Inflation Targeting and Product Market Deregulation

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Abstract

I evaluate the effect of inflation targeting on inflation and how it interacts with product market deregulation during the disinflationary process in the 1990s. Using a sample of 21 OECD countries, I show that, after controlling for product market deregulation, the effect of inflation targeting is quantitatively important and statistically significant. Moreover, product market deregulation also matters in particular in countries that adopted an inflation targeting regime. I propose a New Keynesian Phillips curve with an explicit role for market deregulation to rationalize the empirical evidence.

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1 Introduction

Inflation targeting (IT henceforth) has been adopted by an increasing number of central banks since the beginning of the 1990s. This new monetary policy framework requires a numerical objective for inflation, the absence of intermediate targets and a high level of transparency and accountability of the central bank.[1]

Extensive research has been conducted on various aspects of this regime.[2] Previous empirical studies report contrasting results regarding its effect on inflation: Wu (2003), Pétursson (2004), Vega and Winkelried (2005) and Batini and Laxton (2005) argue that it has been effective, while Ball and Sheridan (2003) and Willard (2006) provide evidence of the irrelevance of IT for OECD countries.

An aspect overlooked in the analysis of the effect of IT is the contribution of non-monetary factors to the disinflation of the 1990s. As pointed out in Rogoff (2003), the improvement in central banking institutions and practice has to be considered the major factor leading to the disinflation. However, he acknowledges that improved fiscal policy and increased competition, both in product and labor markets, resulting from the interaction of increased globalization, deregulation and a decreased role for the government in the economy, also played an important role. Gerlach et al. (2009) acknowledge the significant, although limited, influence of non-monetary factors in the general disinflation observed since 1990s.

In this paper, I contribute to the literature in two ways. First, I evaluate the effect of IT on the inflation rate for a sample of OECD countries, controlling for other important

[1] For a discussion on the features that characterize IT and the rationale for adopting the framework, see Debelle (1997), Debelle et al. (1998), Bernanke et al. (1999), Schaechter et al. (2000), Carare and Stone (2003), Mishkin (2004) and Roger (2009), among others.

[2] The empirical research areas include the effect on inflation rate (Laubach and Posen (1997), Neumann and von Hagen (2002), Wu (2003), Vega and Winkelried (2005), Ball and Sheridan (2005), Willard (2006), and with particular attention to emerging market economies: Mishkin (2000), Mishkin and Savastano (2001) and Schmidt-Hebbel and Werner (2002)), on the persistence of the inflation rate (Siklos (1999), Corbo et al. (2002), Levin et al. (2004), Pétursson (2004)), on the sacrifice ratio (Bernanke et al. (1999), and Corbo et al. (2002)) and on the behavior of expectations (Johnson (2002)). See also Corbo et al. (2001), Mishkin and Schmidt-Hebbel (2007), Walsh (2009) and the contributions in Bernanke et al. (1999), Bernanke and Woodford (2005), Mishkin and Schmidt-Hebbel (2007) and Cobham et al. (2010) for a broad overview of the IT experience.

phenomena that contributed to the generalized disinflation observed in this period, with particular attention to product market deregulation. Doing so is important because it allows me to test whether the disinflation was due to the adoption of IT, product market deregulation or both these factors. Moreover, by improving the fit and reducing the error variance, it yields more precise estimates of the effect of IT. To my knowledge, there are no empirical studies that analyze the effect of regulation in product or labor markets on inflation. Instead the focus has been on analyzing the effect of reforms on the unemployment rate. Second, I estimate carefully the effect using a Difference-in-Difference (DID) panel data model taking into account the high persistence of the dependent variable, which is essential for a correct inference when analyzing serially correlated time series with persistent treatment.

The analysis is performed on a sample of 21 OECD countries, of which eight[3] adopted IT during the period 1985-2007, to ensure an homogeneous sample in terms of inflation histories and economic and political structure. I focus on the role of product market regulation using the Indicators of Regulation in Energy, Transport and Communications (ETCR) coded by Conway and Nicoletti (2006). They provide the longest time-series currently available, to my knowledge, to compare product market regulations across countries in the non-manufacturing sectors which constitute two-thirds of economic activity and are affected by import penetration only to a limited extent. Conway and Nicoletti (2006) take into account market characteristics such as barriers to entry, public ownership, excessive vertical integration and the presence of price controls. I further control for the government budget deficit as a percentage of GDP, to account for the stance of the fiscal policy, and for globalization using the index coded by Dreher (2006) and updated in Dreher et al. (2008). Using the ETCR indicator allows me to control for the impact on competition of domestic market policies in non-manufacturing sectors, while including the globalization index in the empirical part helps to control for the effect of international competition on tradable goods prices.

[3]Australia, Canada, Finland, New Zealand, Norway, Spain, Sweden and United Kingdom are characterized in having IT. Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Portugal and United States are characterized as not having IT.

I estimate the effect of the adoption of IT on inflation using a panel DID estimator with country and time fixed effects in order to exploit both the time and country variation in the data. Given the autocorrelated nature of inflation rate and the persistence of the treatment variable, the standard errors of the OLS estimator are biased, as pointed out in Bertrand et al. (2004). However, OLS estimates with the inclusion of lagged dependent variables yield inconsistent estimates in the case of short time series. For these reasons I follow Hansen's (2007) methodology and I estimate the model using Feasible Generalized Least Squares (FGLS) with bias-corrected AR(2) coefficients of the error term.

I find that IT had both economically and statistically significant effect on inflation. On average it accounts for a reduction of over 1 percentage point of inflation in the sample 1985-2007. Moreover, regulation has also an important effect, a higher lever of regulation is associated with a higher inflation rate while a one point increase in regulation leads to an increase of over 0.65 percent in the inflation rate.

I further analyze whether the effect of product market regulation in inflation targeters and non-inflation targeters differed. Interestingly, I find that the level of regulation matters more in the inflation targeters countries, both before and after the adoption of the new regime, than the non-inflation targeters. Moreover, the change in regulation, which can be seen as a measure of deregulation reforms, has a much larger impact in the inflation targeting countries than in the control group.

To understand better how deregulation impacted on inflation, I next propose a New Keynesian Phillips curve with an explicit role for market deregulation. Following Blanchard and Giavazzi (2003), I use a time varying elasticity of substitution between goods to proxy for the level of regulation in the economy.[4] In the model, a higher elasticity of substitution represents a lower market power of the firm, lower barriers to entry or lower regulation. I assume, consistently with the data, that the elasticity over time rises during the deregulation period. I simulate a general equilibrium model that replicates the timing of the disinflation

[4]A stochastic elasticity of substitution is usually used in the DSGE models as a short cut to introduce supply-side shocks.

in the IT countries and find an initial decrease in inflation rate due to product market deregulation and a permanent disinflation only afterwards.

The rest of the paper is organized as follows: section 2 briefly summarizes the related literature. Section 3 describes the sample. Section 4 explains the empirical methodology. Section 5 discusses the empirical results. Section 6 explains the model and the simulation results. Section 7 concludes.

2 Related Literature

The popularity of IT has lead to a growing number of studies evaluating the benefits of this regime. Ball and Sheridan (2003) use a cross-section DID with a sample of 20 OECD countries and show that countries that started with an higher than average inflation rate at the beginning of the sample tended to revert to the mean as time progresses. Thus, there is evidence of simple regression to the mean. Willard (2006) confirms Ball and Sheridan's results using a cross-section model for 22 OECD countries with quarterly data. However, the use of cross-sectional data limits the scope of the analysis since IT was adopted at different points in time and collapsing the data in pre- and post-IT periods leads to less precise estimates.[5]

On the other hand, Wu (2003), using a panel data DID methodology on the same sample as Willard (2006), shows that the IT countries experienced a decrease in their average inflation rates, with no evidence of mean reversion. However, he controls for time and country fixed effects and includes a lag of the dependent variable among the regressors, leading to potential bias in the estimates. Hyvonen (2004) studies the convergence of inflation across countries and concludes that it is the result of similar policies or common objectives. Pétursson (2004), using different samples for only IT countries, finds evidence of a disinfla-

[5]Inflation targeters adopted the new regime at different points in time, so the divide between the pre- and post-treatment periods can only be an arbitrary date and the the variables' averages are computed over slightly different time ranges. Moreover, the estimates may be less precise because the data aggregation reduces the number of data points.

tionary effect of IT. His results are confirmed also when using a panel data set including both inflation targeters and non-inflation targeters. Vega and Winkelried (2005), using a sample of 23 countries with IT and 86 without IT, account for a possible endogenous selection in the IT group by performing propensity score matching. They find that the adoption of IT reduces the mean and, to a lesser extent, the persistence of inflation in both industrialized and developing countries. Other studies, including Batini and Laxton (2005), analyze the experience of emerging economies in particular and find a beneficial effect of IT.

One contribution of this paper is to evaluate the effectiveness of IT while controlling for other factors recognized by the literature as potential causes of global disinflation in the 1990s. In discussing the reduction of inflation in the 1990s, White (2008) concludes that both domestic factors, such as a more effective monetary policy and a decrease in domestic regulation, and international factors, such as a global "saving glut" and an increase in global competition, contributed.

On the other hand, Ciccarelli and Mojon (2010) assess the importance of global factors for domestic inflation and their study supports the increasing attention given to global factors in the conduct of monetary policy. Similarly, Borio and Filardo (2007) argue that the dependence of inflation on solely domestic factors has declined and the relevance of global factors has increased.

For the reasons noted by Rogoff (2003), I focus on the role of the increased level of competition. While there is an extended literature on the role of regulation in explaining unemployment[6], to my knowledge, this is the first study that uses the index coded by Conway and Nicoletti (2006) in a study on the determination of inflation.

[6]See Boeri et al. (2000), Nicoletti and Scarpetta (2005), Griffith et al. (2006), Berger and Danninger (2006), Amable et al. (2006), Bassanini and Duval (2006) and Fiori et al. (2007) for an empirical analysis. While see Amable and Gatti (2001), Blanchard and Giavazzi (2003), Ebell and Haefke (2003) and Spector (2004) for a theoretical analysis. Moreover, see Schiantarelli (2008) for a general overview of the effects of product market regulation.

3 Data and Preliminary Evidence

In this section I discuss the classification of countries as having, or not having, IT; review the behavior in the two groups of countries and explain the measures of product market regulation, globalization and the stance of fiscal policy that I use in the econometric work.

The analysis focuses on a group of 21 OECD countries that have similar economic and institutional structures, and that are exposed to similar aggregate shocks, which facilitate a comparison of the inflation dynamics. My sample begins in 1985, that is, about five years before the first adoption of IT, and ends in 2007 due to the limited availability of data on regulation. Table (1) lists the countries and the dates of adoption of IT.

Switzerland is not classified as using IT because the Swiss National Bank (SNB) does not label itself as an inflation targeter. As discussed in Gerlach and Jordan (2011), despite the similarities with IT, including an explicit definition of price stability and the publication of broad-based quarterly inflation forecasts, the SNB has no preference for where in the 0-2% price stability zone inflation should be and it has never said how fast it would seek to return inflation to the range if it deviated from it. Nevertheless, some authors classify the SNB as "de facto" inflation targeter since the end of 1999.[7]

By contrast, Spain is classified as an inflation targeter before it joined the euro in 1999, even though it remained a member of the Exchange Rate Mechanism (ERM) in that period. Finland is considered having IT also after becoming a member of the ERM in 1996 in preparation for joining the Economic and Monetary Union before joining the euro. This classification might be debatable, but the fluctuations bands in the ERM at that time were wide, $\pm$ 15% with respect to the ECU, and this prevented the ERM from functing as a nominal anchor. The European Central Bank (ECB) is not classified as inflation targeter due to the two pillar approach and to the fact that it stabilizes the euro-area wide inflation rate, not the rate of inflation in individual member countries.

[7] Pétursson (2004), Wu (2004), Vega and Winkelried (2005), Gonçalves and Carvalho (2008) and Schmidt-Hebbel (2009) among others.

Figure 1 plots the average inflation rate for the countries with and without IT in the period in question.[8] The behavior of inflation in the two sets of countries follows the same pattern up to the late 1980s, afterwards the IT countries started a faster disinflation. The inflation rates in the two groups converge only after 2000. The disinflation in the IT group occurred in 1990-1995, and consequently coincides with the bulk of the adoptions of IT. This raises the important policy question of whether the observed decline is due to the introduction of IT, is simply the effect of global disinflation, or to the combination of various institutional reforms. It is therefore of interest to investigate the importance of the reform of the monetary policy frameworks and other factors in reducing inflation.

I report in Figure 2 the inflation rate of the inflation targeters and the date when IT was adopted. The figure shows that all countries experienced a notable decrease of inflation after the change in the policy regime. However, in some countries the disinflationary process started earlier. This may be due to expectations of a regime change, although usually the announcement did not precede the actual implementation[9] by much and, as pointed out by Johnson (2002), inflation expectations fell only after the announcement of the target. However, many factors contributed to create the conditions for sustained disinflation in the 1990s.

Following Rogoff (2003), I report in Figure 3 the level of product market regulation for the inflation targeters and the date of adoption of IT. It is noticeable that the process started before the adoption of IT and continued afterwards. Overall, the OECD countries have undergone a clear decline in product market regulation over the 1990s. When comparing the timing of the disinflation from Figure 1, it seems that the disinflationary process in some countries began with product market deregulation.

[8] An important caveat about Figure 1 is that the average inflation for the IT-group is computed for all the countries that adopted IT over the sample regardless of when they did so.

[9] See the cases of Canada and New Zealand. The Governor of Bank of Canada, in a memorial lecture in 1988, stated the central role of price stability in Canadian monetary policy; the first official target was announced only in 1991. The Reserve Bank of New Zealand act in 1989, enacted by the Parliament, specifies that price stability is the priority of monetary policy. Moreover, it requires the Governor and the Minister of Finance to make periodic Policy Target Agreements regarding the price to be targeted and its allowable range. The first official target was announced in March 1990. See McCallum (1998).

As a proxy for product market regulation, I use the ETCR index constructed by Conway and Nicoletti (2006), which captures the level of regulation in seven non-manufacturing sectors: airlines, telecommunication, electricity, gas, post, rail and road freight. These sectors represent two thirds of economic activity and the area in which domestic economic regulation is more concentrated and has a major impact due to limited import penetration. The index takes into account characteristics of the markets, such as the presence of barriers to entry, public ownership of the firms, vertical integration, monopolies and the presence of legally imposed price controls, that distort the market and contribute to keep prices high. It is constructed as the summary of sectoral indicators which measure explicit policy settings and formal government regulations; it varies between 0 and 6 reflecting increasing restrictiveness of regulation.[10] The index, which is annual and starts in 1975, was initially computed for a sample of 21 OECD countries until 2003, but was recently updated to 2007. The new index has many missing data points which I interpolate. I study the effect of IT on inflation using the updated index, and I use the original index for a robustness check. To my knowledge, the ETCR index is the only measure of product market regulation for a long time series of OECD countries for the non-manufacturing sector.

Another important factor is labor market regulation. Unfortunately, an annual index is not available. The OECD (2004) has published an Employment Protection Legislation (EPL) index for the late 1980s, 1990s and 2003. Fiori et al. (2007) find that there is some evidence that past product market deregulation have lead to labor market deregulation by affecting labor market policies or the power of the unions. In contrast, there is no evidence that labor market deregulation has triggered product market regulation. This suggests that it is difficult to disentangle the effect of the two reforms and that the product market deregulation index tends to capture the effect of both.

I also use the degree of openness of the economy and the index coded in Dreher (2006)

[10] All the data are stored in the OECD International Regulation Database and are collected from different sources including the OECD Regulatory Indicators Questionnaire (for more information see also Nicoletti et al. (1999)).

and updated in Dreher et al. (2008) to proxy for the effect of globalization on competition in the manufacturing sector, which is more exposed to import penetration and faces higher competition abroad. In particular, I use the index of economic globalization which is the combination of two indexes: the actual flows (trade, foreign direct investment, portfolio investment and income payment to foreign nationals, all in percent of GDP) and an index measuring the restrictions on trade and capital (using hidden import barriers, average tariff rates, taxes on international trade (in percent of current revenue) and capital account restrictions). Dreher (2006) codes also a broader index of globalization which includes economic, political and social aspects of the phenomenon.[11]

Another possible factor behind the disinflation could have been tighter fiscal policy. However, Rogoff (2003) argues that improved fiscal policy played a broadly supportive, but not decisive, role in the disinflation. In fact, as observed in Gerlach et al. (2009), significant fiscal consolidation in industrialized economies occurred only after 1995. In particular, the fiscal position of the IT countries improved only after the adoption of the new regime, so it seems implausible that fiscal factors triggered the initial disinflation.

4 Methodology[12]

I study the effect of the adoption of the IT on the inflation rate with a panel data model, which allows me to exploit both the time and cross-country variation. Following the microeconometric literature, I define the countries that adopted IT as the "treatment group" and the countries that did not as the "control group". I estimate the causal effect of the reform with a Difference-In-Difference (DID) estimation, where the subscript i refers to country and t to year:

$$y_{it} = b_t + c_i + \beta IT_{it} + \gamma z_{it} + \epsilon_{it} \tag{1}$$

[11] For more details see the appendix of Dreher (2006).
[12] Parts of this section are taken from Moretti (2011).

where y_{it} is the inflation rate, b_t and c_i are the time and the country fixed effects. IT_{it} is a dummy variable that takes the value of 1 in the year in which the country's central bank used IT, and 0 otherwise. z_{it} contains observable variables that change across i and t.

DID has become an increasingly popular method for the estimation of causal relationships.[13] However, it can lead to biased estimates of the coefficients if the treatment, the use of IT, is endogenous, and of the standard errors, if the residuals are serially correlated. I discuss these issues below.

4.1 Biased parameter estimates

In the absence of a fully randomized experiment, the identification of causal effect requires additional assumptions. As explained in Besley and Case (2000)[14], the identifying assumption requires that the adoption of IT is not systematically related to other factors that affect inflation. Given the impossibility of a fully randomized experiment, it is crucial that the choice of IT is not driven by systematic differences between IT and non-IT countries. Looking at the sample, it does not appear to be an underlying factor that leads some countries to adopt IT. In fact, both groups include countries that started with high levels of inflation (e.g. Greece, Italy, Portugal among the countries without IT and New Zealand among the countries with IT) and countries that suffered from speculative attacks (non-IT: Italy; IT: Finland, Sweden, United Kingdom). In fact, not all countries that started with high level of inflation rate adopted IT, nor did all countries that experienced a currency crisis switch to the new regime.

There is some research on the factors that influenced the adoption of IT. Gerlach (1999) finds that IT tends to be adopted by countries characterized by a low degree of central bank independence, a less open economy but more exposure to external shocks; however, he does not find that past inflation rates matter. On the other hand, Gonçalves and Carvalho (2008)

[13] See Bertrand et al. (2004) for a survey on studies using DID and their econometric issues.
[14] See also Giavazzi and Tabellini (2005) for a macroeconomic application.

find that countries with higher past inflation, lower debt levels and that are without an exchange rate anchor have an higher probability of adopting IT.[15]

To my knowledge, the only study that tackles the issue of endogeneity is Vega and Winkelried (2005). They estimate the effect of the adoption of IT on the inflation rate using propensity score matching in a cross-section of 109 countries. The sample contains 23 inflation targeters and 86 controls, and comprises both industrialized and emerging markets economies. However this methodology has also problems. Since different countries adopted the IT regime at different point in times, collapsing the data in pre and post adoption periods is problematic and leads to the comparison of inflation performance from slightly different time periods.[16] Other methodologies proposed to overcome the endogeneity issue are usually based on cross-sectional data.[17] As suggested in Besley and Case (2000), a solution is to include in the regression any variable that potentially influence not only the policy decision but also the outcome. In this study I control for, aside from country and year fixed effects, the deficit-to-GDP ratio, the degree of globalization and, in particular, for product market deregulation, as possible factors that contributed to the disinflation.

4.2 Biased standard errors

Even when excluding any bias in the estimation of the parameters, there is still a potential bias of the standard errors. Bertrand et al. (2004) point out that most papers use DID to

[15]The results may be sensitive to the sample used. While Gerlach (1999) uses a sample of 22 OECD countries, Gonçalves and Carvalho (2008) use a sample of 30 OECD countries and classify Switzerland as an inflation targeter. Moreover, as pointed out in Mishkin and Schmidt-Hebbel (2001), the adoption of IT, while having certain exogenous structural features, requires countries to eschew other nominal targets, to improve macro performance (the reduction of the inflation rate and the tightening of the fiscal stance) and the strengthening of central bank independence.

[16]For inflation targeters: average of variables of 5 years prior and after the adoption, while for the control group: either 1990-2004, or the 5 years before 1996 or 1998 depending on the specification.

[17]Abadie (2005) suggest a semiparametric methodology using the "propensity score", the probability of complying with the treatment. However, he suggests the use of pre-determined observable variables in order to estimate the propensity score, a characteristic that might not fit well in a macro economic context. Besley and Case (2000) propose to take account of the endogeneity of policy decisions using political economy instruments, such as women's political involvement in the adoption of health and family related issues. However, this might be difficult to implement in this context.

analyze long time series of serially correlated outcomes with persistent treatments. These factors reinforce each other and they might lead to a severe underestimate of the standard errors of the estimated parameters. This study is not immune to this issue since I use time series of yearly data for inflation, which is autocorrelated, and a persistent treatment, since the decision to adopt IT is rarely reversed (only Spain and Finland did so in this sample).

Bertrand et al. (2004) argue that there are two viable solutions to this problem. The first method is to ignore the time series information and to average the data before and after the intervention and run regression (1) in a panel of length 2. However, this solution can be applied only if IT is adopted at the same time, otherwise the "before" and "after" are not the same between the treated and they are not defined for the controls. Needless to say, this is not the case in this study. The second method is to use an arbitrary Variance-Covariance Matrix, a generalized White-like formula, to compute the standard errors.

It should be noted that the inclusion of a lagged dependent variable on the right-hand side is not a solution because it is well known that it leads to biased estimates in the presence of fixed effects and when the time dimension is small.[18]

Hansen (2007), on the other hand, proposes a FGLS-based estimator that improves on the suggestions by Bertrand et al. (2004), and which delivers accurate and powerful inference in the presence of the "clustering problem" and the "autocorrelation problem".[19] Hansen's procedure aims at reducing the bias in the estimation of the standard errors in the presence of autocorrelated residuals. In fact, given the model in equation (1), let $\widetilde{\epsilon}_{it}$ be the residuals from the estimation. Suppose that the variance-covariance matrix, $\Omega = \Omega(\alpha)$, is characterized by a finite dimensional parameter α. If so, an obvious approach would be to use the fitted

[18]See Nickell (1981), Judson and Owen (1999) and Phillips and Sul (2007). Judson and Owen (1999) show that even with a time dimension as large as 30, the bias may be equal to as much as 20% of the true value of the coefficient of interest.

[19]Where the "clustering problem" is caused by the presence of a common unobserved random shock at the group level that leads to a correlation between all the observations within each group, and which does not arise in the present analysis since I use only group level data. The "autocorrelation problem", instead, arises if the groups are followed over time and the group level shocks are serially correlated, and it might be severe in this context since I use monthly data of an highly correlated variable. Neglecting these correlation will bias conventional least squares standard errors.

residuals $\widetilde{\epsilon}_{it}$ to get an estimate of α. However, in a fixed effect model, the residuals do not behave like the underlying errors, but like the difference between these errors and their within-group means ($\widetilde{\epsilon}_{it} \approx \epsilon_{it} - \bar{\epsilon}_i$, where $\bar{\epsilon}_i = (1/T)\sum_{t=1}^{T} \epsilon_{it}$). This behavior alters the correlation structure of the residuals when T is small, and results in the inconsistency of conventional estimators, which fail to account for this difference. Intuitively this bias is introduced by the subtraction of the group means from the data to eliminate the fixed effects which alters the variance structure of the data when the time dimension is short. As a result, conventional estimators of the parameters of the underlying time series model that fail to account for this distortion of the variance structure will be biased. To alleviate this issue, Hansen (2007, section 3) proposes a bias correction for the coefficient of the AR(p) model for the residuals simply by removing an estimate of this bias from the OLS estimator.

In this study I adapt Hansen's bias correction procedure to the data of interest, and I model the residuals as an AR(2) process.[20]

5 Empirical Results

I estimate the following equation:

$$\pi_{it} = b_t + c_i + \beta IT_{it} + \gamma x_{it} + \delta z_{it} + \varepsilon_{it} \tag{2}$$

where π_{it} is the annual inflation rate, IT_{it} is the IT reform dummy that is equal to 1 from the year in which a country employed the IT regime[21] and zero otherwise, x_{it} is the regulation index and z_{it} is a set of control variables. b_t and c_i are the time and country fixed effects, respectively.

Following the preliminary analysis and the literature on global disinflation, the control variables included in the regression are: the government deficit as a percentage of GDP[22], in

[20] I verify that there is no residual autocorrelation in the residuals.

[21] In constructing the data, I classify a central bank as using IT in a given year if it has operated the regime for at least six months.

[22] The data come from IFS and OECD.

order to account for a possible effect of changes in fiscal policy; the economic globalization index coded by Dreher (2006) and Dreher et al. (2008)[23]; and a dummy variable that accounts for the duration of currency crises.[24] The reason for including this last variable is that several countries switched to IT after a currency crises (e.g. Finland, Sweden, United Kingdom). Thus it is necessary to control for possible spikes in the inflation rate due to the crisis. In addition to these controls, all the regressions are estimated with country fixed effects, that account for other systematic differences across countries, and time fixed effects, that account for common shocks to the inflation rate.

Among the regressors, particular attention is paid to the role of product market deregulation for which I use either the level of regulation (ETCR), or its change (ΔETCR).

Results for the sample 1985-2007 are reported in Table 2. In the first column I use only the IT dummy; in the second column I use only the level of product market regulation (*ETCR*); then include both the IT dummy and ETCR in the third column. The results show that both policies had an important effect in the reduction of the inflation rate. The effect of the adoption of IT is large and statistically significant, leading to a decrease in the inflation rate of over one percentage point depending on the control used for regulation. The effect of regulation is also large and statistically significant: an higher level of the ETCR index (that is, more regulation) is associated with higher inflation (second column), while, a one point increase in the ETCR index leads to an increase in the inflation rate of over 0.65 percentage point in the inflation rate (fourth column).

Furthermore, the *Globalization* variable has a negative sign as expected when the IT dummy is on its own or together with ΔETCR, implying that countries that are more open tend to have lower inflation. However, when ETCR is used *Globalization* is positive and significant which is surprising. The sign of the *Deficit ratio* variable is always negative even

[23]I also estimate the same regression using openness to trade, defined as the sum of import and export as a percentage of GDP, which has a positive rather than negative sign as expected, while the other coefficients of interests have similar results. In the interest of brevity, these estimates are not reported.

[24]Source is Ghosh, Gulde and Wolf dataset which is available only till 1999, but which I have updated till 2007.

though the coefficient is very small, casting doubt on role of improved fiscal policy in the disinflationary process.

Table 5 reports the results for the sample 1985-2003, using the regulation index before the update, and Table 6 for the sub-sample 1989-2007. It is worth noticing that the effect of deregulation reforms ($\Delta ETCR$) is larger in the 1985-2003 sample while it is not significant in the sample 1989-2007, signaling the possible initial contribution of deregulation in the disinflationary process. However, the effect of the level of regulation ($ETCR$) is statistically significant in both samples, even though it is larger in the 1985-2003 one. The effect of IT is instead smaller in the sample 1985-2003 and larger in the sample 1989-2007 showing the more persistent effect of IT in reducing inflation.

I, then, analyze whether the effect of product market deregulation differed between the countries that adopted IT and those that did not. Table 3 reports the estimates distinguishing the effect of regulation and deregulation between countries that adopted IT at some point in time and those that never did. I find that the effect on inflation of the level of regulation is almost half for the non-inflation targeters, 0.810 rather then 1.641 (see the first column), while the change in regulation has a ten-times smaller effect and it is statistically significant only at the 10% level, 0.167 rather than 1.686 (see the third column). This provides evidence that deregulation played a more important role in the disinflationary process in IT countries.

In Table 4 the results are reported distinguishing the effect of regulation and deregulation between IT countries, before and after the adoption, and for non-IT countries. The effect of the level of regulation is larger in the IT countries, both before and after the adoption, than non-IT countries. Moreover, the effect of deregulation reforms ($\Delta ETCR$) is larger before the adoption and statistically significant in both cases. It is small and statistically significant at only 10% level for countries that did not adopt IT. These results show that both IT and product market deregulation helped reducing inflation. There is also evidence of a reinforcing effect of the two reforms with deregulation being more effective in IT countries than in non IT countries. Moreover, when ΔETCR is used the results suggest that deregulation had a

larger impact on inflation before the adoption of IT.

6 The Model

6.1 The Phillips Curve

The empirical analysis shows that IT was successful in reducing inflation but also that the deregulation in the product market played a role. For this reason it is important to take deregulations into account when analyzing the inflation dynamics. Moreover, the effect of deregulation was particularly relevant at the beginning of the disinflation process and there is also some evidence of mutually reinforcing effect of the two sets of reforms.

Next, I propose an extension of the basic New Keynesian model with time-varying elasticity of substitution between goods. This allows me to analyze both the role of deregulation in the reduction of inflation and to rationalize the timing of disinflation observed in the data. I take from Blanchard and Giavazzi (2003) the idea of proxing product market regulation with the elasticity of substitution between goods. In their paper, the elasticity of substitution depends on product market regulation through two channels. The first is the number of firms, which ultimately depends on the entry cost. The second is a generic taste parameter, an increase of which can be viewed indicating a higher substitutability between goods due to policies such as a reduction in trading barriers. I assume, consistent with the data, that the elasticity of substitution is not stochastic as in Steinsson (2003) (a way to introduce cost push shocks), but it grows at a given rate during the reform period, to remain constant at a higher level thereafter. In fact, the regulation index decreased in all OECD countries, but in particular in the IT countries, before the adoption of the new regime.

I derive the New Keynesian Phillips curve in an environment of monopolistically competitive firms, with staggered price setting à la Calvo, where a fraction $(1-\omega)$ of firms are allowed to reset their prices every period. Each firm j produces a differentiated product and faces the standard demand function:

$$c_{jt} = \left(\frac{p_{jt}}{P_t}\right)^{-\theta_t} C_t \tag{3}$$

where p_{jt} and c_{jt} are the nominal price and output of the good j and P_t and C_t the corresponding aggregate values. The only difference with the standard framework is that the elasticity of substitution θ_t is assumed to vary over time instead of being fixed. The price p_{jt} is set by the firms to maximize the future stream of profit, which takes also into account the probability of adjusting the price in the future periods. Thus:

$$p^*_{jt} = \arg\max_{p_{jt}} \mathrm{E}_t \sum_{i=0}^{\infty} \omega^i \Delta_{i,t+i} \left(\frac{p_{jt}}{P_t} - \varphi_{t+i}\right) c_{jt+i}$$

where $\Delta_{i,t+i}$ is the stochastic discount factor, equal to $\beta^i (C_{t+i}/C_t)^{-\sigma}$, and φ_{t+i} the real marginal cost. Since all firms that adjust the price in time t have the same objective function, they will all choose the same price p^*_t. Substituting the demand function (3) into the objective function and solving the first order conditions of the optimization problem results in the following expression for the optimal price of the forward looking firms:

$$\frac{p^*_t}{P_t} = \frac{\mathrm{E}_t \sum_{i=0}^{\infty} (\omega\beta)^i \, C_{t+i}^{1-\sigma} \, \varphi_{t+i} \, \theta_t \left(\frac{p_{t+1}}{P_t}\right)^{\theta_t}}{\mathrm{E}_t \sum_{i=0}^{\infty} (\omega\beta)^i \, C_{t+i}^{1-\sigma} \, (\theta_t - 1) \left(\frac{p_{t+1}}{P_t}\right)^{\theta_t - 1}} \tag{4}$$

Loglinearizing equation (4) around the steady state yields

$$\hat{p}^*_t = (1-\omega\beta) E_t \left[\sum_{i=0}^{\infty} (\omega\beta)^i \left(\hat{\varphi}_{t+i} + \hat{p}_{t+i} - \frac{1}{\left(\bar{\theta}-1\right)^2} \hat{\theta}_{t+i}\right)\right]$$

or

$$\hat{p}^*_t = (1-\omega\beta) \left(\kappa \hat{x}_t + \hat{p}_t - \frac{1}{\left(\bar{\theta}-1\right)^2} \hat{\theta}_t\right) \tag{5}$$

where $\bar{\theta}$ is the steady state level of θ_t. In order to write equation (5) in terms of the output gap x_t, I use the relationship $\varphi_t = \kappa x_t$. Using the expression for the price index and

recalling that only a fraction $1-\omega$ of the firms adjust the price in period t, I obtain the following expression:

$$\hat{p}_t^* - \hat{p}_t = \frac{\omega}{1-\omega}\pi_t \tag{6}$$

where the inflation rate $\pi_t = \hat{p}_t - \hat{p}_{t-1}$. Substituting the optimal price rule in equation (5) into equation (6), after some manipulation, I obtain a version of the New Keynesian Phillips curve that explicitly takes into account the time-varying elasticity of substitution (hats are omitted):

$$\pi_t = \lambda x_t - \gamma\theta_t + \beta \mathrm{E}_t\pi_{t+1}$$

where:

$$\begin{aligned} \lambda &= \frac{(1-\omega)(1-\omega\beta)}{\omega}\kappa \\ \gamma &= \frac{(1-\omega)\,(1-\omega\beta)}{\omega(\bar{\theta}-1)^2} \end{aligned}$$

Instead of including in the model an IS equation and an interest rate rule, I follow Mankiw and Reis (2002) and keep the specification as simple as possible, modeling the demand side as $m = p + y$, where m is the nominal GDP. This can be viewed as a quantity-theory approach to aggregate demand, where m is interpreted as the money supply with constant log velocity. Alternatively, m can be viewed more broadly as the incorporating the any other variables that shift aggregate demand. By simplifying the demand side, I can focus better on the link between deregulation and inflation.

6.2 Simulation

Despite the fact that my data are yearly, I simulate the model for quarterly data to produce results that are easier to interpret in the light of the existing literature. Following Steinsson (2003), I set the elasticity of substitution equal to 5. Following Gali and Gertler (1999), I set the output elasticity of marginal cost κ to 2. I also set β to 0.95. I assume that the elasticity of substitution θ grows at a rate of 0.025 per year for 5 years (between period 30 to 50), and remains constant afterwards. I also assume that the initial inflation rate is 1.5% and that money growth is constant. However, two years after the beginning of deregulation (period 38), a disinflationary policy of constant money supply is implemented to bring inflation to zero. The results of the simulation for the inflation rate are summarized in Figure 4.

The effect of the monetary policy alone, as shown in the upper left panel of the figure, is to immediately bring inflation to zero. This pattern depends on the purely forward looking nature of the New Keynesian Phillips curve. The effect of deregulation alone, with no change in monetary policy, is a decrease of the inflation rate only in the period of deregulation. As shown in the upper right panel of Figure 4, when the elasticity of substitution stabilizes at the higher level, the inflation rate returns to the previous level. When both reforms are considered, the timing of the disinflation resembles that observed in the data: an initial decrease in the inflation rate due to the effect of deregulation and then the permanent effect due to disinflationary monetary policy.

The simulation thus show that deregulation, modeled as an increase in the elasticity of substitution, leads to a temporary decrease in the inflation rate during the deregulation period, even without a change in monetary policy. This suggests that the permanent decline in the inflation observed in the data was due to the change in the monetary policy framework.

7 Conclusion

A number of authors have studied the impact of the adoption of IT on inflation, reaching conflicting results. One potential reason is that, around the time IT was adopted, a number of countries also experienced important product market deregulation. Including product market deregulation explicitly into the analysis is helpful for two reason. First, it permits an analysis of the relative importance of IT and product market deregulation in the disinflation period. Second, by improving the fit of the regression and reducing the error variance, it makes it possible to obtain more precise estimates of the effect of IT on inflation.

I estimate the model using a DID panel. Since the dependent variable, the rate of inflation, is highly autocorrelated and the treatment, the IT dummy, is persistent, I correct the bias in the standard errors with the methodology proposed by Hansen (2007). The main empirical finding is that both IT and product market deregulation played a role in the disinflation process, as one might have expected. Furthermore, product market deregulation (measured as the change in the ETCR index) was associated with a sharper fall of inflation in IT countries, in particular before the adoption of IT.

I also study a simple New Keynesian model to understand better how product market deregulation may have impacted on inflation. Following Blanchard and Giavazzi (2003), I model product market deregulation as time varying elasticity of substitution between goods and I derive a New Keynesian Phillips curve. The effect of deregulation leads to a temporary decrease in the inflation rate, while permanent disinflation is achieved only with monetary policy.

This paper shows the importance of the regime of IT in reducing inflation, but also finds a relevant contribution of product market deregulation. While the improvements in monetary policy institutions and practice still remain the major factor in the disinflationary process of the 1990s, non-monetary factors, such as product market deregulation, contributed to the achievement of low inflation.

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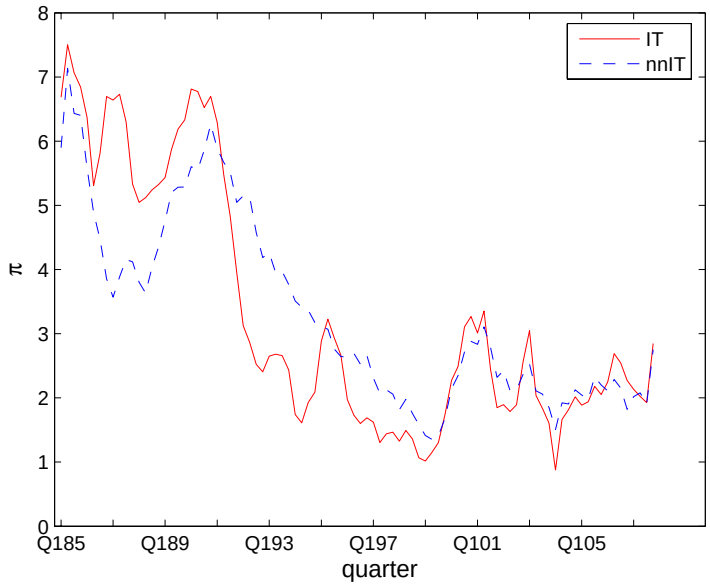
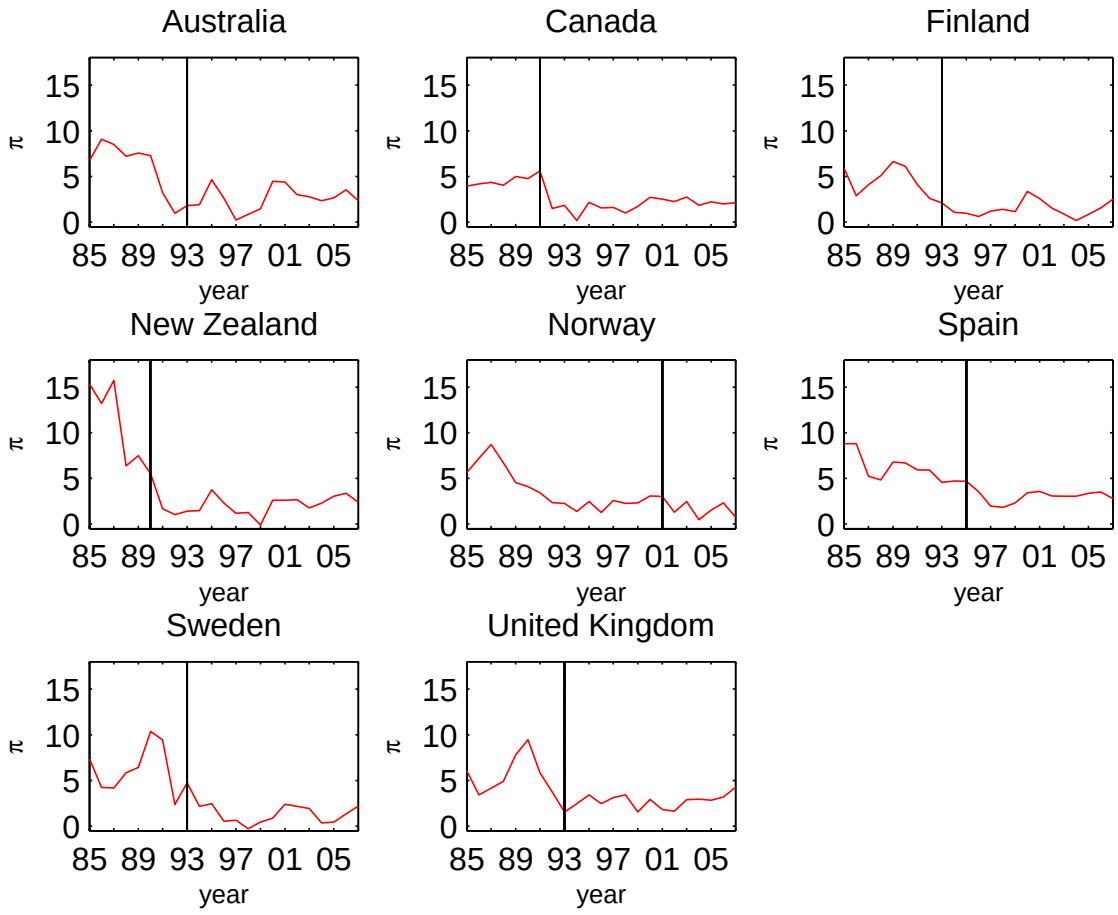
Figure 1: **Average Inflation Rate for IT and Non-IT Countries, quarterly data, 1985-2007.**



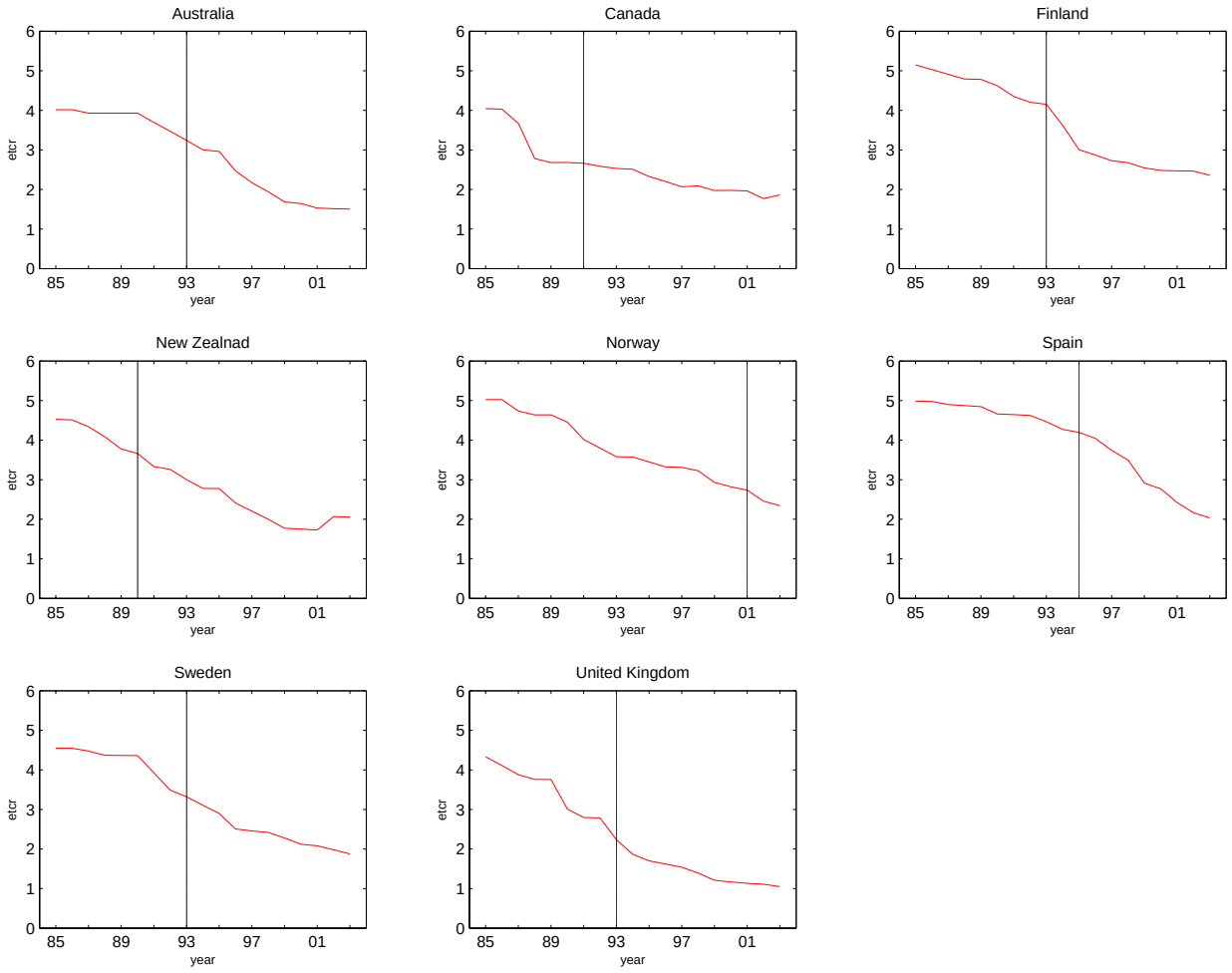
Notes: The solid line is the average inflation rate for IT countries (countries that have adopted IT at some point), the dashed line the average inflation for countries that never adopted IT.
Source IFS.

Figure 2: **Inflation Rate for IT Countries**



Notes: Average annual inflation rate for IT countries. The vertical line signals the IT adoption date. Source IFS.

Figure 3: **Regulation Index (ETCR) for IT Countries**



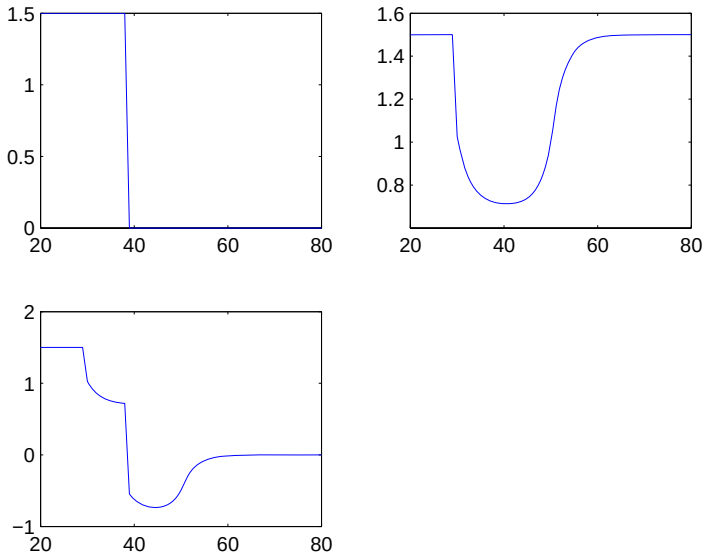
Notes: Average level of regulation measured by the ETCR index in the IT countries. ETCR is the aggregate indicator of regulation obtained as the average of indicators in six main sectors (Airlines, Telecom, Electricity, Gas, Post and Rail Road). The index goes from 0 to 6, with 0 indicating the lower level of regulation and 6 the highest level of regulation in the market. The vertical line signals the IT adoption date.
Source OECD.

Table 1: **OECD Countries in the Sample**

IT countries (quarter of IT adoption)			
Australia	Q1 1993	Norway	Q4 2000
Canada	Q1 1991	Spain	Q4 1994 Q4 1998
Finland	Q1 1993-Q4 1998	Sweden	Q1 1993
New Zealand	Q1 1990	United Kingdom	Q4 1992
Non-IT countries			
Austria	France	Ireland	Netherlands
Belgium	Germany	Italy	Portugal
Denmark	Greece	Japan	Switzerland
			United States

Notes: Finland and Spain are IT countries until joining the European Monetary Union.
Source: Central banks' webpages.

Figure 4: **Simulation Results**



Notes: Behavior of the inflation rate in response to policies. Top left: permanent disinflation from period 38. Top right: deregulation from period 30 to 50, with a rate of growth of the elasticity of substitution of 0.025. Bottom: deregulation from 30 to 50 and permanent disinflation after period 38.

Table 2: **Estimates of equation (2) using GLS, annual data, sample 1985-2007.**

		ETCR		ΔETCR	
	(1)	(2)	(3)	(4)	(5)
IT	-1.296***		-1.001***		-1.299***
	(0.101)		(0.102)		(0.100)
ETCR		1.138***	1.056***		
		(0.022)	(0.021)		
$\Delta ETCR$				0.669***	0.655***
				(0.063)	(0.064)
Deficit ratio	-0.036***	-0.016***	-0.016***	-0.034***	-0.032***
	(0.000)	(0.0002)	(0.000)	(0.000)	(0.000)
Globalization	-0.068***	0.004***	0.004***	-0.077***	-0.071***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Crisis	0.593***	0.568***	0.568***	0.632***	0.629***
	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)
R^2	0.288	0.250	0.288	0.243	0.302

Notes: Dependent variable (π): yearly inflation (CPI annual percentage change). Source: IFS. *IT*: inflation targeting dummy (half year rule) equal to 1 from the year of adoption of IT. *ETCR* is the aggregate indicator of regulation obtained as the average of indicators in six main sectors (Airlines, Telecom, Electricity, Gas, Post and Rail Road). The index goes from 0 to 6, with 0 indicating the lower level of regulation and 6 the highest level of regulation in the market. $\Delta ETCR$ is the absolute change in the ETCR index. *Deficit ratio* is the government deficit as a percentage of GDP. Source: IFS and OECD. *Globalization* is the index of economic globalization coded by Dreher (2006) and Dreher et al. (2008). *Crisis* is the (lagged) dummy variable for currency crises duration. Source Ghosh, Gulde and Wolf dataset (available only till 1999, I updated it till 2007). The regressions include country and time fixed effects. Standard errors adjusted using the methodology proposed by Hansen (2007) are reported in brackets. ***=significant at the 1% level; **=significant at the 5% level; *=significant at the 10% level.

Table 3: **Estimates of equation (2) using GLS, annual data, sample 1985-2007.**

	ETCR			ΔETCR	
	(1)	(2)		(3)	(4)
IT	-0.654***		*IT*	-1.217***	
	(0.114)			(0.101)	
ETCR_it_cnt	1.641***	1.848***	$\Delta ETCR\_it\_cnt$	1.686***	1.800***
	(0.055)	(0.053)		(0.199)	(0.195)
ETCR_nnIT	0.810***	0.823***	$\Delta ETCR\_nnIT$	0.167*	0.136
	(0.027)	(0.029)		(0.093)	(0.091)
Deficit ratio	-0.011***	-0.001***	*Deficit ratio*	-0.029***	-0.031***
	(0.000)	(0.000)		(0.000)	(0.000)
Globalization	0.003***	0.008***	*Globalization*	-0.078***	-0.084***
	(0.000)	(0.000)		(0.000)	(0.000)
Crisis	0.530***	0.525***	*Crisis*	0.636***	0.641***
	(0.042)	(0.041)		(0.042)	(0.042)
R^2	0.292	0.272	R^2	0.306	0.252

Notes: Dependent variable (π): yearly inflation (CPI annual percentage change). Source: IFS. *IT*: inflation targeting dummy (half year rule) equal to 1 from the year of adoption of IT. *ETCR_IT_cnt* is the aggregate indicator of regulation (ETCR) for the countries that adopted IT at some point. The index ETCR is obtained as the average of indicators in six main sectors (Airlines, Telecom, Electricity, Gas, Post and Rail Road). The index goes from 0 to 6, with 0 indicating the lower level of regulation and 6 the highest level of regulation in the market. *ETCR_nnIT* instead is the ETCR index for countries that never adopted IT. $\Delta ETCR\_IT\_cnt$ is the absolute change in the ETCR index for countries that adopted IT and $\Delta ETCR\_nnIT$ for the ones that did not. *Deficit ratio* is the government deficit as a percentage of GDP. Source: IFS and OECD. *Globalization* is the index of economic globalization coded by Dreher (2006) and Dreher et al. (2008). *Crisis* is the (lagged) dummy variable for currency crises duration. Source Ghosh, Gulde and Wolf dataset (available only till 1999, I updated it till 2007). The regressions include country and time fixed effects. Standard errors adjusted using the methodology proposed by Hansen (2007) are reported in brackets. ***=significant at the 1% level; **=significant at the 5% level; *=significant at the 10% level.

Table 4: **Estimates of equation (2) using GLS, annual data, sample 1985-2007.**

	ETCR			ΔETCR	
	(1)	(2)		(3)	(4)
IT	-1.117***		*IT*	-1.332***	
	(0.407)			(0.118)	
ETCR_before	1.606***	1.744***	$\Delta ETCR\_before$	2.081***	1.563***
	(0.056)	(0.052)		(0.400)	(0.380)
ETCR_after	1.787***	1.607***	$\Delta ETCR\_after$	1.296***	2.048***
	(0.087)	(0.075)		(0.394)	(0.353)
ETCR_nnIT	0.793***	0.817***	$\Delta ETCR\_nnIT$	0.164*	0.142
	(0.027)	(0.028)		(0.093)	(0.093)
Deficit ratio	-0.010***	-0.012***	*Deficit ratio*	-0.029***	-0.032***
	(0.000)	(0.000)		(0.000)	(0.000)
Globalization	-0.001**	0.006***	*Globalization*	-0.077***	-0.088***
	(0.000)	(0.000)		(0.000)	(0.000)
Crisis	0.5268***	0.521***	*Crisis*	0.644***	0.639***
	(0.042)	(0.042)		(0.042)	(0.042)
R^2	0.292	0.284	R^2	0.306	0.262

Notes: Dependent variable (π): yearly inflation (CPI annual percentage change). Source: IFS. *IT*: inflation targeting dummy (half year rule) equal to 1 from the year of adoption of IT. *ETCR_before* and *ETCR_after* indicate the regulation index (ETCR) before and after the adoption of IT respectively, while $\Delta ETCR\_before$ and $\Delta ETCR\_after$ indicate the absolute change of the ETCR index before and after the adoption of IT. *ETCR_nnIT* and $\Delta ETCR\_nnIT$ are the ETCR index and the absolute change of the index respectively for countries that never adopted IT. The index ETCR is obtained as the average of indicators in six main sectors (Airlines, Telecom, Electricity, Gas, Post and Rail Road). The index goes from 0 to 6, with 0 indicating the lower level of regulation and 6 the highest level of regulation in the market. *Deficit ratio* is the government deficit as a percentage of GDP. Source: IFS and OECD. *Globalization* is the index of economic globalization coded by Dreher (2006) and Dreher et al. (2008). *Crisis* is the (lagged) dummy variable for currency crises duration. Source Ghosh, Gulde and Wolf dataset (available only till 1999, I updated it till 2007). The regressions include country and time fixed effects. Standard errors adjusted using the methodology proposed by Hansen (2007) are reported in brackets. ***=significant at the 1% level; **=significant at the 5% level; *=significant at the 10% level.

Table 5: **Estimates of equation (2) using GLS, annual data, sample 1985-2003.**

		ETCR		ΔETCR	
	(1)	(2)	(3)	(4)	(5)
IT	-0.785***		-0.474***		-0.773***
	(0.110)		(0.111)		(0.110)
ETCR		1.363***	1.266***		
		(0.032)	(0.030)		
Δ*ETCR*				1.078***	1.102***
				(0.073)	(0.077)
Deficit ratio	0.071***	0.081***	0.069***	0.084***	0.071***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Globalization	-0.098***	0.005***	-0.003***	-0.095***	-0.095***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Crisis	0.757***	0.750***	0.735***	0.831***	0.807***
	(0.044)	(0.042)	(0.044)	(0.042)	(0.044)
R^2	0.296	0.298	0.291	0.258	0.307

Notes: Dependent variable (π): yearly inflation (CPI annual percentage change). Source: IFS. *IT*: inflation targeting dummy (half year rule) equal to 1 from the year of adoption of IT. *ETCR* is the aggregate indicator of regulation obtained as the average of indicators in six main sectors (Airlines, Telecom, Electricity, Gas, Post and Rail Road). The index goes from 0 to 6, with 0 indicating the lower level of regulation and 6 the highest level of regulation in the market. Δ*ETCR* is the absolute change in the ETCR index. *Deficit ratio* is the government deficit as a percentage of GDP. Source: IFS and OECD. *Globalization* is the index of economic globalization coded by Dreher (2006) and Dreher et al. (2008). *Crisis* is the (lagged) dummy variable for currency crises duration. Source Ghosh, Gulde and Wolf dataset (available only till 1999, I updated it till 2007). The regressions include country and time fixed effects. Standard errors adjusted using the methodology proposed by Hansen (2007) are reported in brackets. ***=significant at the 1% level; **=significant at the 5% level; *=significant at the 10% level.

Table 6: **Estimates of equation (2) using GLS, annual data, sample 1989-2007.**

		ETCR		ΔETCR	
	(1)	(2)	(3)	(4)	(5)
IT	-0.996***		-0.735***		-1.014***
	(0.106)		(0.108)		(0.105)
ETCR		0.930***	0.885***		
		(0.025)	(0.026)		
$\Delta ETCR$				0.080	0.055
				(0.089)	(0.089)
Deficit ratio	-0.029***	-0.011***	-0.010***	-0.033***	-0.030***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Globalization	-0.058***	-0.004***	-0.006***	-0.070***	-0.060***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Crisis	0.131**	0.117**	0.107*	0.140**	0.130**
	(0.056)	(0.055)	(0.055)	(0.057)	(0.056)
R^2	0.253	0.268	0.289	0.232	0.259

Notes: Dependent variable (π): yearly inflation (CPI annual percentage change). Source: IFS. *IT*: inflation targeting dummy (half year rule) equal to 1 in the year of adoption of IT. *ETCR* is the aggregate indicator of regulatory reforms obtained as the average of indicators in six main sectors (Airlines, Telecom, Electricity, Gas, Post and Rail Road). The index goes from 0 to 6, with 0 indicating the lower level of regulation and 6 the highest level of regulation in the market. $\Delta ETCR$ is the absolute change in the ETCR index. *Deficit ratio* is the government deficit as a percentage of GDP. Source: IFS and OECD. *Globalization* is the index of economic globalization coded by Dreher (2006) and Dreher et al. (2008). *Crisis* is the (lagged) dummy variable for currency crises duration. Source Ghosh, Gulde and Wolf dataset (available only till 1999, I updated it till 2007). The regressions include country and time fixed effects. Standard errors adjusted using the methodology proposed by Hansen (2007) are reported in brackets. ***=significant at the 1% level; **=significant at the 5% level; *=significant at the 10% level.