of the coefficients also depend on the degree of credibility of the inflation target and therefore with full credibility the coefficients of expected inflation in both equations could be higher resulting in an even lower sacrifice ratio.

Variance decomposition results from VARs show that the influence of price and output shocks on the behavior of inflation and output gaps has changed much more strongly among ITers than in non-targeting industrial countries in the course of the 1990s. Inflation persistence has declined strongly among ITers during the 1990s. This suggests that IT has played a role in strengthening the effect of forward-looking expectations on inflation, hence weakening the weight of past inflation inertia. The influence of inflation shocks on output has declined while output persistence has increased significantly during the 1990s. The influence of price and output shocks on inflation and output gaps tended to converge among ITers in the late 1990s to the pattern observed among non-targeting industrial countries. Regarding exchange-rate innovations on inflation – evidence of reduced-form devaluation-inflation passthroughs – no differences where identified between stationary (industrial-country) ITers and non-targeting industrial countries.

Cecchetti and Ehrmann (CE) found that the aversion of central bankers towards inflation did not differ, on average, between ITers and NITers. However they found that inflation aversion increased significantly in most ITers when they adopted IT (i.e., during the 1990s), as opposed to NITers. We extended CE's estimates and inflation-aversion measures in various ways and confirmed their first result: inflation aversion is on average not different among ITers in comparison to NITers. However, in opposition to CE's second result, we do not find evidence that industrial-country (stationary) ITers showed increasing inflation aversion through the 1990s. In contrast, inflation aversion increased in the emerging-country (and transition) ITers: Israel and Chile. Also in opposition to CE, we find a trend increase in inflation aversion among industrial-country NITers. Among potential ITers (PITers), inflation aversion fell during the 1990s.

Does IT change central bankers' behavior in setting interest rates? First we performed variance decomposition exercises from country VARs to test for changes in the response of interest rates to inflation and output innovations. In fact, the reaction of interest rates to both inflation and output shocks has declined significantly among ITers throughout the 1990s. Among industrial-country NITers, however, these reductions were either nil or much weaker in the 1990s. Next we estimated Phillips curves that confirmed the latter result: the coefficients of inflation and output gaps have monotonically declined in both emerging and industrial ITers during the 1990s – as opposed to unchanged parameters among NITers. This result suggests that ITers have gradually reaped a credibility gain, allowing them to achieve their ITs with smaller changes in interest rates in the late 1990s than the changes that were necessary to adopt in the early 1990s.

Chile is the developing country with the longest IT experience and where inflation has already converged to the Central Bank's long-term target level. Hence it is of interest to draw the lessons from this experience. Three main lessons emerge. First, the initial progress in reducing inflation toward the target was slow as the public was learning about the true commitment of the Central Bank to attain the target. Second, the gradual phasing in of IT contributed to declining inflation by lowering inflation expectations and changing wage and price dynamics. Third, with respect to the speed of inflation reduction, a cold–turkey approach would have resulted in a larger sacrifice ratio stemming from higher unemployment during the early years of IT, when credibility was gradually built up.

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Data Appendix

Inflation Targeting periods

Countries are considered as ITers in the following periods: United Kingdom since the fourth quarter of 1992, Sweden since the first quarter of 1993, Canada since the first quarter of 1991, Finland from the first quarter of 1993 to the fourth quarter of 1999, Spain form the third quarter of 1996 to the fourth quarter of 1998, Australia since the fourth quarter of 1994, New Zealand since the second quarter of 1990, Chile since the fourth quarter of 1990 and Israel since the first quarter of 1991.

Industrial Production

For all countries less those indicated below, the Seasonally Adjusted Industrial Production Index, code 66.czf of the International Financial Statistics (IFS) of the IMF. For Switzerland, the Seasonally Adjusted Industrial Production Index (90=100), code 66.izf of the IFS, for Turkey, the Industrial Production Index, code 66.zf of the IFS, for New Zealand, the Seasonally Adjusted Manufacturing Production Index, code 66ey.czf of the IFS, for Chile, Colombia and Mexico, the Manufacturing Production Index, code 66ey.czf of the IFS.

Money

For all countries less those indicated below, defined as the sum of Money, code 34.zf of the IFS catalogue and Quasi-Money, code 35.zf of the IFS. For Germany, Italy, Finland and Spain, the sum of Currency in Circulation, code 34a.nzf and Demand Deposits, code 34b.nzf of the IFS.

Inflation

For all counties, the rate of change of the Consumer Price Index, code 60.zf of the IFS.

Interest Rate

For Norway, Denmark, Sweden and Spain, the Call Money rate, code 60 b.zf of the IFS, for Switzerland, Italy, Korea and Japan, the Money Market rate, code 60 b.zf and 60 p.zf of the IFS, for the United States, the Federal Funds rate, code 60 b.zf of the IFS, for the United Kingdom, the Overnight Interbank rate, code 60 b.zf of the IFS, for Canada, the Overnight Money Market rate, code 60 b.zf of the IFS catalogue, for Finland, the Average Bank Lending rate, code 60 p.zf of the IFS, for Turkey, the Interbank Money Market rate, code 60 b.zf of the IFS, for Austria, the New Issue rate 3 Months T-Bills, code 60 c.zf of the IFS, for New Zealand, Comm. Bill Rate (90 Day Max), code 60 b.zf of the IFS catalogue, for Chile, the Monthly Average rate of 90-D Deposit Certificates, source Central Bank of Chile, for Mexico, the Treasury Bill rate, code 60 b.zf of the IFS, for Israel, the Overall Cost of Unindexed Credit, code 60 p.zf of the IFS, for Colombia, the Lending rate, code 60 b.zf of the IFS.

Nominal Exchange Rate

For all countries less those indicated below, defined as the Market rate, code ..rf..zf of the IFS For Norway, Sweden, Switzerland and Finland, the Official rate, code ..rf..zf of the IFS, for Chile and Mexico, the Principal rate, code ..rf..zf of the IFS.

Relative Trend Deviations

For any variable x, we construct its relative trend deviation as log(x)-log(hpx), where log is the natural logarithm and hpx is a trend estimated by the Hodrick-Prescott filter of x. It is important to stress that this measure represents the relative distance of the variable with respect to its trend rather than the period change of the variable.

Table 1

Country Sample of Inflation Targeters (ITers), Potential Inflation Targeters (PITers), and Non-Inflation Targeters (NITers) during the 1990s

ITers		PITers	NITers
Transition ITers	**Stationary ITers**		
Chile	Australia	Colombia	Denmark
Israel	Canada	Korea	France
	Finland	Mexico	Germany
	New Zealand	South Africa	Italy
	Spain		Japan
	Sweden		Netherlands
	United Kingdom		Norway
			Portugal
			Switzerland
			United States

Table 2

Alternative Measures of Initial Disinflation in IT Countries

	(t-1 ; t+1)	(t-2 ; t+1)	(t-3 ; t+1)
Australia	0.9	-1.3	-5.4
Canada	-3.3	-3.5	-2.5
Colombia	-17.5	-16.0	-17.3
Chile	-10.6	-1.6	0.8
Finland	-1.5	-3.0	-5.0
Israel	-8.1	-6.2	-9.3
Korea	-3.6	-4.1	-3.7
Mexico	-8.7	-13.4	-27.2
New Zealand	-5.8	-4.7	-14.1
Spain	-1.2	-1.0	-2.4
Sweden	-0.1	-7.1	-8.3
South Africa	-1.4	-3.1	-4.8
United Kingdom	-1.3	-3.9	-7.0
Average	**-4.8**	**-5.3**	**-8.2**

Note: Projected inflation was used for South Africa, Colombia, and Mexico.
Source: Authors´ calculations based on data from IFS and JP Morgan.

Table 3

Convergence to Stationary Inflation under IT in 13 Countries: 1989-2000[1]

	Initial Inflation	(Date)	Final Inflation	(Date)	Quarters of Convergence	Inflation Change	Average Inflation per Quarter
ITers							
Australia	1.2	(1993.1)	1.2	(1993.1)	0	0.0	-
Canada	4.9	(1990.4)	1.6	(1992.1)	5	-3.3	-0.7
Chile	29.0	(1990.4)	2.5	(1999.4)	36	-26.5	-0.7
Finland	2.5	(1992.4)	2.0	(1993.3)	3	-0.5	-0.2
Israel	18.5	(1991.4)	1.9	(1999.4)	24	-16.7	-0.7
New Zealand	4.4	(1989.2)	2.8	(1991.2)	8	-1.6	-0.2
Spain	4.7	(1994.3)	1.6	(1997.2)	11	-3.1	-0.3
Sweden	1.8	(1992.4)	1.8	(1992.4)	0	0.0	-
United Kingdom	3.6	(1992.3)	1.8	(1993.1)	2	-1.8	-0.9
Average	**7.8**		**1.9**		**9.9**	**-5.9**	**-0.5**
PITers							
Colombia	10.0	(1999.2)	10.6	(2000.2)	4	0.6	0.2
Korea	5.1	(1997.4)	0.7	(1999.1)	5	-2.4	-0.5
Mexico	17.6	(1998.4)	10.6	(2000.1)	5	-7.0	-1.4
South Africa	2.0	(1999.4)	2.0	(1999.4)	0	0.0	-
Average	**8.7**		**6.0**		**3.5**	**-2.2**	**-0.6**
Overall Average	**8.1**		**3.2**		**7.9**	**-4.8**	**-0.5**

[1] Convergence refers to most recent available observation. Stationary inflation for countries that do not explicitly annouce a long - term inflation target is calculated as inflation attained by industrial countries (2-3%).
Source: Authors´ calculations based on data from IFS, country sources, and Schaechter et al. (2000).

Table 4

Annual Average Deviation of Actual from Target Inflation under IT in 12 Countries: 1989-2000 (various subperiods)[1]

	(Percentage points)		(As a ratio to current inflation)	
	Relative	**Absolute**	**Relative**	**Absolute**
ITers				
Australia	-0.18	1.13	1.25	1.44
Canada	-0.15	0.20	-0.60	0.67
Chile	-0.12	0.40	-0.08	0.12
Finland	-0.69	0.69	-2.12	2.12
Israel	0.46	1.62	0.02	0.14
New Zealand	0.06	0.40	-0.08	0.25
Spain	0.15	0.45	-0.01	0.21
Sweden	-0.71	0.71	1.05	1.05
United Kingdom	0.09	0.31	0.00	0.12
Average	**-0.12**	**0.66**	**-0.06**	**0.68**
PITers				
Colombia	-5.23	5.23	-0.54	0.54
Korea	-2.30	2.30	-0.71	0.71
Mexico	-0.68	0.68	-0.06	0.06
South Africa	n.a.	n.a.	n.a.	n.a.
Average	**-2.74**	**2.74**	**-0.44**	**0.44**
Overall Average	**-0.78**	**1.18**	**-0.16**	**0.62**

[1] Relative (absolute) deviation: sum of relative deviations divided by number of periods. Relative (absolute) deviation as a ratio to current inflation: sum of relative (absolute) deviations as ratios to inflation divided by number of periods. Depending on the IT framework. inflation target is defined as a range or as a point.
Source: Authors´calculations based on data from IFS. country sources. and Schaechter. et al.

Table 5

Sacrifice Ratios during Inflation Stabilization with IT in 13 Countries: 1980-2000 (based on annual GDP, and quarterly industrial production data, various subperiods)[1]

ITers	**GDP**	**Ind. Output**	**PITers**	**GDP**	**Ind. Output**
Australia	1.1	3.3	Colombia	0.2	1.8
Canada	-2.3	-4.2	Korea	0.4	1.7
Chile	-0.4	23.3	Mexico	-0.0	-2.7
Finland	2.4	6.2	South Africa	-2.3	-1.5
Israel	0.6	4.6			
New Zealand	0.2	-2.1			
Spain	2.5	18.2			
Sweden	0.6	6.6			
United Kingdom	0.9	3.8			
Average	**0.6**	**6.6**		**-0.4**	**-0.2**

[1] Sacrifice ratios calculated as cumulative GDP variation (to a trend calculated by a Hodrick-Prescott filter) divided by inflation change between 3 years before and 1 year after IT adoption year.
Source: Authors´calculations based on data from IFS and country sources.

Table 6a

Sacrifice Ratios during Inflation Stabilization in 13 IT Countries and 10 NIT Countries: 1980(1990)-2000 (based on annual GDP data, various subperiods)(1)

ITers			**PITers**		**NITers**	
	Before	**After**	During 1990s			During 1990s
Australia	-1.41	0.01	Colombia	0.00	Denmark	0.90
Canada	-6.84	0.64	Korea	0.15	France	-0.45
Chile	0.37	-0.7	Mexico	-3.06	Germany	-0.12
Finland	0.03	-4.74	South Africa	-5.69	Italy	0.25
Israel	0.17	-0.14			Japan	1.46
New Zealand	-0.67	0.22			Netherlands	1.47
Spain	-0.85	0.82			Norway	-0.87
Sweden	0.08	0.22			Portugal	-0.39
United Kingdom	0.75	0.02			Switzerland	0.87
					United States	0.78
Average	**-0.22(2)**	**0.06(2)**		**-2.15**		**0.39**

(1) Sacrifice ratios calculated as the cumulative GDP variation (to a trend calculated by a Hodrick-Prescott filter) divided by inflation change in any disinflation period. ITers´ sacrifice ratios are calculated before (since 1980) and after adopting IT framework. Outlier observations are excluded.
(2) Excluding Canada and Finland.
Source: Authors´calculations based on data from IFS and country sources.

Table 6b

Sacrifice Ratios during Inflation Stabilization in 13 IT Countries and 10 NIT Countries: 1986(1990)-2000 (based on quarterly industrial production data. Various subperiods)[(1)]

ITers			**PITers**		**NITers**	
	Before	**After**		During 1990s		During 1990s
Australia	-1.3	0.1	Colombia	-0.1	Denmark	-0.8
Canada	-1.2	1.4	Korea	-0.4	France	-1.2
Chile	-0.5	-0.6	Mexico	-0.6	Germany	3.0
Finland	3.2	-4.5	South Africa	-2.9	Indonesia	-3.3
Israel	3.5	0.0			Italy	3.7
New Zealand	-0.2	-0.2			Japan	2.8
Spain	1.8	-4.9			Netherlands	3.7
Sweden	0.0	-2.2			Norway	-0.7
United Kingdom	-0.8	0.3			Portugal	-0.1
					Switzerland	2.0
					United States	-0.7
Average	**0.5**	**-1.2**		**-1.0**		**1.2**

[(1)] Sacrifice ratios calculated as the cumulative Industrial Production variation (to a trend calculated by a Hodrick-Prescott filter) divided by inflation change in any disinflation period. ITers´ sacrifice ratios are calculated before (since 1986) and after adopting IT framework. Outlier observations are excluded.
Source: Authors´calculations based on data from IFS and country sources.

Table 7

Output Volatility in 13 IT Countries and 10 NIT Countries: 1980-2000 (based on quarterly industrial production data, various subperiods)[1]

ITers			**PITers**			**NITers**	
	Before	**After**		**Before**	**After**		**During 1990s**
Australia	2.8	1.2	Colombia	4.5	-	Denmark	2.8
Canada	4.4	2.2	Korea	3.6	9.4	France	1.6
Chile	6.2	3.1	Mexico	4.0	-	Germany	2.4
Finland	3.1	2.5	South Africa	3.2	-	Italy	2.3
Israel	2.9	1.7				Japan	3.3
New Zealand	3.4	3.1				Netherlands	2.2
Spain	2.4	1.7				Norway	2.8
Sweden	3.1	3.4				Portugal	10.8
United Kingdom	2.4	1.3				Switzerland	2.8
						United States	2.3
Average	**3.4**	**2.2**		**3.8**	**9.4**		**3.3**

(1) Volatility calculated as standard deviation of industrial production variation (to a trend calculated by a Hodrick-Prescott filter).
Source: Authors´calculations based on data from IFS and country sources.

Table 8: Estimates of Central Bank Inflation Aversion: Robustness Exercise

	Gammas				Alphas			
	Average of Cecchetti and Ehrmann	Cecchetti and Ehrmann or Average	Ranking of Aggregate Supplies	Ranking of Impulse Responses	Average of Cecchetti and Ehrmann	Cecchetti and Ehrmann or Average	Ranking of Aggregate Supplies	Ranking of Impulse Responses
ITers	**2.83**	**3.39**	**3.83**	**2.63**	**0.92**	**0.89**	**0.94**	**0.89**
Australia	2.83	4.65	3.71	2.80	0.88	0.92	0.90	0.88
Canada	2.83	1.80	2.71	2.72	0.93	0.90	0.93	0.93
Chile	2.83	0.84	6.00	2.73	0.95	0.85	0.98	0.95
Finland	2.83	3.76	3.14	1.68	0.94	0.95	0.94	0.90
Israel	2.83	1.42	4.07	3.23	0.88	0.79	0.92	0.90
New Zealand	2.83	0.67	3.25	0.60	0.92	0.74	0.93	0.72
Spain	2.83	1.22	4.59	5.65	0.96	0.90	0.97	0.98
Sweden	2.83	2.35	3.33	1.91	0.94	0.93	0.95	0.92
United Kingdom	2.83	13.76	3.70	2.34	0.89	0.97	0.91	0.87
PITers	**2.83**	**2.83**	**2.77**	**2.18**	**0.94**	**0.94**	**0.94**	**0.93**
Colombia	2.83	2.83	3.43	1.19	0.97	0.97	0.98	0.94
Korea	2.83	2.83	3.40	1.75	0.92	0.92	0.93	0.87
Mexico	2.83	2.83	1.90	2.70	0.91	0.91	0.88	0.91
South Africa	2.83	2.83	2.34	3.07	0.97	0.97	0.97	0.98
NITers	**2.83**	**3.24**	**2.66**	**2.53**	**0.93**	**0.91**	**0.92**	**0.87**
Denmark	2.83	0.70	3.29	2.32	0.94	0.80	0.95	0.93
Francia	2.83	6.15	2.59	0.10	0.94	0.97	0.93	0.41
Germany	2.83	5.72	2.57	1.61	0.91	0.95	0.90	0.85
Italy	2.83	4.89	2.25	2.90	0.94	0.97	0.93	0.95
Japan	2.83	1.09	3.16	2.38	0.94	0.87	0.95	0.93
Netherlands	2.83	2.03	2.96	6.00	0.91	0.88	0.91	0.95
Norway	2.83	2.83	3.10	2.73	0.93	0.93	0.94	0.93
Portugal	2.83	2.83	2.19	2.89	0.95	0.95	0.94	0.95
Switzerland	2.83	5.08	1.42	2.52	0.92	0.95	0.86	0.91
U.S.	2.83	1.10	3.12	1.90	0.92	0.83	0.93	0.89

Source: Authors´ estimations.

Table 9: Estimation Results of Simple Taylor Rules for ITers and NITers (1990.1 - 1999.4)

	Lagged Interest Rates	Inflation Gap (1)	Activity Gap (2)	Adjusted R-Squared
<u>NITers</u>				
Denmark	0.94**	0.06	0.12	0.81
	(0.09)	(0.95)	(0.13)	
France	0.97**	-0.12	0.07**	0.98
	(0.02)	(0.11)	(0.02)	
Germany	0.98**	0.04	0.10**	0.99
	(0.01)	(0.03)	(0.01)	
Italy	0.94**	0.27	0.02	0.85
	(0.08)	(0.32)	(0.09)	
Japan	0.98**	0.09*	0.02	0.99
	(0.02)	(0.06)	(0.01)	
Netherlands	0.97**	0.34*	0.08*	0.97
	(0.03)	(0.21)	(0.05)	
Norway	0.82**	-0.51	0.09	0.67
	(0.10)	(0.69)	(0.14)	
Portugal	0.98**	0.36**	0.02	0.98
	(0.03)	(0.14)	(0.06)	
Switzerland	0.95**	0.12	0.07*	0.96
	(0.04)	(0.12)	(0.04)	
U.S.	0.78**	0.21**	0.22**	0.97
	(0.04)	(0.08)	(0.03)	
<u>ITers</u>				
Australia	0.79**	0.17**	0.09**	0.98
	(0.03)	(0.06)	(0.04)	
Canada	0.97**	-0.14	0.17**	0.92
	(0.05)	(0.12)	(0.06)	
Chile	0.65**	0.68	0.00	0.40
	(0.13)	(1.05)	(0.41)	

Table 9:
(continued)

	Lagged	Inflation	Activity	Adjusted
	Interest Rates	Gap (1)	Gap (2)	R-Squared
Finland	0.97**	0.17	0.01	0.98
	(0.04)	(0.11)	(0.03)	
Israel	0.71**	0.23**	-0.19	0.80
	(0.08)	(0.08)	(0.13)	
New Zealand	0.92**	-0.07	0.17**	0.86
	(0.08)	(0.17)	(0.08)	
Spain	0.99**	0.27	0.05	0.97
	(0.03)	(0.25)	(0.05)	
Sweden	0.54**	0.26	0.04	0.26
	(0.16)	(0.38)	(0.24)	
United Kingdom	0.87**	0.27**	0.04	0.97
	(0.04)	(0.11)	(0.08)	
<u>PITers</u>				
Colombia	0.85**	0.62**	0.08	0.76
	(0.09)	(0.19)	(0.15)	
Korea	0.68**	0.56**	0.09	0.60
	(0.15)	(0.28)	(0.09)	
Mexico	0.59**	-0.07	-0.94	0.57
	(0.14)	(0.16)	(0.51)	
South Africa	0.80**	0.12	0.13*	0.81
	0.08	0.14	0.08	

(1) As deviations from an HP1600 trend
(2) Anualized deviations from IT or an HP1600 trend
Note: standard errors are noted in parenthesis. Coefficients with one (two) asteriscs denote significance level at 10% (5%).

Table 10

Estimated Model Coefficients for Chile (based on inflation expectations estimated from nominal – real interest rate differences)

Parameter	Estimated Value	Standard Error	Equation	Estimated Value	Standard Error
Equation 7.1			**Equation 7.6**		
α_0	-0.632	0.363	ϕ_0	-0.326	1.059
α_1	0.432	0.119	ϕ_1	0.379	0.191
α_2	0.141	0.041	ϕ_2	-0.070	0.116
α_3	0.105	0.048	ϕ_3	-0.002	0.0005
α_4	1.394	0.325	ϕ_4	-0.245	0.097
α_5	0.686	0.344	ϕ_5	-0.079	0.060
α_6	0.517	0.307	**Equation 7.7**		
α_7	0.285	0.135	μ_0	0.426	0.082
α_8	0.141	0.041	μ_1	1	-
Equation 7.2			μ_2	0	-
β_0	1.378	0.186	μ_3	0.125	0.074
β_1	0.826	0.099	**Equation 7.8**		
β_2	0.174	-	λ_0	-0.347	0.249
β_3	-1.221	0.347	λ_1	1.078	0.123
β_4	-1.249	0.326	λ_2	0.982	0.212
Equation 7.3			λ_3	1.093	0.214
γ_0	1.621	1.074	λ_4	-0.711	0.355
γ_1	0.675	0.093	λ_5	-0.762	0.300
γ_2	0.059	0.022	λ_6	-0.617	0.276
γ_3	-0.427	0.149	λ_7	-0.702	0.271
γ_4	0.055	0.041	**Equation 7.9**		
Equation 7.4			ψ_0	6.718	0.281
δ_0	1.292	0.314	ψ_1	0.628	0.140
δ_1	-0.126	0.032	ψ_2	0.361	0.097
δ_2	0.843	0.038	ψ_3	5.055	0.119
δ_3	0.604	0.197	ρ	0.563	0.048
δ_4	0.207	0.204			
δ_5	-1.214	0.205			
Equation 7.5					
χ_0	-0.278	0.133			
χ_1	0.219	0.043			
χ_2	0.850	0.033			

Source: Authors' estimation.
Note: This is the version used for the simulations and the counterfactuals. All the restrictions over the coefficients were tested before they were imposed, including homogeneity of degree one of all nominal variables in the price and wage equations (equation (7.1) and (7.2), respectively).

Table 11
Core Inflation in Chile: Benchmark 1 and Non-Target Expectations Simulation
(Four-quarter sum of quarterly percentage rates of core CPI change)

	Benchmark	Simulation 1
Dec. 1993	11.6	12.9
June 1994	10.3	11.5
Dec. 1994	10.2	10.9
June 1995	9.6	10.0
Dec. 1995	7.6	8.6
June 1996	7.7	9.2
Dec. 1996	8.6	10.4
June 1997	7.5	9.5
Dec. 1997	6.4	8.9
June 1998	6.6	9.4
Dec. 1998	7.3	10.0
June 1999	5.9	8.5

Source: Authors' calculations based on model simulations.

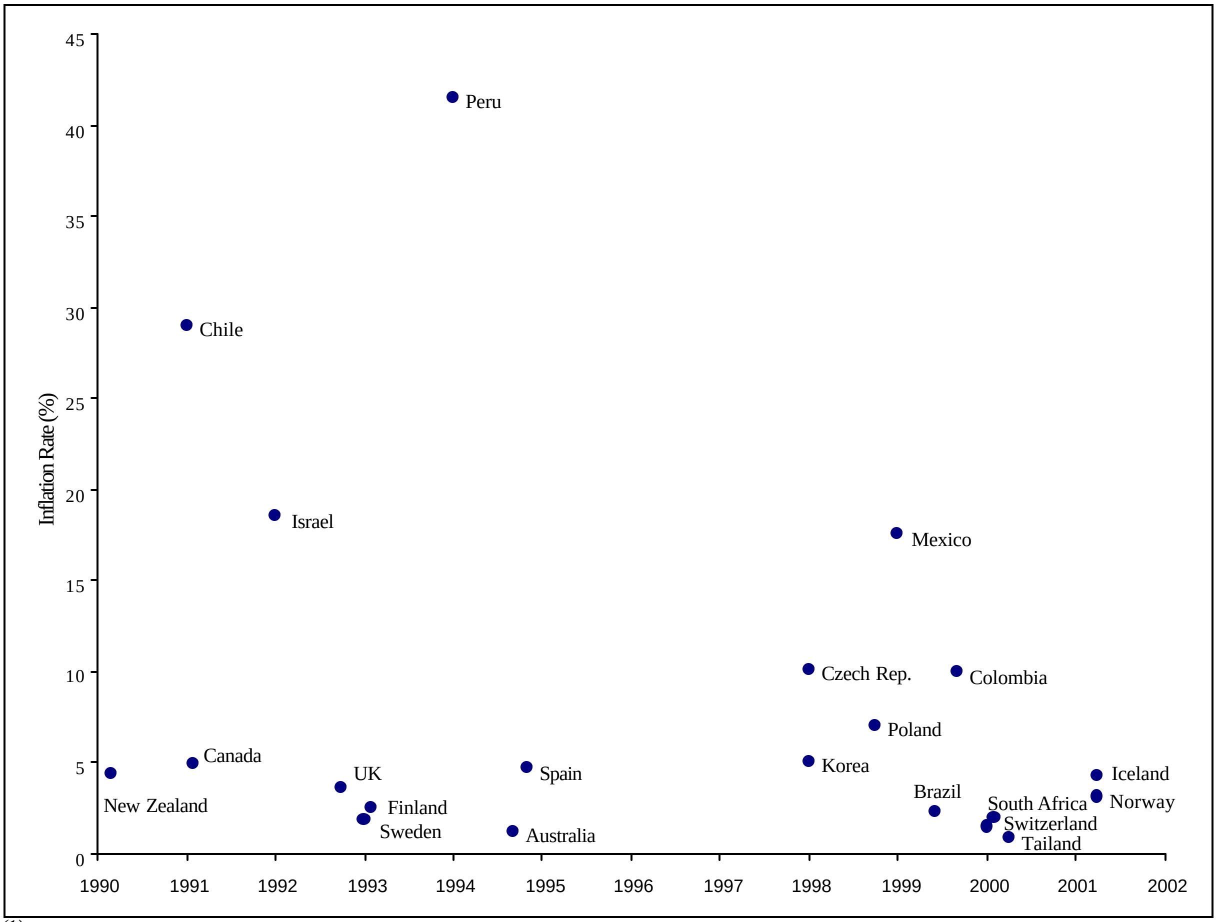
Table 12
Actual and Counterfactual Paths for the Inflation Target in Chile
(Dec. to Dec. percentage of CPI change)

	Actual Target	Cold-Turkey Target	Gradual Target
Dec. 1991	17.5	17.5	17.5
Dec. 1992	15.0	15.0	15.0
Dec. 1993	11.0	11.0	11.0
Dec. 1994	10.0	8.0	10.5
Dec. 1995	9.0	5.0	10.0
Dec. 1996	6.5	3.0	9.5
Dec. 1997	5.5	3.0	9.0
Dec. 1998	4.5	3.0	8.5
Dec. 1999	4.3	3.0	8.0
Dec. 2000	3.5	3.0	7.5

Source: Central Bank of Chile and authors' assumptions.

Figure 1

Inflation at Adoption of IT Framework in 21 Countries: 1990-2001 [(1)]



[(1)] *Inflation attained one quarter before adopting IT.*

Source: Authors´calculations based on data from IFS, country sources, and Schaechter et al.

Figure 2a
Average Quadratic Errors of Inflation Deviation Forecasts for IT and NIT Countries (obtained from out of sample forecasts of a rolling VAR and divided by the level of trend inflation): 1980-1999, quarterly data

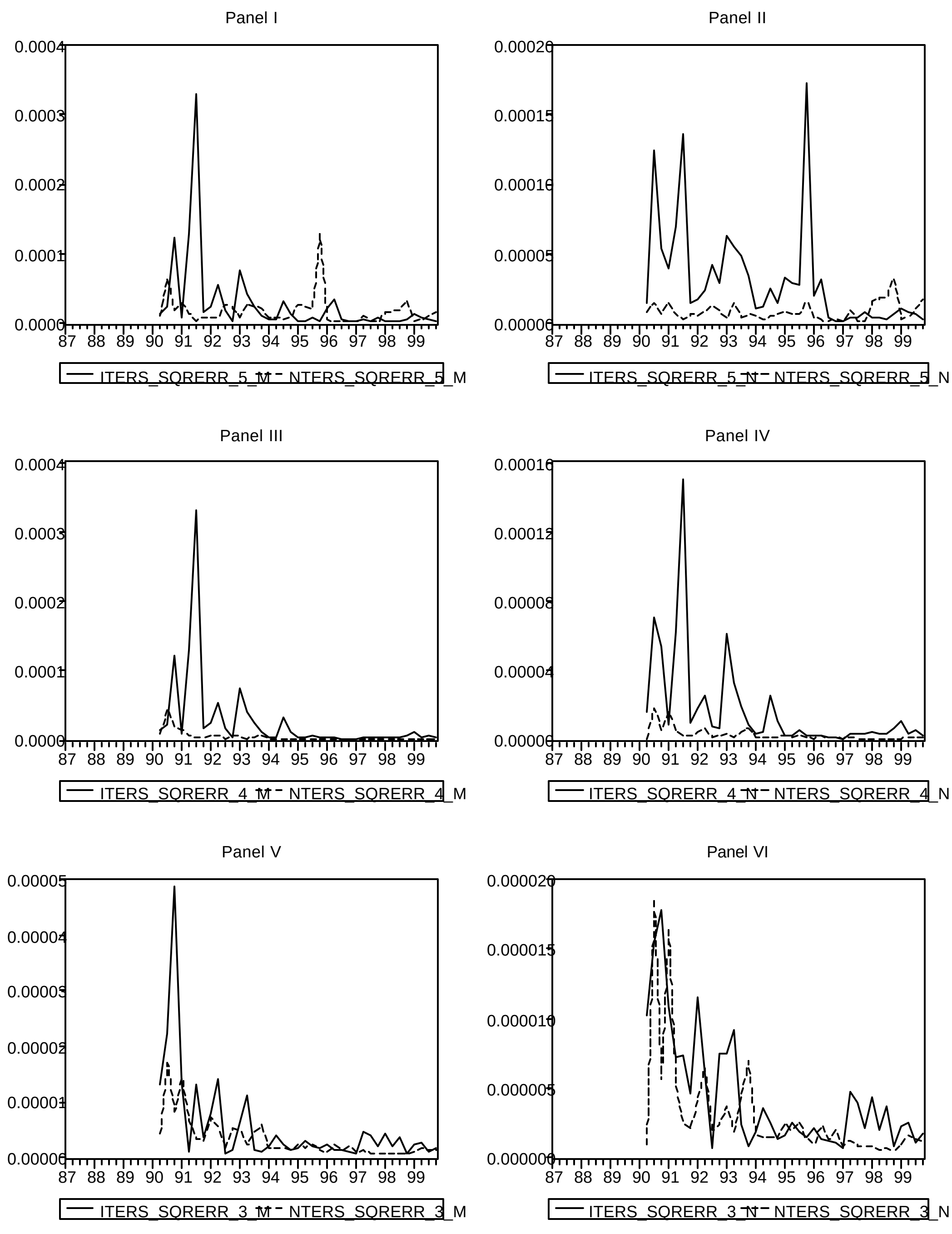


Figure 2b
Average Quadratic Errors of Inflation Deviation Forecasts for IT and NIT Countries (obtained from out of sample forecasts of a recursive VAR and divided by the level of trend inflation): 1980-1999, quarterly data

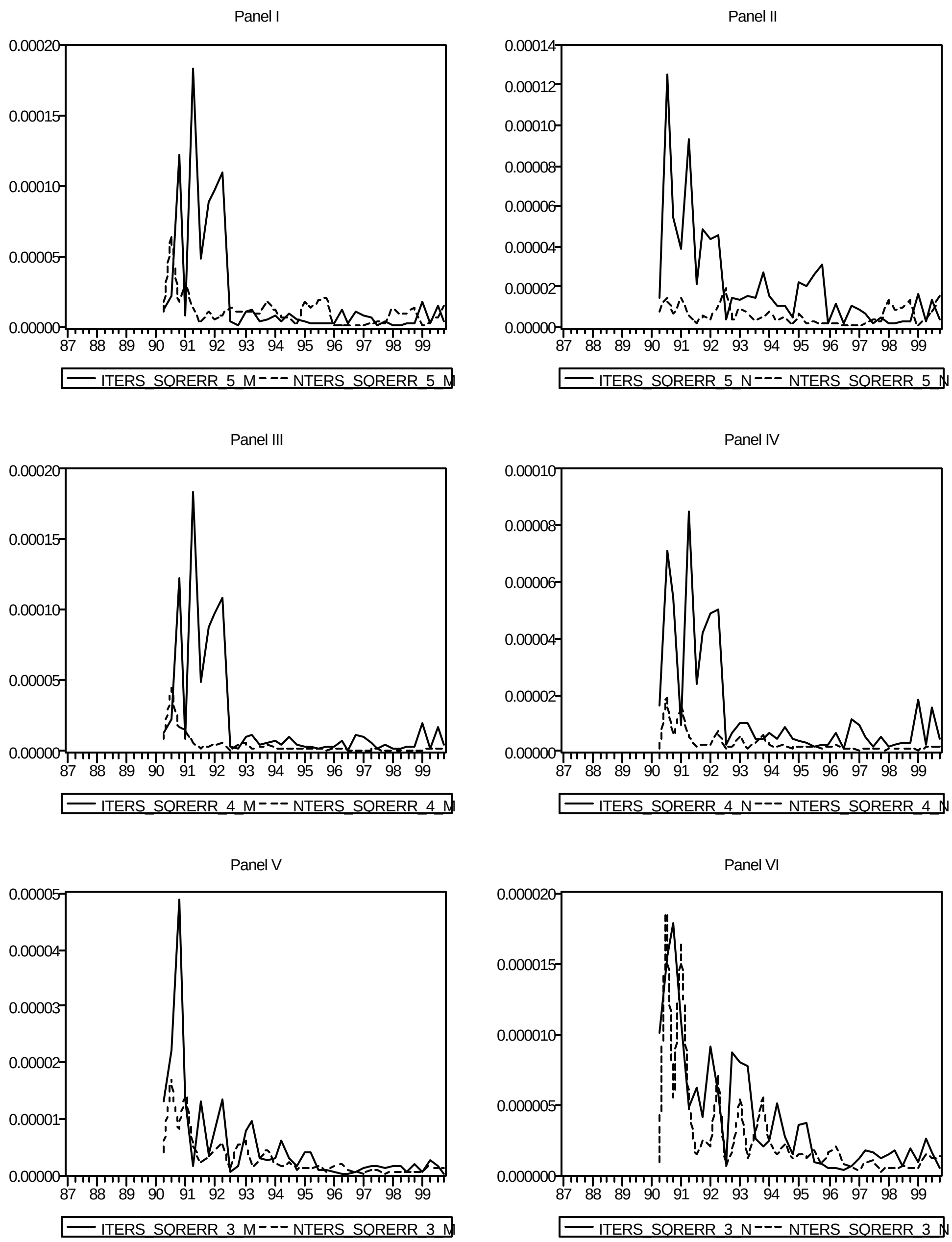


Figure 3a
Average Quadratic Errors of Inflation Deviation Forecasts for IT and NIT Countries (obtained from out of sample forecasts of a Rolling VAR with errors filtered for remaining structure and divided by the level of trend inflation): 1980-1999, quarterly data

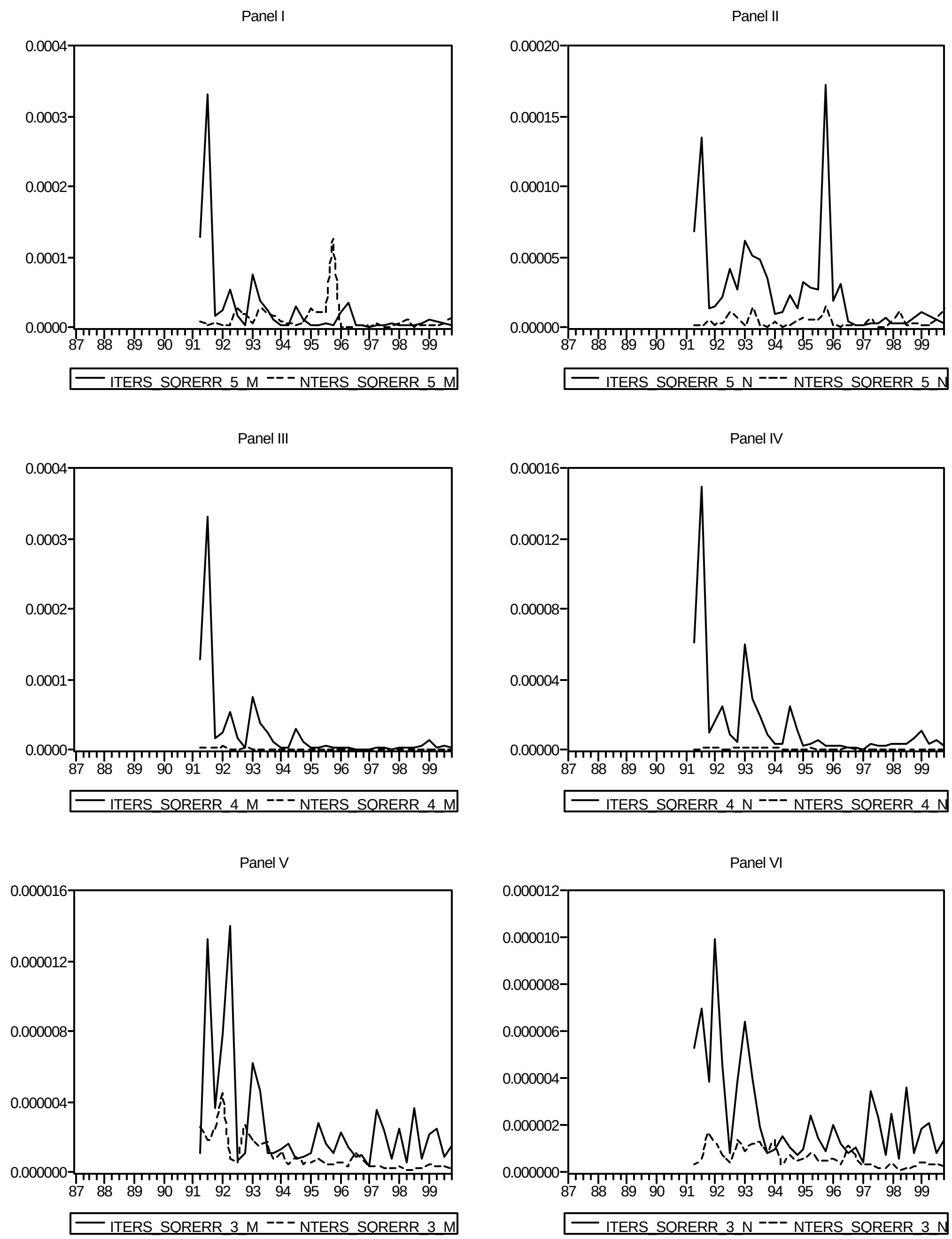


Figure 3b
Average Quadratic Errors of Inflation Deviation Forecasts for IT and NIT Countries (obtained from out of sample forecasts of a Recursive VAR with errors filtered for remaining structure and divided by the level of trend inflation): 1980-1999, quarterly data

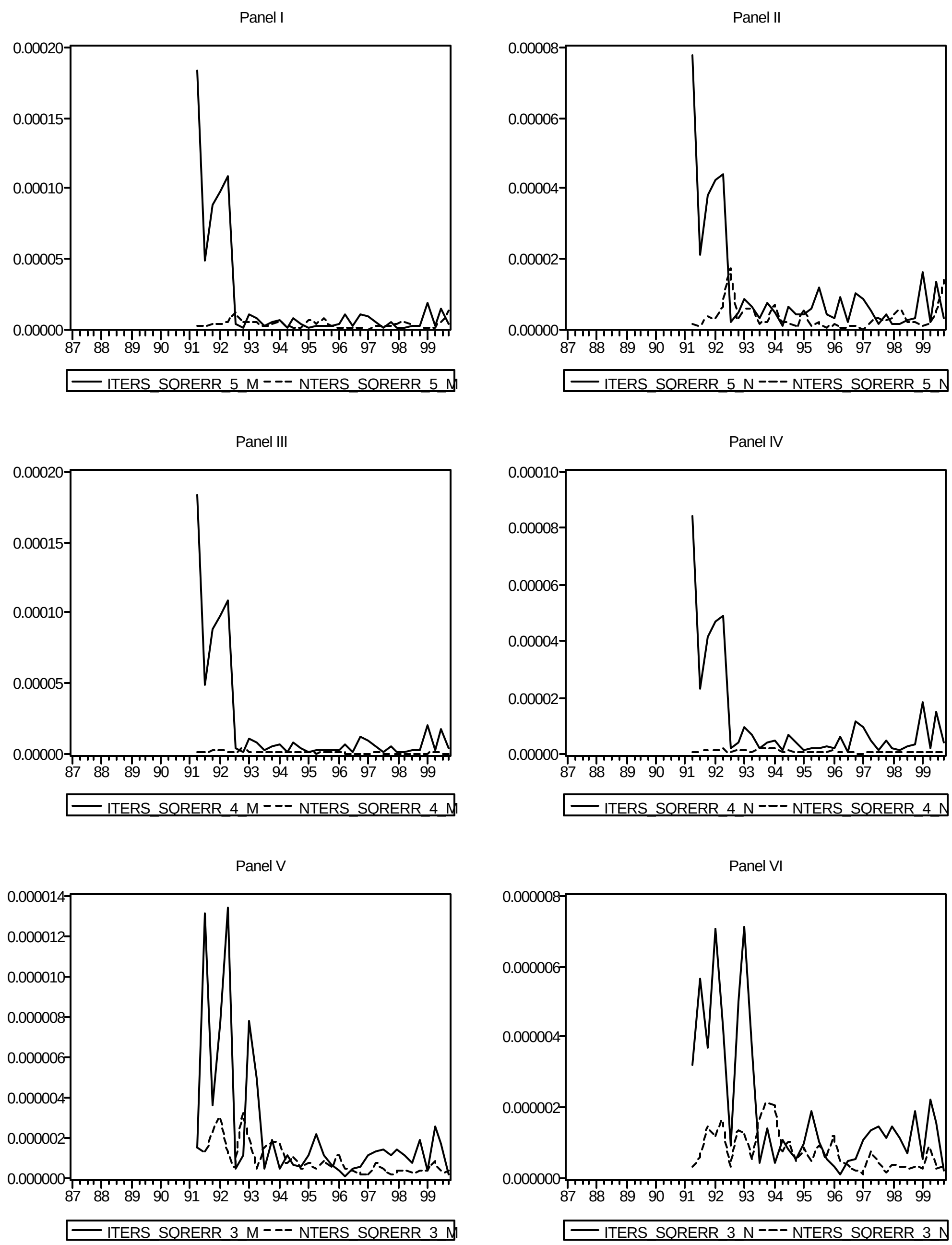


Figure 4a
Dynamic Variance Decomposition for Inflation and Output Gaps, Full Country Sample (obtained from out-of-sample forecasts of a Rolling VAR): 1990-1998, quarterly data

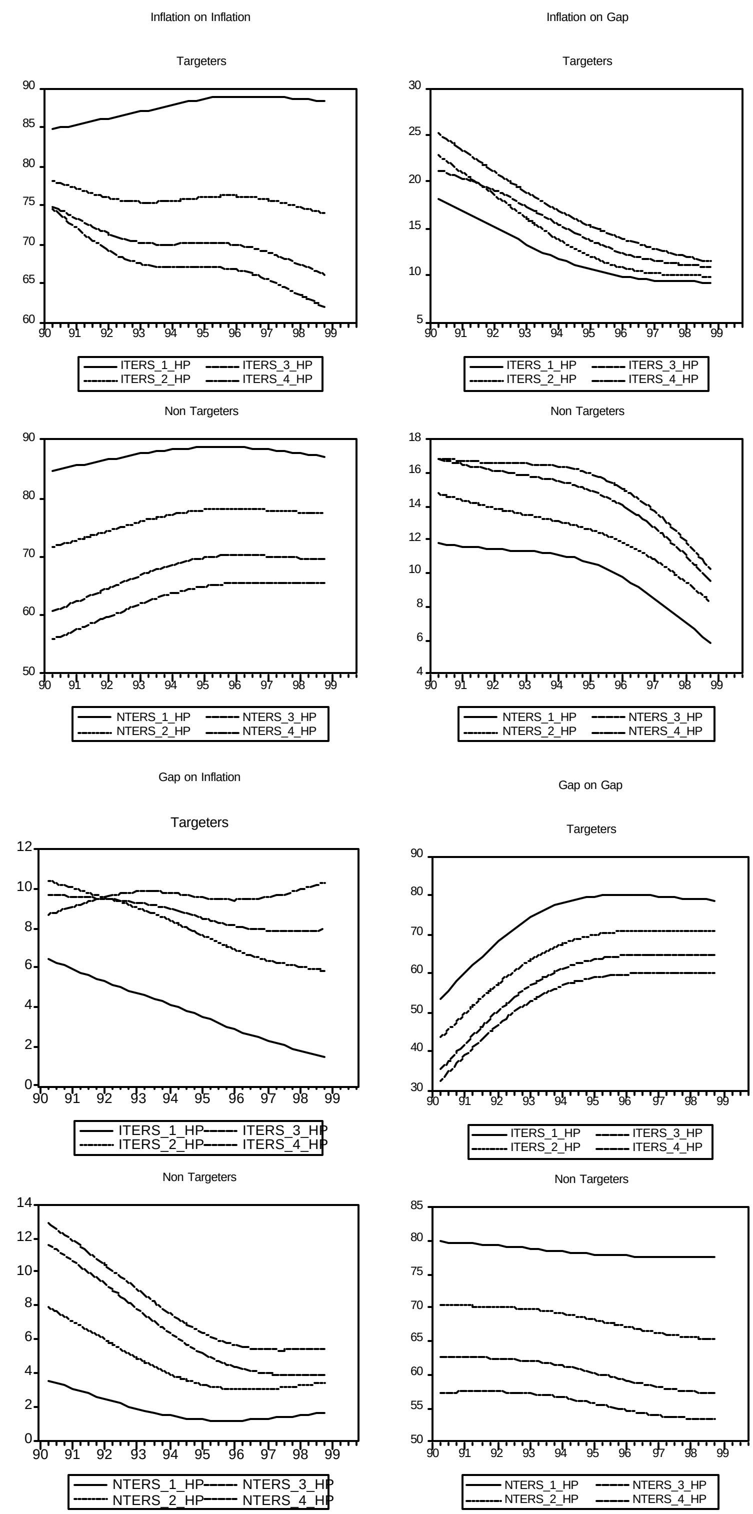


Figure 4b
Dynamic Variance Decomposition for Inflation and Output Gaps, Industrial-Country Sample (obtained from out-of-sample forecasts of a Rolling VAR): 1990-1998, quarterly data

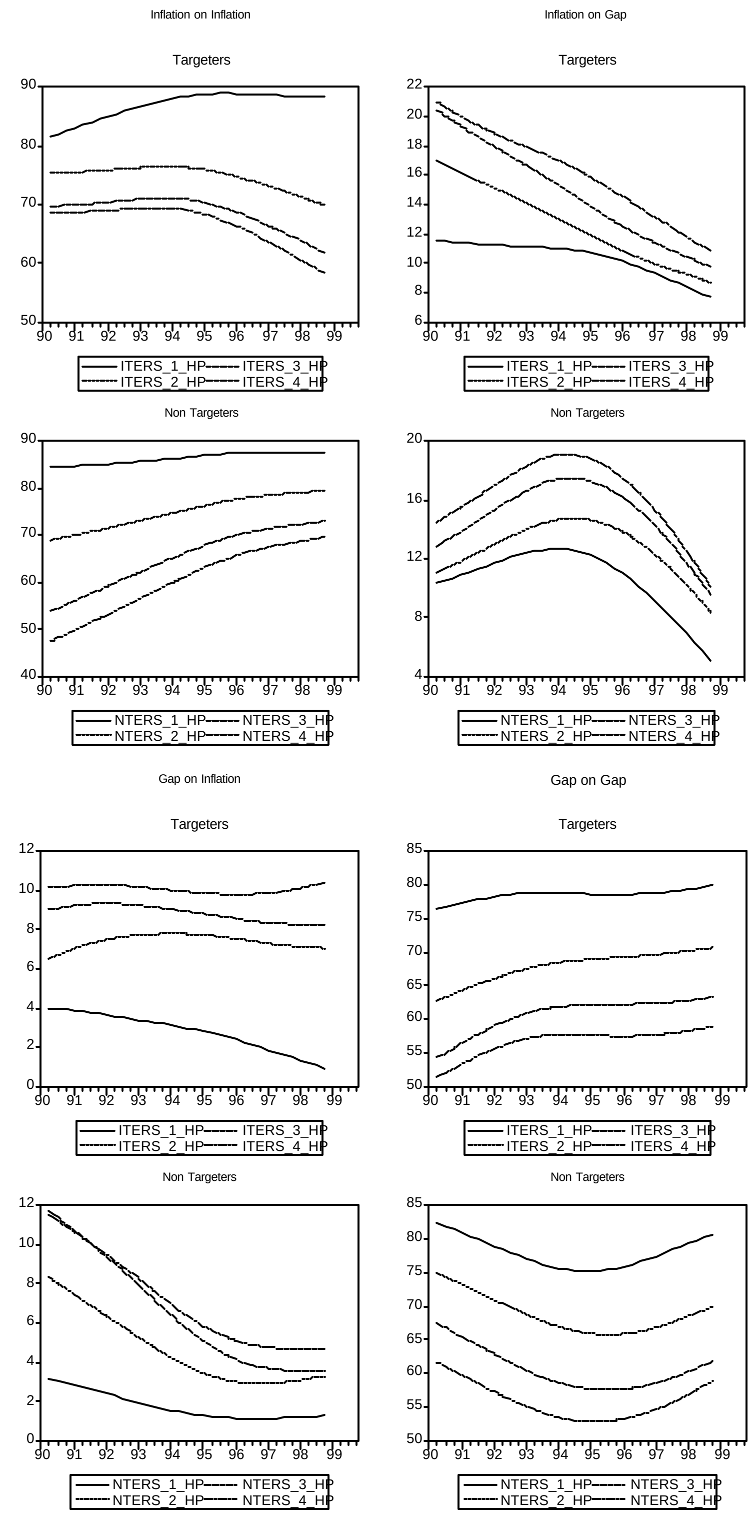


Figure 5
Dynamic Inflation Aversion Coefficients of OECD ITers (ITERS_OECD), Israel and Chile (ITERS_ISCH), PITers (PTERS), and NITers (NTERS)

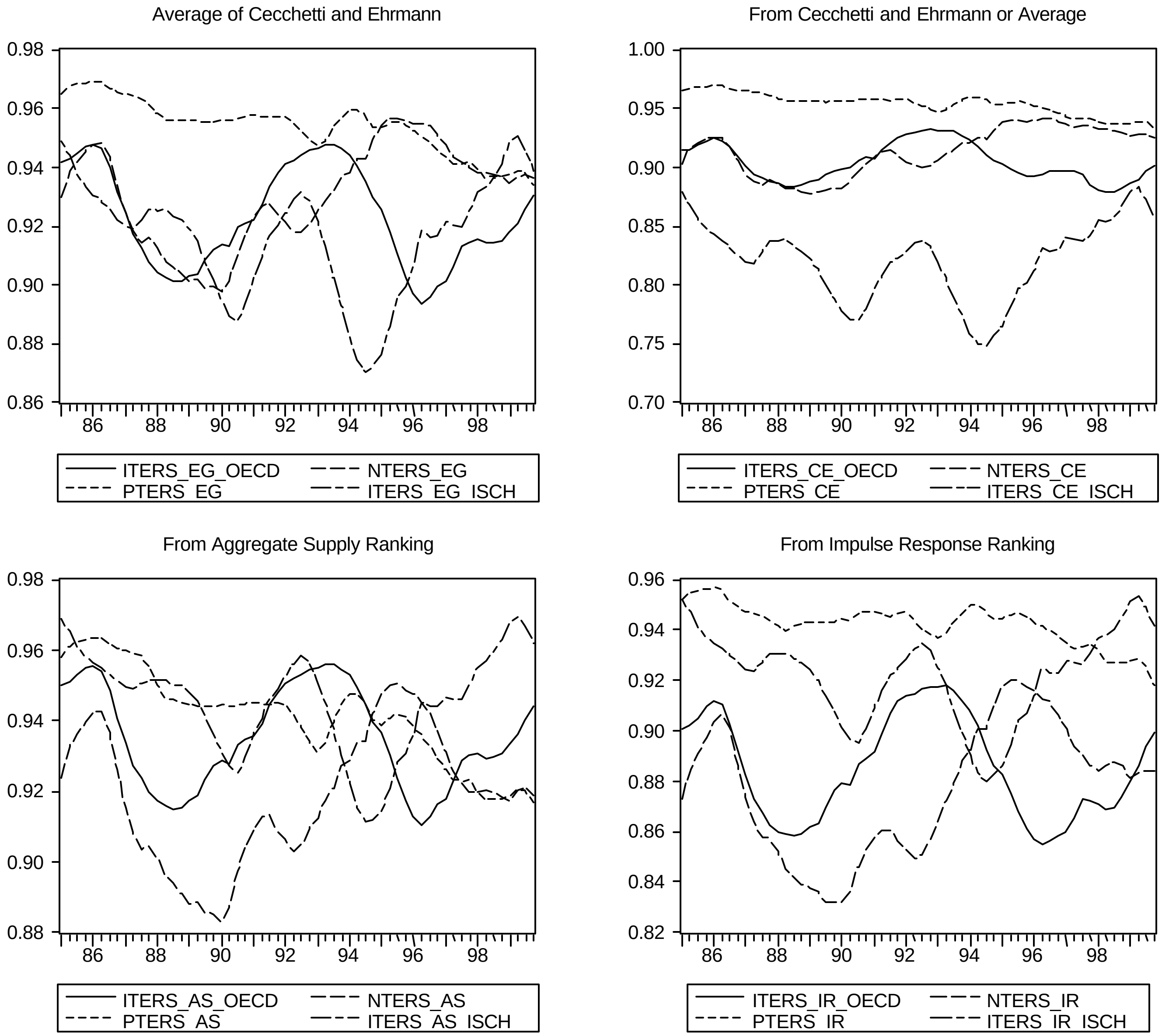


Figure 6
Dynamic Variance Decomposition for Interest Rates, ITers and NITers (obtained from out-of-sample forecasts of a Rolling VAR): 1990-1998, quarterly data

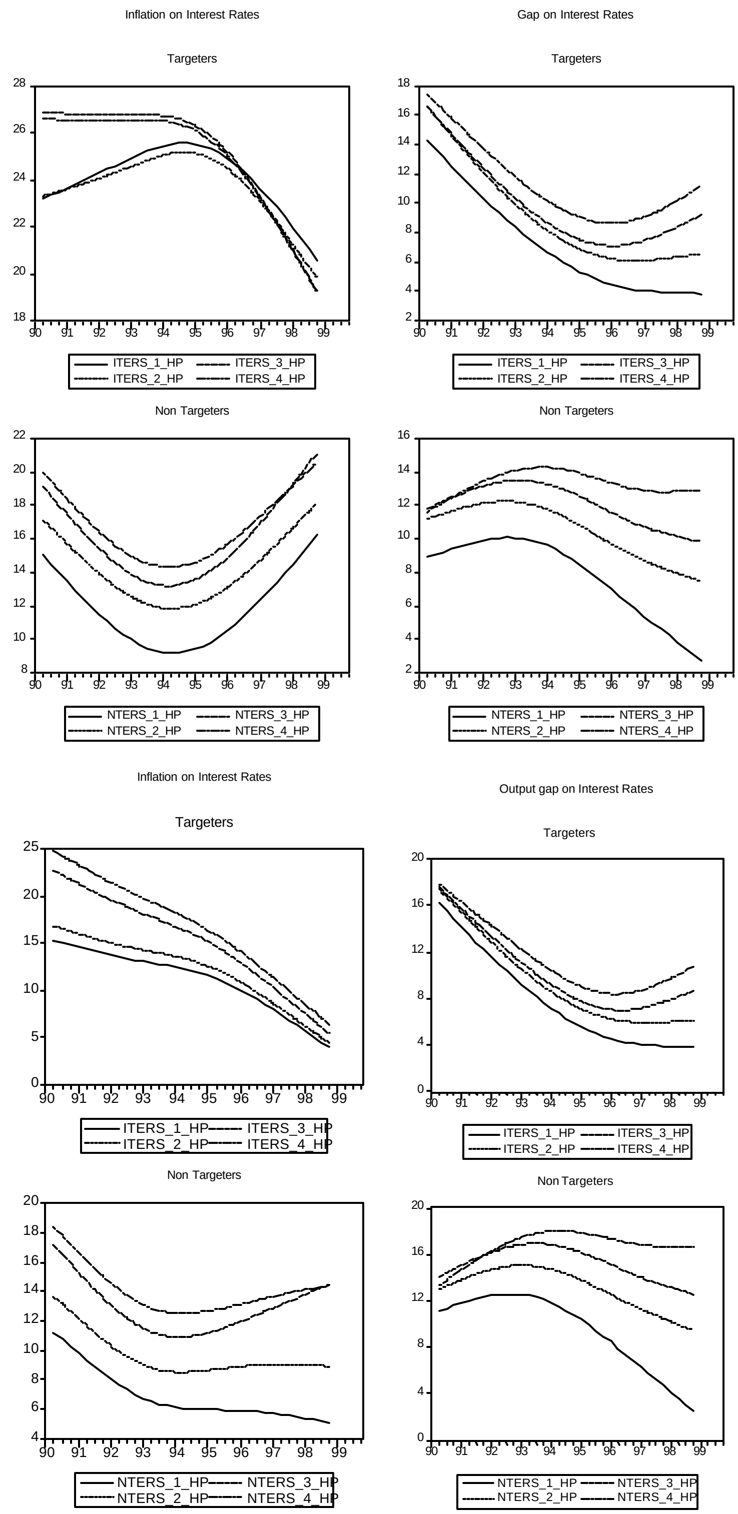


Figure 7a
Rolling Taylor Rule Coefficients for Industrial ITers plus Chile and Israel and Industrial NITers (Taylor Rule Estimated with Contemporary Inflation and Activity as Independent Variables)

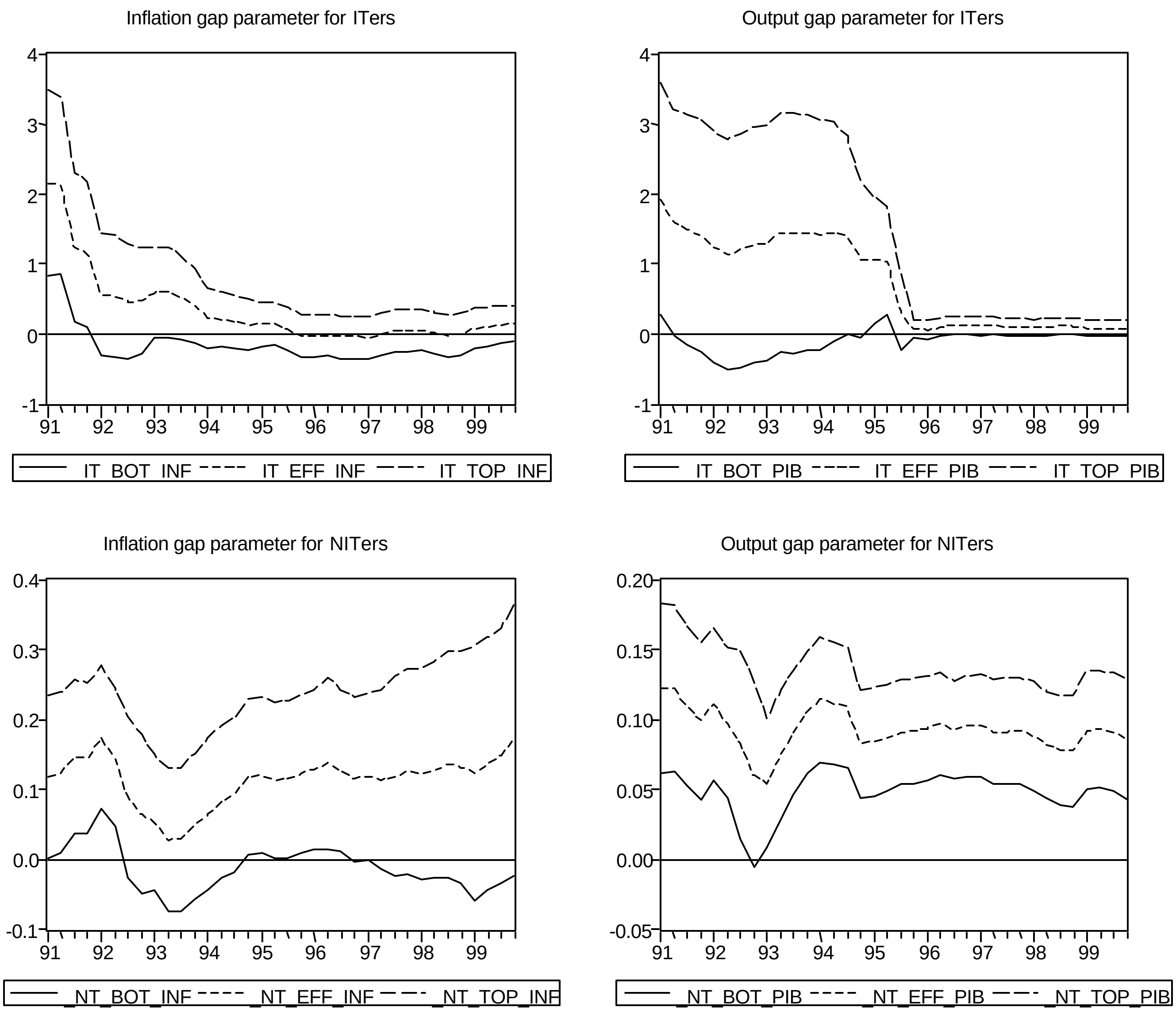


Figure 7b
Rolling Taylor Rule Coefficients for Industrial ITers and Industrial NITers (Taylor Rule Estimated with Contemporary Inflation and Activity as Independent Variables)

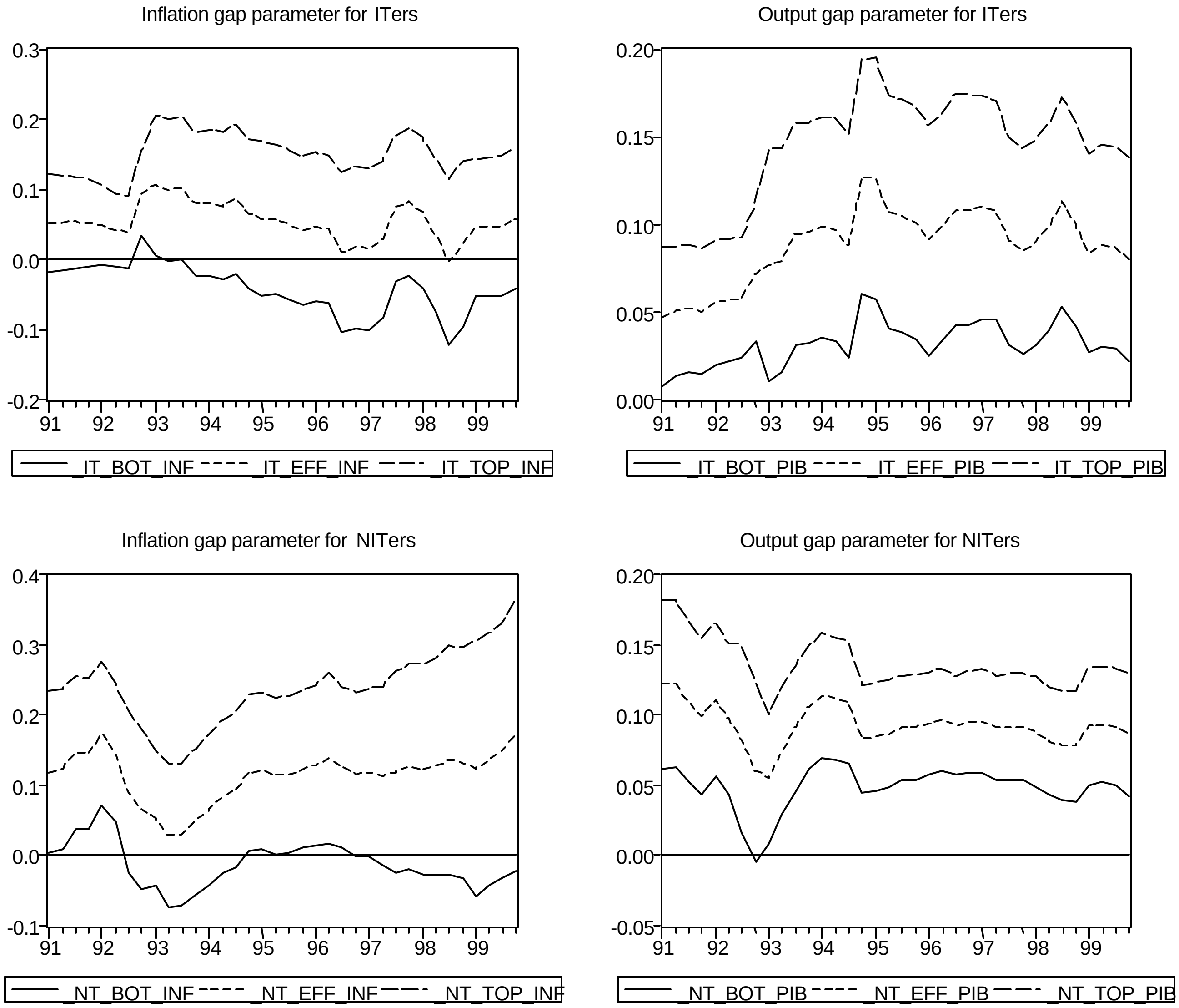


Figure 8
Core Inflation: Observed and Benchmark 1
(Quarterly rate of change; %)

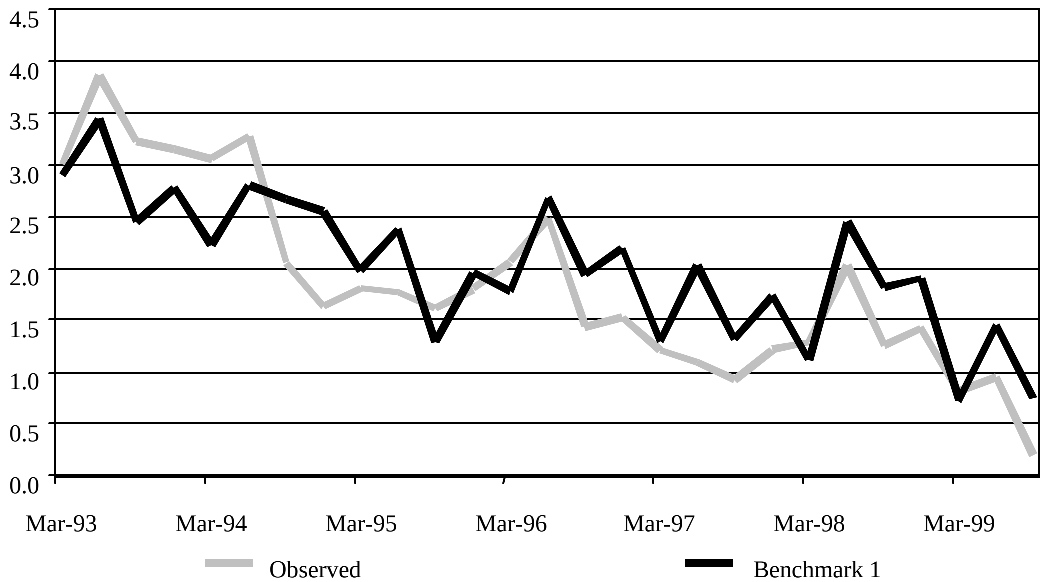


Figure 9
Core Inflation: Benchmark 1 and Non-Target Expectations Simulation
(Quarterly rate of change; %)

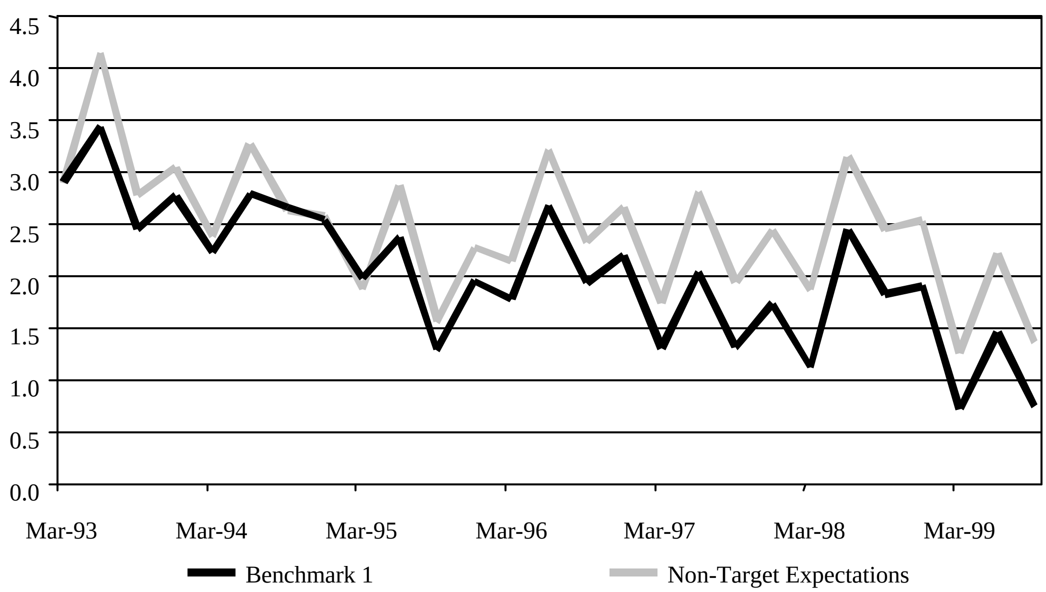


Figure 10
Core Inflation: Observed and Benchmark 2
(Quarterly rate of change; %)

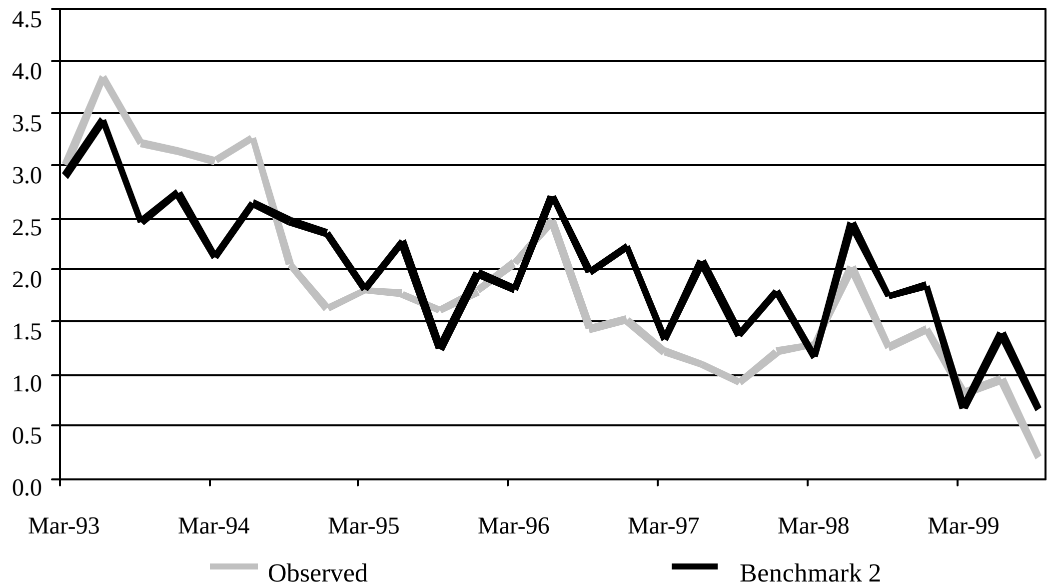


Figure 11
Core Inflation: Benchmark 2, Gradual Target, and Cold-Turkey Target Simulation
(Quarterly rate of change; %)

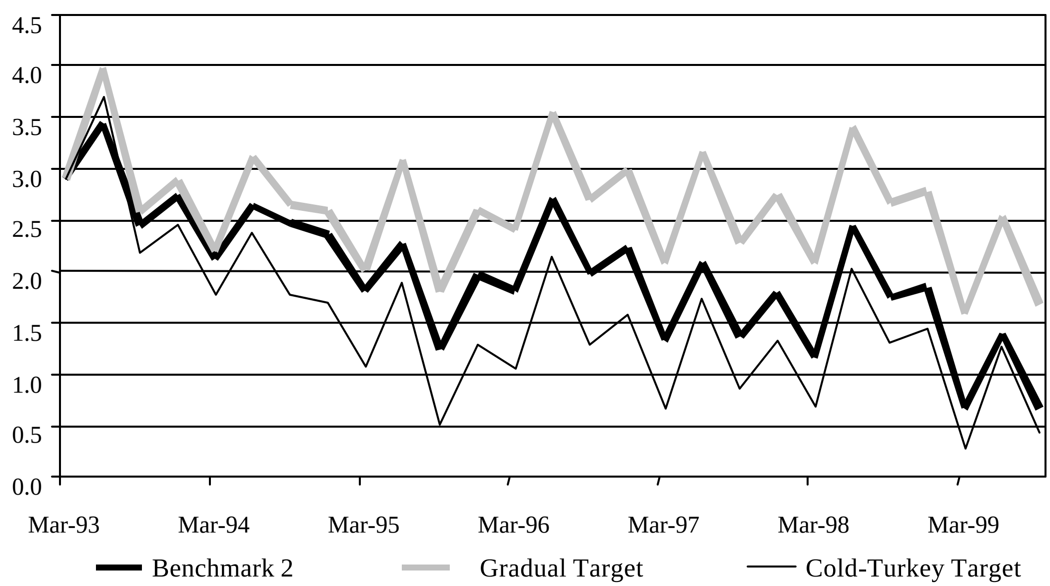


Figure 12
Unemployment: Benchmark 2, Gradual Target, and Cold-Turkey Target Simulation
(Quarterly rate; %)

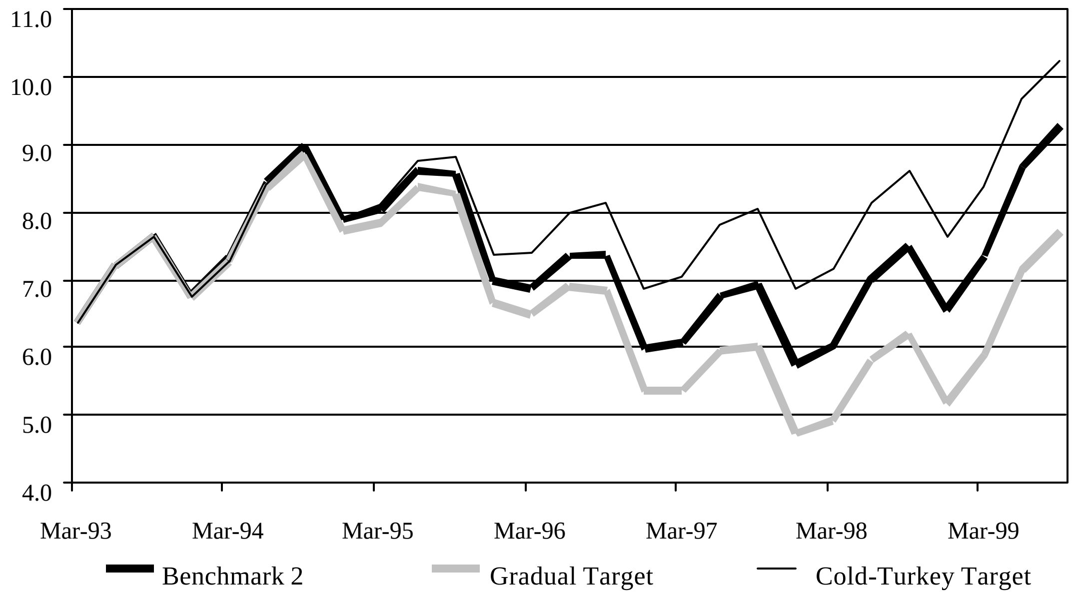


Figure 13
Core Inflation: Benchmark 2, Gradual Target, and Cold-Turkey Target Simulation using CF Expectations
(Quarterly rate of change; %)

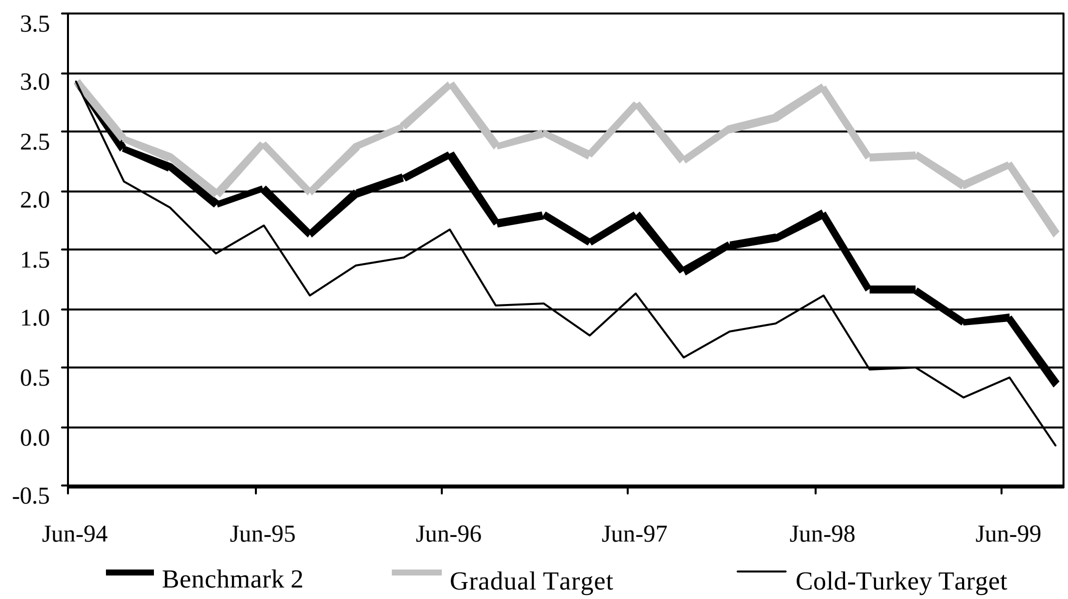


Figure 14
Unemployment: Benchmark 2, Gradual Target, and Cold-Turkey Target Simulation using CF Expectations
(Quarterly rate; %)

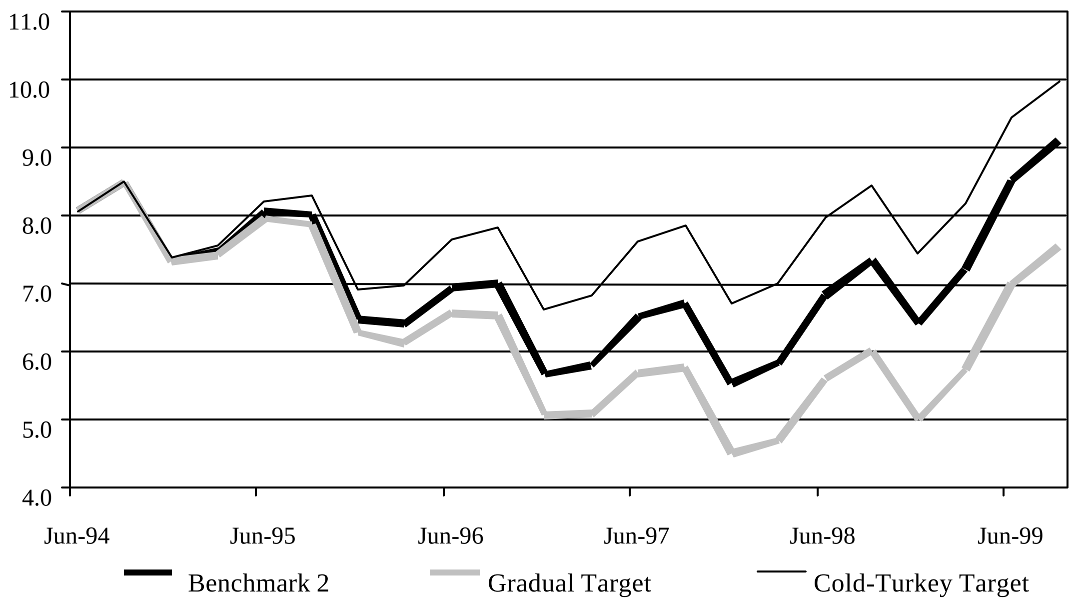


Figure 15
Core Inflation: Benchmark 2 and Cold-Turkey Target Simulation using CF Expectations with Partial and Full Credibility
(Quarterly rate of change; %)

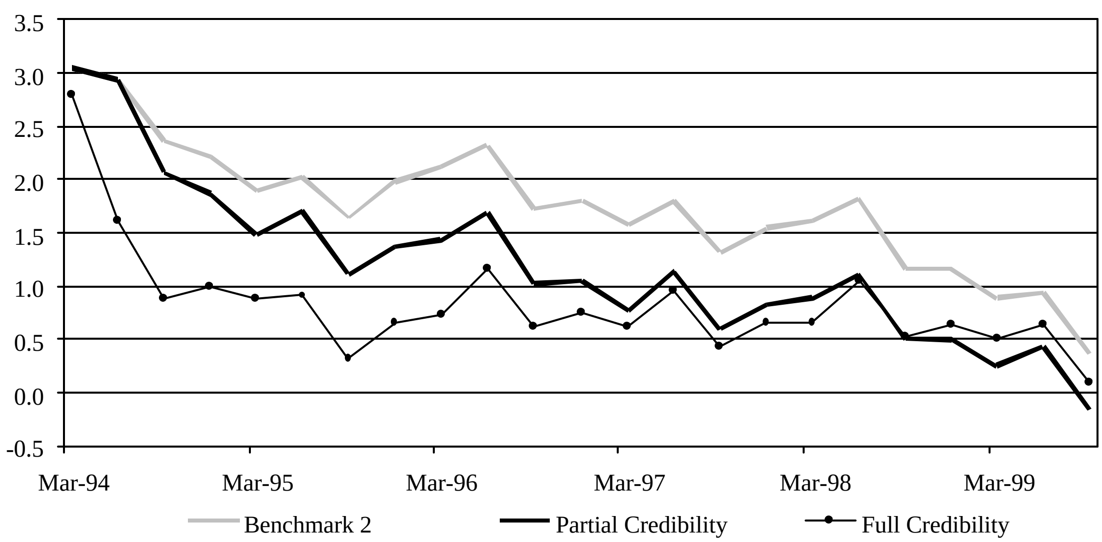
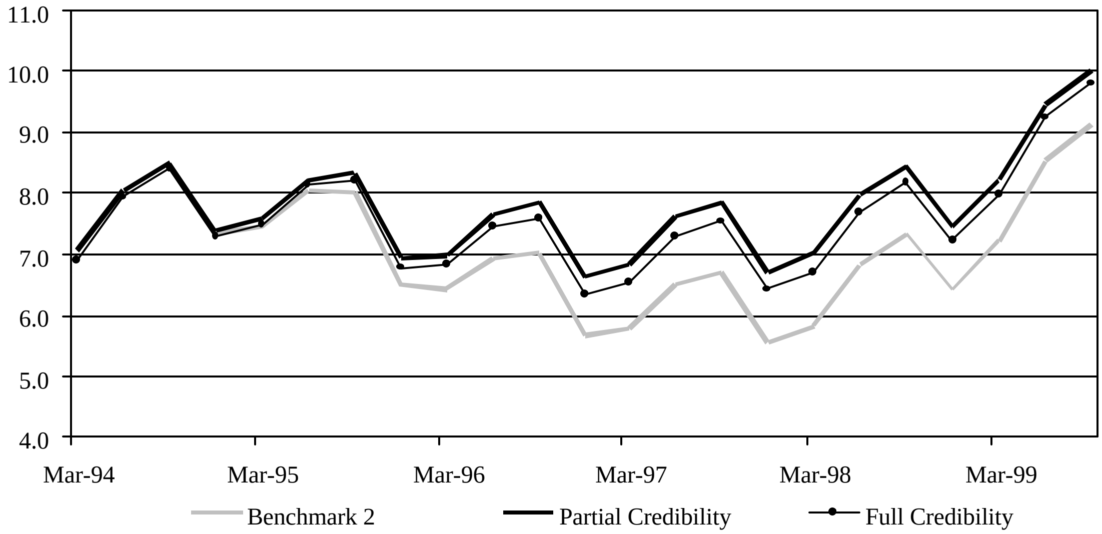


Figure 16
Unemployment: Benchmark 2 and Cold-Turkey Target Simulation using CF Expectations with Partial and Full Credibility
(Quarterly rate; %)



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