Three Essays on the Macroeconomic Impact of Inflation Targeting

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Thesis Abstract

This doctoral thesis contains three essays on the macroeconomic impact of inflation targeting.

1. Inflation-targeting regime, as a framework for monetary policy conduct, has been adopted by central banks in thirty countries. Some of these countries enjoy high incomes while others have middle incomes. In contrast to the development-based classification – often applied in the literature, thus ignoring income disparity– this study employs income-based classification in constructing the data sample. The objective is to investigate, using a panel of middle-income countries, whether inflation targeting is a good remedy for high inflation. In addition to the commonly used covariates in the literature, this study also includes in its covariate matrix the worldwide governance indicators as proxy for institutional quality. The findings exhibit a significant reduction of inflation and its volatility among the inflation-targeting adopters compared to the non-adopting middle-income countries. The results are robust to the exclusion of high inflation episodes, and to using the alternative measures of inflation. The results are also robust to the post-estimation sensitivity tests recommended for such empirical analysis.

2. Many economists acknowledge the paramount role that foreign investment plays in fostering economic development and growth via integrating economies around the globe. Studies have shown that foreign investment, particularly foreign direct investment (FDI) is attracted to countries that exhibit good governance, low uncertainty and a high degree of macroeconomic stability. The literature also argues that monetary policy under inflation targeting (IT) mitigates uncertainty, enhances governance and brings macroeconomic stability to the adopting countries. Hence, it would seem that the IT-adoption should enable

the adopting countries attract the largest FDI inflows. To verify this conjecture, this study performs a comparison between the IT-adopting countries and the non-adopters in attracting FDI. Using a panel of OECD and middle-income countries, the empirical findings exhibit an interesting but contradicting pattern: when it comes to the OECD countries, the results show that the IT-adopters do better than the non-adopters in attracting the FDI inflows. For the middle-income countries, however, the IT-adoption appears to have the opposite effect: a significant reduction in the FDI inflows is witnessed among the IT-adopters compared to their counterparts. The results are robust to the post-estimation sensitivity tests.

3. Inflation targeting, as a monetary-policy framework, is said to promote economic efficiency and growth. Yet, when evaluating the macroeconomic performance of inflation-targeting regimes, the existing literature only emphasizes the dynamics of inflation and the costs associated with taming inflation. There is hardly any assessment of the claim of efficiency and growth. To fill this gap, and to measure the causal impact of inflation-targeting adoption on economic efficiency, we compare the dynamics of output growth and long-term unemployment between countries that have adopted inflation targeting and the non-adopting countries. Our findings seem to refute the efficiency claim, and paint a bleak picture of inflation targeting: when compared to the countries that did not adopt inflation targeting, there is a significant reduction in the average growth rate among the inflation-targeting adopters by over ½ percentage point. Additionally, long-term unemployment significantly rises among the inflation-targeting countries by almost 2 percentage points as compared to the non-adopters. These results are robust to both the exclusion of the outlier observations and to the sensitivity tests recommended for such analysis.

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Motivation

In the summer of 2013, the newly-elected government of Pakistan was having negotiations with the International Monetary Fund (IMF) over a $6.6 billion loan. The purpose of the loan was to reduce Pakistan's inflation and fiscal deficit, as stated by the IMF Survey Magazine of September, 2013. However, the immediate impact was devastating. Soon after the announcement of the loan approval, the Pakistani currency started plummeting: it lost about 10% of its value over a span of just one week. This currency devaluation exacerbated the already volatile price level in the country, where the exchange pass-through is almost instantaneous and often higher than 100% due to the fragile governance institutions. The Pakistani media blamed the IMF for the fiasco.

As a Pakistani-Canadian economist, I was keeping an eye on the news as well. I decided to investigate the matter. Indeed, after reading the details of the approval, I realized that the IMF conditionality, namely a lower bound or a 'floor' on the net international reserves (NIRs) and an upper bound or a 'ceiling' on the net domestic assets (NDAs), deservedly were to blame for the currency devaluation and the higher rate of inflation. More importantly, the IMF conditionality signaled a clear message to the government of Pakistan: abandon exchange rate targeting and adopt inflation targeting. I was curious to know whether the IMF's demand of inflation-targeting adoption for a middle-income country like Pakistan was justifiable. This curiosity led me to conduct a formal analysis of the appropriateness of inflation targeting as a monetary-policy framework for the middle-income countries – the topic of the first chapter.

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Thesis Introduction

Price stability is considered as one of the principal goals of monetary policy, regardless of the policy framework that a central bank adheres to. In fact, a vast majority of central banks often cite price stability, explicitly or implicitly, as the sole objective and central goal of their monetary policy. Politicians even go farther and treat it as a 'public good' which must be safeguarded and provided at any cost.[1] Although price stability is the revealed preference of policymakers across the globe, it means different things to different people, as pointed out by Barro and Gordon (1983). While advanced industrial economies gauge price stability as having inflation rates in the low single digits, emerging and developing economies may consider inflation rates under 10% as a sign of price stability.[2] Yet there are others, such as low income countries, where inflation rates in the low-teens are also acceptable. Nonetheless, in spite of differences in the gauge of price stability, the overall attitude towards inflation has always been adverse, often amounting to pure anti-inflationism.[3] This adverse attitude grew impatient following persistently higher inflation rates faced by industrial economies during the 1970s and 1980s. Widespread uncertainty stemming from these higher inflation rates was breeding abnormal business cycles, thus threatening the prosperity of these economies. Eventually, swift and drastic measures of disinflation were taken that helped curbing inflation, but at a very dear cost, as shown by Ball (1993). No policymaker would want to resort to those measures again as explained by Mishkin (2011). In order to avoid the recurrence of high inflation episodes and the painful measures of disinflation, the development of a new monetary framework was sought,

[1] In 1974, the US President Ford, in an address to Congress, declared inflation '*domestic enemy number one.'*
[2] For example, Gasper and Smets (2000) note that the US Federal Reserve, European Central Bank, and Bank of Canada all define price stability as an annual increase of less than 2% in the consumer price index.
[3] For a rich survey of this attitude, see Forder (2014), *Macroeconomics and the Phillips Curve Myth*.

which could directly deal with the inflation problem, and replace the tested and failed monetarists' anchor, money supply targeting.[4]

This new framework, inflation targeting, was first initiated by New Zealand in 1989 and soon was followed by others among industrial nations. Since then, the inflation-targeting regime (ITR onward) has attracted a considerable amount of interest. A list of its proponents – as well as opponents – includes renowned academic scholars and policymakers from influential institutions around the globe.[5] Moreover, the IMF also encourages its member countries, in particular emerging and developing countries, to switch from exchange rate or money supply targeting to adopting ITR. In fact, countries interested in adopting ITR can benefit from the IMF-supported programs that are specifically designed for such a policy transition.[6]

The objective of this thesis is to evaluate the merits of inflation-targeting regime:
The first essay is dedicated to the analysis of how the middle-income countries (MICs) that adopted inflation targeting fare under this regime. Using a panel of 59 middle-income countries, the essay analyzes whether inflation targeting is a good remedy for high inflation among the MICs. In addition to the commonly used covariates in the literature, the essay also includes the worldwide governance indicators as proxy for institutional quality. The empirical findings exhibit a significant reduction of inflation and its volatility among the inflation-targeting adopters compared to the non-adopting MICs. The results are robust to the exclusion of high inflation episodes, and to using the alternative measures of inflation.

[4] The inappropriateness of money targeting for monetary policy conduct was already highlighted during the 1960s, but the Monetarism prevailed! For more on this, see Lavoie (2009).
[5] For a complete survey of inflation-targeting regimes, see Carare and Stone (2006).
[6] See for example, Schaechter et al. (2000) and Carson et al. (2002).

The results are also robust to the post-estimation sensitivity tests recommended for such empirical analysis, such as Rosenbaum bounds.

The second essay delves into the effectiveness of inflation-targeting regime in attracting FDI into the adopting countries. To find out how the IT-adoption, coupled with taxation and governance, has affected a country's attractiveness for FDI, we match the FDI inflows into the IT-adopting countries with those flowing into the non-adopters. The findings exhibit an interesting but contradicting pattern: when it comes to the OECD countries, the results show that the IT-adopters do better than the non-adopters in attracting FDI. For the middle-income countries, however, the IT-adoption appears to have the opposite effect: a significant reduction in the FDI inflows is witnessed among the IT-adopters compared to their counterparts.

Finally, in the third essay, we embark on verifying the core claim by the proponents of inflation targeting that the IT-adoption promotes economic growth. We measure the causal impact of inflation-targeting adoption on economic growth by comparing the dynamics of output growth and long-term unemployment between the IT-adopting countries and the non-adopters. Our findings seem to refute the growth claim, and paint a bleak picture of inflation targeting: when compared to the countries that did not adopt inflation targeting, there is a significant reduction in the average growth rate among the IT-adopters by over ½ percentage point. Additionally, long-term unemployment significantly rises among the inflation-targeting countries by almost 2 percentage points as compared to the non-adopters. These results are robust to both the exclusion of the outlier observations and to sensitivity tests.

Essay 1

How Do Middle Income Countries Fare Under Inflation Targeting?

1.1 Introduction

Due to disagreements over the criterion of price stability, as mentioned earlier in the general introduction and overview section, there is no unified definition of inflation-targeting regime (ITR) in the literature. In fact, even among the IT- club members there are vast differences over the regime's definition and workings; and so no two central banks (among the IT-adopters) are alike.[7] The following are some of the multiple definitions of ITR, ranging from simple and generic to sophisticated, technical and detailed.

1.1.1 Definition of Inflation Targeting: In their seminal work on inflation targeting, Rudebusch and Svensson (1999) call ITR a '*commitment mechanism*' where a central bank simply commits itself by announcing an explicit inflation target. Bernanke et al. (1999, p. 4) define ITR as '*a framework for monetary policy characterized by the public announcement of official quantitative targets (or target ranges) for the inflation rate over one or more time horizons, and by explicit acknowledgement that low, stable inflation is monetary policy's primary long-run goal*.' Sherwin (2000) defines ITR as choosing the appropriate target rate of inflation, backing it up by political will, tailoring monetary policy accordingly, and setting the time horizon thereafter to achieve the target. Genberg (2001) calls ITR '*a statement of objectives*'. Schmidt-Hebbel and Tapia (2002) define ITR as: anchoring expectations, granting the central bank operational independence, having

[7] Truman (2003).

forecasting capacity, and exhibiting transparency and accountability. Truman (2003) defines ITR by listing four ingredients: an explicit goal of price stability, a numerical point or range for inflation target, a time horizon to achieving the target and an evaluation of policy objectives.

These definitions clearly demonstrate the nature of ITR as being a framework that has developed through combining together monetary policy '*rule'* and '*discretion'*. It is this combination that invites both its proponents and opponents to debate the merits of ITR plausibility. While the opponents criticize ITR for polluting policy rule with discretion, thus rendering it untrustworthy and bringing back the same old issue of time inconsistency, its proponents credit the combination of rule with discretion for its flexibility in responding to short-run shocks without jeopardizing the long-run policy objective of price stability. In reality, however, adherence to strict policy rules is rare: no central bank would refrain itself from using discretionary power, particularly in the short-run when the economy bumps into hostile shocks.[8] This imbedded discretion, therefore, leads us to reiterate that ITR is a '*constrained discretion*', Bernanke et al. (1999, p. 29).

Given the brief lifespan of inflation-targeting regime (ITR), it is amazing to see the enormous body of literature devoted to studying different aspects of ITR, both theoretical and empirical, along with policy design procedures. This literature seems to exhibit a consensus on two criteria: First, if implemented successfully, ITR has advantages that outweigh the risks associated with it. Second, and more importantly, successful implementation of ITR hinges upon some institutional and structural settings that are

[8] Bernanke et al. (1999)

considered as necessary preconditions for any economy prior to adopting ITR. Indeed, the early ITR adopters, mainly advanced economies, have enjoyed some of the advantages and benefits highlighted in the literature (discussed in the next section). This has led the ITR club to grow to a number of thirty countries (see Appendix 'A' for the list of these countries). These ITR club members enjoy either high income levels (13 members) or share middle income levels, both upper and lower (17 members). However, none of them is classified as a low income country (LIC). The income-based classification is important for the purpose of this study because the previous literature has neglected the income-based classification when studying IT-adoption. Instead other classification criteria – such as 'emerging', 'developing', or 'less' and 'least developed economies'– were used for countries that are not 'advanced' or 'developed'. This, of course, resulted in having rich economies – such as Israel, Singapore, and South Korea – often grouped together with poor economies – such as Ghana, Indonesia, and Pakistan. Furthermore, since inflation acts as a flat distortionary tax, it can have far worst devastating impact on low or middle income groups – leaving them with squeezed income levels – compared to the high income groups who have the luxury of hedging against inflation. To this end, this study seems to be the first to decompose the ITR club members into two groups, and assign them to their appropriate income-based groups.[9] Subsequently, this study focuses its empirical analysis on MICs only by comparing the performance of inflation dynamics among ITR club members with that of MICs that have not adopted ITR. Moreover, this study also seems to be the first to use worldwide governance indicators as proxy for the quality of institutions.

[9] Roger (2009) and Gamayel et al. (2011) also mention income-based classification, but in a broad sense.

The rest of the paper is organized as follows: Section 2 expands the introductory note on ITR, discussing advantages and disadvantages, the preconditions, and the working environment for ITR. Section 3 reviews some of the literature on theory and empirics of ITR. Section 4 describes the data and the econometric methodology used in the empirical work of this study; Section 5 presents and analyzes the empirical results; and Section 6 concludes the study.

1.2 Advantages and Disadvantages: Svensson (1997) believes that ITR has the general advantage of focusing monetary policy explicitly and directly on inflation. Moreover, he credits ITR for communicating the specific targets directly to the public, thus enabling them to evaluate the credibility of policymakers and hold them accountable in case they renege on their commitment. ITR, therefore, serves as a '*potential commitment mechanism*'. Bernanke and Mishkin (1997) hail ITR as the most interesting development in the history of monetary policy, as it offers answers to the time-inconsistency problem. Bernanke et al. (1999) call inflation targeting a '*superior framework*' compared to other frameworks, such as money targeting or currency targeting. They admire ITR for having the features: explicitly defined objectives, greater transparency stemming from central bank's communication of the explicit objectives and enhanced accountability, due to the fact that the general public is periodically briefed about the progress over monetary policy objectives. Moreover, Bernanke et al. (1999) also credit ITR for protecting price level from the 'pass through' of unexpected shocks into inflation and for keeping the nominal interest rates at low levels due to low inflation expectations. Mishkin (1999) attributes two major achievements to the inflation targeting regime: first, inflation targeting has caused a significant reduction in overall levels of inflation rates; and second, it has helped to curb

future inflation expectations, bringing them below the pre-inflation-targeting levels. Rudebusch and Svensson (1999) add an important feature of inflation targeting, that is, 'locking-in' future inflation expectations. They also attribute to inflation targeting the reduction in volatility of inflation rates as well as that of output gaps. Furthermore, Schaechter et al. (2000) summarize these outlined advantages of ITR over other monetary frameworks, and conclude that: ITR rejuvenates the motivations for institutional reforms that are necessary for disinflation. Gavin (2003) attributes to ITR the reduction in uncertainty about inflation, the risk of deflation and the confusion over the monetary policy stance. Truman (2003) states that ITR helps policymakers in building credibility and anchoring inflation expectations faster as compared to other monetary regimes. Goodfriend and King (2005) assign yet another advantage to ITR: its flexibility. This flexibility enables policymakers to focus on medium-to-long-term horizons, without worrying about short-term shocks. Citing some examples of emerging economies, like Argentina and South Africa, Batini and Laxton (2007) conclude that the economic costs of policy failure under ITR are benign, in the form of a bit higher inflation, as opposed to losses stemming from policy failure under an exchange rate peg for instance, where reserve losses could engender a banking crisis or even worse, a debt crisis.[10]

Opponents of ITR cite disadvantages that impose unnecessary constraints on policymakers: ITR is an overly narrow approach, with a one-variable focus, the price level, which limits policymakers' discretion. In particular, they have no discretion with regards to output or unemployment. On one hand, commitment demands swift actions in fighting inflation; on

[10] For a comprehensive look on advantages and risks associated with ITR, see Bernanke and Woodford (2005).

the other hand, this aggressive approach may have some serious repercussions on output and employment. Arestis and Sawyer (2003) raise an important question, and that is whether any central bank has the ability to control inflation. For example, international supply shocks, fiscal policy, or even domestic wage negotiations could have a severe impact on inflation, but central bank has no ability whatsoever to influence these factors in any economy. Since falling output induces negative supply shocks, the ITR-pursuing central bank would only worsen the situation when tightening monetary policy to contain inflation. Nonetheless, this critique seems to address one aspect of ITR, which is strict inflation targeting (SIT); but there are hardly any central banks that practise SIT. In fact, the vast majority of ITR adopters follow what Svensson (1997) calls flexible inflation targeting (FIT) where the central bank has the discretion to assign different weights to inflation, output gap, or unemployment, etc. Other skeptics criticize ITR for granting too much discretion to central banks, leading to 'moving the goalposts' phenomenon, thus endangering the credibility of central bank.[11] Yet some others point to the fact that most of the ITR club members were experiencing higher inflation rates prior to adopting ITR, which hints at the appropriateness of ITR only for economies that suffer from higher inflation rates. This critique stems from the view that ITR is a disinflationary tool. However, there is a consensus among proponents of ITR that it is not a stabilizing policy, instead ITR helps 'lock in' the already gained low levels of inflation rates. ITR, therefore, could do more harm than good if implemented as a disinflation tool in an economy which is experiencing higher inflation rates.[12] Another disadvantage attributed to ITR is that it is a replacement for other nominal anchors, specifically an exchange rate regime: a central

[11] This is a valid critique, however, as mentioned earlier, under FIT the central bank can target a wider range.
[12] Sims (2004).

bank cannot have multiple anchors at the same time, so it must adopt a free-floating exchange rate mechanism. Opponents argue that for MICs, leaving the exchange rate unguarded – in face of speculative attacks, supply shocks, and abrupt capital flows – is a recipe for disaster, resulting in extreme volatility propagating into the macro-economy. To address this issue, there are IMF-supported programs that are designed to help those planning to adopt ITR through the transitory phase. Besides, neither ITR nor any other policy framework can refrain central banks from intervening in face of speculative attacks.

1.2.2 Working Environment for ITR and MICs:[13] Inflation targeting is a '*state of the art*' framework that demands sophisticated facilities throughout different stages of implementation including quality data collection, modeling and forecasting, policy design, communication and evaluation. Quality data on advanced- and high-income countries are readily available through the public domain. For middle-income countries, unfortunately, data accessibility is an obstacle where data are either not available at all, or if available, the quality is seriously compromised and only annual (often with missing) observations are available. Moreover, policy decision-making requires the ability to build models that truly represent the economy. Absent this ability, policymakers would simply rely on replicating the popular dynamic stochastic general equilibrium (DSGE) models which were originally built for an advanced economy. They neither represent the settings of MICs, nor can their assumptions be justified. In addition, Mishkin (2011) calls ITR a communication strategy that should go beyond the announcement of an inflation target. Instead, it requires a proper functioning channel in the form of a vibrant financial sector having a web of financial intermediaries as well as fully developed equity and bond markets. It also requires that

[13] This section draws upon Hammond (2012).

firms and households have an uninterrupted access to these markets. Finally, once policy objectives are explicitly defined and communicated, policymakers must understand and face repercussions in case of reneging on their commitments. This may be true in advanced- and high- income countries, but it still remains a dream in middle-income countries.

The advantages of ITR certainly outweigh its pitfalls, but there is a caveat to reaping these advantages: some preconditions for institutional and structural environment are necessary prior to adopting ITR. Bernanke et al. (1999) and Mishkin (1999) dub them as 'necessary conditions', while Schaechter et al. (2000) call them 'foundational blocks'. They are: central bank independence (CBI), a free-floating exchange rate regime, and the absence of fiscal dominance. In addition, there are also some secondary conditions, such as developed and fluid financial markets, facilities for data collection, modeling, forecasting, transparency and accountability.

Central bank independence (CBI), as noticed above, comes at the helm of adopting ITR. There is a decent amount of literature on CBI, and so there are different interpretations of CBI as well. Some refer to it as central bank autonomy, where the central bank acts as an agent implementing what has been mandated to it by the political leadership through legislation. Others interpret CBI as independence from political influence in every aspect, including recruitment, financial, and policy independence. Nevertheless, the majority of authors agree on two interpretations of CBI: Goal independence and instrument independence. The goal refers to setting up single or multiple goals, such as price stability,

output growth and unemployment, while the instrument refers to policy tools, such as short-term interest rates, quantitative easing (QE) or credit easing (CE).[14]

The second necessary condition for ITR adoption is the divorce from currency targeting (thus letting the exchange rate float freely) and from aggregate money targeting, in order to avoid a multiplicity of anchors. The latter anchor can be, and in fact has been, neglected by most central banks. The former, however, is linked to the economy's balance of payment, and neglecting it would invite serious repercussions. For a small open economy, and with the presence of external dominance, a free-floating exchange rate is an open invitation to speculators that may lead to a spiral of volatility in the capital flows. This would cause more harm to the stability of the price level than any good resulting from the ITR adoption.

The third and last necessary condition is the absence of fiscal dominance along with financial and external dominance. Fiscal dominance can be defined as an excessive growth of money supply stemming from the central bank's monetization of the central government's fiscal deficits. Rich economies tend to have a broad tax base and developed financial markets that help them avoid excessive indirect taxation or an excessive monetization of the fiscal deficits. Moreover, seigniorage seems to play a minimal role in revenue generation among rich economies. This is not true for middle-income countries where the tax base is very limited, and where seigniorage is considered a major source of revenues. MICs also suffer from financial dominance and external dominance. The former

[14] For more on the CBI, see Barro and Gordon (1983).

points to a weak financial structure that mainly comprises commercial banks while the latter hints at threats to the economy coming from external shocks.[15]

In addition to these necessary conditions, a successful implementation of ITR requires sophisticated data collection and modeling facility, fluid and developed equity and bond markets (that would channel the policy propagation and would also alleviate financial dominance), and the institutional capacity for accountability and transparency. These can be called the sufficient conditions that can help in reaping fully the advantages and benefits of ITR.

The early adopters of ITR, mainly advanced and rich economies – the subject of the studies that enlist the advantages of ITR – have indeed enjoyed good quality institutions that promote transparency, rule of law, freedom of expression and accountability. These economies also exhibit decent structural balance, in addition to being equipped with the state-of-the-art facilities in almost every aspect of life. It is noteworthy here that compromising on the institutional and structural requirements may turn advantages into disadvantages if ITR is adopted under unbalanced sectoral structures or under the infancy of institutional development. Following is a summary of stylized macroeconomic facts among MICs – the subject of this study – compared with the stringent conditions put forth in the literature for ITR adoption:[16]

Most MICs resemble the small open-economy model. They are open to trade (as measured by the ratio of exports/imports to GDP), are price taker, face exogenous terms of trade

[15] For more on fiscal dominance and inflation, see Nachega (2005).
[16] These features are a summary of chapter 1 from Agenor and Montiel (2009).

(TOTs) and have a constrained balance of payments (BOPs). Given these macroeconomic facts, the optimal choice for MICs will be a managed (dirty) float or a pegged exchange rate regime. Another worrisome feature of MICs is the extremely weak fiscal regime (measured by the low ratio of tax revenues to GDP). Because of this drawback, governments do not rely solely on their thin tax base for revenue generation. Instead they often resort to deficit monetization and seigniorage as revenue generating tools. In addition, indirect taxation – in the form of VATs, import tariffs, and import duties – is considered a quick fix for revenue shortages. Furthermore, the financial system is mainly dominated by the banking sector where poor regulation and public ownership coupled with corruption exacerbate the inefficiencies of this sector. Equity markets are also at the infant stage, and long-term bond markets are almost non-existent. Policy uncertainty resulting from the instability of the policy regime has often led to crises, such as currency substitution, flight of capital, exchange rate crises, the collapse of private investment, etc. To sum up, instability, fluctuations, uncertainty, and volatility appear to be the hallmark of MICs.

1.2.3 Which Price Index to Target? There are a number of price indices that are used to gauge price levels in an economy, such as the consumer price index (CPI), the producer price index (PPI) and the GDP deflator. Among the three, the CPI is considered as the most appropriate index due to the general public's interaction with it on a daily basis, and due to the fact that policymakers have minimal manipulating power over it. CPI can be further divided into two indices: the headline CPI, which takes into account all consumption goods and services, and the core CPI, which excludes the volatile goods, such as food and energy products. The earlier ITR adopters were using core CPI for their policy design purpose, but

at present, all 30 central banks of the ITR-member countries use both the core and headline CPI to set their policy-related inflation target.

It is a common practice among advanced industrial economies to have a separate agency for data collection that acts semi-autonomously and independently from the influence of the central bank. This practice, though rarely followed in MICs, is strongly recommended by the IMF for those intending to adopt ITR, as well as for those already adopted ITR but do not have an independent data-collecting entity.[17] An alternative to CPI is either PPI or GDP deflator. Since the PPI is an intermediate price index that eventually shows up in the final goods price, and can be easily manipulated, it is not recommended for policy consideration. The GDP deflator on the other hand is less familiar among the general public, and its data collection is often less frequent. Using GDP deflator, therefore, may degrade the transparency and credibility of the central bank, the two requirements that are paramount for a successful ITR. This study does employ GDP deflator as an alternative measure of inflation, but only for the purpose of robustness check.

1.3 Literature Review

The bulk of the literature covers practical aspects of ITR, empirical and analytical, perhaps due to the fact that ITR '*does not represent an ironclad policy rule*' in the words of Bernanke and Mishkin (1997). Instead, ITR is a framework that can be tailored to policymakers' objectives. In what follows, a brief discussion is presented on the theoretical and empirical aspects of ITR.

[17] Schaechter et al. (2000).

1.3.1 Theoretical Underpinning of ITR: Earlier theoretical models of monetary policy used either game theory settings or principal-agent model settings, perhaps due to the inherent presence of 'rule versus discretion' element, which bred time-inconsistency problems. This time-inconsistency created mistrust between policymakers and agents, so the equilibria stemming out of these models were often non-cooperative Nash equilibria.[18] In the seminal works of Kydland and Prescott (1977) and Barro and Gordon (1983) for example, central bank's objective function is considered to minimize the expected loss function:

$$L^C = \lambda\,(y_t - y^P) - \tfrac{1}{2}\,(\pi_t - \pi^T)^2$$

where y_t is the output at time t, y^P is the potential output, π_t is the inflation rate and π^T is the target rate of inflation.

As for agents, both households and firms, their objective is to minimize their own loss function: $L^A = E\,(\pi_t - \pi^e)^2$

where π^e denotes the agents' expectations about the inflation rate. In this simple model, we observe two different objective functions which could be attributed to the presence of time-inconsistency problems. On one hand, agents find their expectations as the optimum, while on the other hand, policymakers are tempted to cheat with the 'surprise element'.

After the birth of ITR in 1990, most studies continued using the above framework. The following theoretical model is taken from Svensson (1997, p. 4):

[18] For a summary and account of the theoretical literature on ITR, see Walsh (2010) and Woodford (2003).

$$\pi_{t+1} = \pi_t + \alpha_1 y_t + \alpha_2 x_t + \varepsilon_{t+1}$$

$$y_{t+1} = \beta_1 y_t - \beta_2 (i_t - \pi_t) + \beta_3 x_t + \eta_{t+1}$$

$$x_{t+1} = \gamma x_t + \theta_{t+1}$$

where π_t is the inflation rate at time t, y_t is the output, x_t is an exogenous variable, i_t is the policy interest rate and ε_t, η_t and θ_t are i.i.d. shocks.

An ITR central bank would choose a sequence of policy interest rates ($\{i_\tau\}^{\infty}_{\tau=t}$) in order to minimize its loss function: $E_t \sum^{\infty}_{\tau=t} \delta^{\tau-t} L(\pi_t)$

where E_t represents the central bank's expectations based on the information available in the current period and δ is the discount factor. A particular period loss function can be written as:

$$L(\pi_t) = \tfrac{1}{2} (\pi_t - \pi^T)^2$$

where π^T represents the target rate of inflation. So the central bank's objective is to minimize the sum of discounted expected deviations of inflation from its target rate. The solution to this minimization problem is: $\pi_{t+1|t} = \pi^T$

which implies that the central bank would set the policy interest rate at time *t* such that the inflation rate in the next period would equal the target rate of inflation.

This model shows the objective function of an ITR central bank having a single goal of price stability. However, for the central banks with multiple goals such as inflation and output stabilization, Svensson (1997) modifies the same model by simply adding another term for the output and its deviation from the potential output:

$$L(\pi_t, y_t) = \tfrac{1}{2}\left[(\pi_t - \pi^T)^2 + \lambda (y_t - y^P)^2\right]$$

$$E_t \sum_{\tau=t}^{\infty} \delta^{\tau-t} L(\pi_t, y_t)$$

where y^P represents the potential output and $0 < \lambda < 1$. In this modified version, the central bank seeks to minimize the sum of discounted expected deviations of both inflation and output from the target rate of inflation and the potential output respectively. Based on the solution to his model above, Svensson (1997) recommends calling ITR an 'inflation forecast targeting', because whether agents build their expectations on past or present data, the policymakers do not have control over the past or present state of inflation, they can only control the future inflation rate by influencing the expectations of the agents.

As for the criticism directed towards the central bank's objective function, the reaction function and its deviations between targets and actual variables, Svensson (1999) offers a detailed explanation in response to the confusion they create: a targeted variable, he explains, in ITR theoretical settings, such as inflation, output, or unemployment, may portray the central bank's reaction function as being restricted to responding only to deviations relative to the target goal and the targeted variable. In reality, central banks have access to, and use, a lot more information than simply the deviations. Hence, the apparent look of the objective functions may be misleading, since central banks are supposed to be targeting the underlying determinants of a targeted variable, and not the variables. He continues to suggest that even under SIT (strict inflation targeting), central banks should respond to both inflation and output, and not only inflation (Svensson, 1999, pp. 622-623). Moreover, Rudebusch and Svensson (1999) interpret inflation targeting as an objective

function of the central bank where deviations between the actual and target inflation rates are assigned some weight. This is referred to as the flexible inflation targeting (FIT).

The hallmark feature of most of theoretic work in monetary policy is the functional form of the central bank's loss function, which is almost always in quadratic form, in addition to the assumption of perfect information stemming from rational expectations.[19] We have also seen that discretion and time-inconsistency both render monetary policy either ineffective or imply that the central bank would renege on its commitment by fooling the agents with a 'surprise element'.

To respond to this theoretic shortcoming, two studies came out at the same time: First, Orphanides and Williams (2004) substitute the perfect information assumption with an imperfect information assumption (learning models). They show that a monetary-policy regime whose sole objective is the control of inflation – such as ITR – reduces costs associated with imperfect information. Moreover, having imperfect information would also facilitate learning and the formation of inflation expectations. Second, Cogley and Sargent (2005) introduce uncertainty into three competing models of the Phillips curve, and show that a central bank updates its probabilities assigned to the three models prior to choosing the appropriate model and sets the level of inflation rate accordingly. They also solve the '*timing puzzle*' – of the US Federal Reserve's sitting idle over the higher inflation rates of 1970s – by using recursive Bayesian techniques and showing that posterior probabilities, though, were in favor of the Lucas–Sargent model during the 1970s. However, the Fed did

[19] Mishkin (2011) blames these two features for the possible failure of the '*Science of Monetary Policy*' in the wake of the recent 2008 financial crisis.

not implement their recommendations due to the fear of a downside risk for employment (Solow–Samuelson interpretation of Phillips curve).[20]

1.3.2 Empirical Literature on ITR: The earliest account of empirical evidence on ITR came in Bernanke and Mihov (1996) who ask the question, and investigate it empirically 'What Does the Bundesbank Target?' Interestingly, the Bundesbank of Germany has always been officially a money targeter, and it never adopted ITR. But the authors employ a structural VARs approach and use the Lombard rate (the Bundesbank policy rate) as the policy indicator to study the system's response: a positive innovation to the forecast of inflation rates leads to a contractionary policy response by the Bundesbank, as witnessed in the rise of the Lombard rate. In addition, they also show that the forecast for output growth declines, while the money growth rate falls on one-to-one ratio with the inflation rates. They conclude based on their empirical findings that the policy actions reveal that the Bundesbank behaves like an inflation-targeter, and not as a money-targeter. Clarida et al. (1998) estimate the monetary policy reaction functions for central banks of two groups of countries: Germany, Japan, and the US (G3), and UK, France, and Italy (E3). Their empirical findings exhibit that the G3 central banks have been pursuing an implicit inflation targeting regime since 1979, which explains their success in terms of taming inflation better than other industrial economies. The E3 central banks on the other hand are simply influenced by the actions and policies of the Bundesbank of Germany. They conclude that based on the success of the G3 central banks, inflation targeting as a nominal anchor seems to be superior to other anchors such as money targeting or exchange rate targeting.

[20] For more on this fear, see Forder (2014).

Cecchetti and Ehrman (1999) investigate the degree of inflation-variability aversion among a sample of 23 economies (both advanced and developing): Nine of these economies had adopted ITR while the remaining 14 had not. Their findings suggest a revealed preference of policymakers – in both ITR adopters and non-adopters – for reducing inflation variability at the expense of output variability. Johnson (2002) uses experts' surveys on inflation for a sample of eleven industrial economies (both ITR adopters and non-adopters). His results suggest that ITR helps to reduce inflation expectations. Neumann and Van Hagen (2002) compare the performance of inflation and interest rates in nine economies, six having adopted ITR and three without ITR. They select two major commodity shocks of the 1970s and 1990s, and then conduct a comparative analysis of inflation dynamics among the two groups, dividing the sample into pre and post shocks periods. Using difference-in-differences approach, they find that ITR has helped the adopters to curb inflation rates. More importantly, it has helped policymakers in communicating clearly the low-inflation objectives to the public. They also calculate the Taylor rules for the ITR adopters and conclude that there is a convergence pattern among the two groups towards the low average inflation rates. A similar study is carried out by Ball and Sheridan (2005) but with an extended sample of 20 economies: seven that adopted ITR in early 1990s and 13 non-adopters.[21] They also employ the difference-in-differences methodology. Using quarterly data spanning over 20 years, they investigate the dynamics of inflation, interest rates, and output growth. Their results show a better performance by ITR adopters as compared to the countries that did not adopt ITR. However, the authors call this enhanced performance to be misleading due to the '*regression to the mean*' phenomenon. Once they

[21] Both studies have the same title: "Does Inflation Targeting Matter?"

control for the mean reversion, there is no difference in the performance of the two groups, leading the authors to conclude that inflation targeting does not matter!

Some of the above mentioned empirical studies have been criticized for a technical and common shortcoming, namely the self-selection bias problem. To address this criticism, Vega and Winkelried (2004) were the first to employ the treatment effects methodology to control for self-selection bias. Using the propensity score matching estimation, they analyze the treatment effects on those countries that adopted ITR and compare them with those that did not adopt ITR. The results confirm a significant reduction in inflation rates and inflation volatility among the countries that adopted ITR. One seemingly shortcoming in this study is that their dataset includes 109 countries –rich, poor, developed, developing and the least developed– all in one sample as if they were a homogeneous group, regardless of the extreme heterogeneity in the counterfactuals. Lin and Ye (2007) also apply the same methodology on a sample of advanced economies to study the inflation dynamics and compare the ITR adopters (the treatment group) with the non-adopters (the control group). Their results do not show any significant effects of adopting ITR, and they conclude, in line with Ball and Sheridan (2005), that ITR is a mere '*window-dressing*' policy that has no significant effect on the dynamics of inflation.

Interestingly, subsequent studies that examined data from developing and emerging economies have found the opposite, and encouraging results for ITR adoption. Batini and Laxton (2007) extend the analysis of Ball and Sheridan (2005) to a larger but different sample of 42 emerging economies: 13 of them are ITR adopters and the remaining 29 are non-adopters. Out of these, 22 are in the JP Morgan Emerging Markets Bond Index. They apply the same methodology of difference-in-differences, as in Ball and Sheridan (2005),

to study the performance of ITR adopters before and after the adoption, and compare them to the non-adopters. Their findings suggest that the ITR adoption leads to a reduction in inflation, inflation volatility, and inflation expectations. They run several robustness checks to confirm that their findings are robust. In the same vein, another study by Goncalves and Salles (2008) extends the analysis of Ball and Sheridan (2005) to a larger and different sample of 36 emerging economies: 13 of them are ITR adopters and the remaining 23 are non-adopters. They study the difference in macroeconomic performance of the two groups via a diff-in-diffs approach. Their sample includes annual observations from 1980 to 2005. The results indicate a large significant reduction in both inflation and output growth variability for the ITR adopters compared to the non-adopters. Their results are also robust to controlling for 'mean reversion'. They conclude that, as opposed to the conclusion of Ball and Sheridan (2005), inflation targeting does matter for emerging economies. Lin and Ye (2009) also study the effects of ITR adoption among developing countries, but using a different methodology: they evaluate the treatment effect of ITR using a variety of propensity score matching methods. Their dataset includes 52 developing countries (13 of them ITR adopters) for the years 1985 to 2005. They find a significantly larger reduction in inflation and its volatility among ITR adopters compared to the non-adopters. Finally, De Mendonça and De Guimarães e Souza (2012) use a much wider sample than their predecessors, 180 countries, and compare the ITR effects between the adopters and non-adopters over a period spanning from 1990 to 2007. They split their sample into two groups: advanced and developing countries. Using a propensity score matching estimation methodology, they obtain encouraging results for developing

countries in the form of a significant reduction in inflation rates thanks to ITR adoption. For advanced countries, they do not find any advantage due to the ITR adoption.

1.4 Empirics

1.4.1 Data: Since the focus of this study is middle-income countries (MICs), we draw our country sample from the World Bank's latest income-based classification table. To enhance the quality of our analysis, the countries with too many missing observations, or those classified by World Bank as small states (SST) and fragile and conflict-affected states (FCS) are dropped, thus restricting our sample to 59 MICS only: 17 of them have adopted ITR (the 'treatment' group), and the remaining 42 MICs are non-adopters (the 'control' group). This income-based grouping is important for our empirical analysis because it satisfies the often violated assumption of 'selection on observables' (also referred to as imbalance in the observed confounders). Our dataset includes the governance indicators as well, in addition to the common covariates, thus reducing the bias stemming from 'selection on non-observables' or imbalance due to the non-observed confounders such as institutional quality. To illustrate this point, I have reproduced Table 1.1, from Lin and Ye (2009), showing their country sample and the World Bank's classification of the countries in 2008. By examining the list of Table 1.1, we can see that among the treatment group, for instance, the Czech Republic had been a high-income country enjoying per capita income of US$21,820, along with Israel and South Korea (at US$25,930 and US$24,750 per capita incomes respectively). As for the control group, the per capita incomes for Hong Kong (US$44,050) and Singapore (US$48,520) do not justify their grouping with countries such as Jamaica, and Cape Verde that are classified as small states and have far less per

Table 1.1 Lin and Ye (2009) Sample with the WB's 2008 Income-Based Classification

Treatment Group		Control Group					
Brazil	Middle	Algeria	Middle	Hong Kong	High	Paraguay	Middle
Chile	High	Argentina	Middle	Indonesia	Middle	Romania	Middle
Colombia	Middle	Belarus	Middle	Iran	Middle	Russia	High
Czech Republic	High	Bulgaria	Middle	Jamaica	Middle	Singapore	High
Hungary	Middle	Cape Verde	Middle	Jordan	Middle	Slovakia	High
Israel	High	China	Middle	Kazakhstan	Middle	Slovenia	High
South Korea	High	Costa Rica	Middle	Latvia	High	Syria	Middle
Mexico	Middle	Croatia	High	Lebanon	Middle	Trinidad & Tobago	High
Peru	Middle	Dominican Rep.	Middle	Lithuania	High	Tunisia	Middle
Philippines	Middle	Egypt	Middle	Macao	High	Turkey	Middle
Poland	High	Estonia	High	Macedonia	Middle	Ukraine	Middle
South Africa	Middle	Georgia	Middle	Mauritius	Middle	Uruguay	High
Thailand	Middle	Guatemala	Middle	Morocco	Middle	Venezuela	Middle

capita income levels (under US$4,000), or countries that have been subjected to sanctions and conflicts such as Iran and Syria. It may, therefore, seem implausible to evaluate the relative dynamics of inflation using countries where there are stark differences in terms of per capita income or quality of institutions. It is precisely this concern that led me to use an income-based classification when constructing a country sample for the treatment and the control group in this study. Table 1.2 lists the 59 countries in our sample.

We use a panel data with annual time series covering the 59 MICs over a period of 18 years from 1996 to 2013. After running regressions on the inclusive sample (1996-2013), the sample time horizon is further truncated (2001-2013) for two reasons: First, the vast majority of MICs joined the ITR club later than their rich counterparts at the beginning of 21st century. Second, the 1990s were marred with episodes of very high inflation (even

Table 1.2 The Sample Countries

The Treatment (IT) Group	The Control (Non-IT) Group		
Albania	Algeria	Honduras	Senegal
Armenia	Angola	India	Sri Lanka
Brazil	Argentina	Jordan	Tunisia
Colombia	Azerbaijan	Kazakhstan	Turkmenistan
Ghana	Belarus	Kyrgyz Republic	Ukraine
Guatemala	Bolivia	Lao PDR	Uzbekistan
Hungary	Bulgaria	Macedonia, FYR	Vietnam
Indonesia	Cameroon	Malaysia	Zambia
Mexico	China	Mauritania	
Moldova	Congo, Rep.	Mongolia	
Peru	Costa Rica	Morocco	
Philippines	Cote d'Ivoire	Nicaragua	
Romania	Dominican Republic	Nigeria	
Serbia	Ecuador	Pakistan	
South Africa	Egypt, Arab Rep.	Panama	
Thailand	El Salvador	Papua New Guinea	
Turkey	Georgia	Paraguay	

Sources: Gamayel et al. (2011), Hammond (2012) and the World Bank (2015).

Table 1.3. The List of Variables

Variable	Description
Inflation Targeting Regime (ITR)	Binary variable used as dummy for inflation targeting regime which equals 1 for the years when a country has had ITR in place, and 0 otherwise.
Lagged CPI Inflation	Annual percentage change in the consumer price index (using Laspeyres method)
Per Capita GDP Log	Log of per capita income (GDP in constant 2005 US dollars over population)
Unemployment Rate	The total unemployment (% of total labor force, ILO estimates)
Trade Openness	The sum of exports and imports measured as % of GDP
Exchange Rate	Annual period average of national currency per SDR
Central Govt. Debt	The gross amount of central government total liabilities as % of GDP
M2 Growth	Annual growth rate of broad money, the sum of currency outside banks.
CPI Volatility	Deviation in CPI inflation of a country from the world's CPI for a specific year.
GDP Deflator	Annual growth rate of the GDP implicit deflator.

hyperinflation) for some MICs, particularly economies-in-transition. This time stratification enables us to discriminate between the treatment effects of ITR adoption during the two different scenarios.

The major source of data is the World Bank's World Development Indicators. The financial indicators are from the International Financial Statistics and the World Economic Outlook of the IMF. Data from Heston and Summers (2012) are used for the comparison purpose.

The aggregate variables listed in the previous section are referred to as the observable covariates (or observables). These covariates are economic variables that broadly define a macro-economy. However, there are some unobservable covariates (unobservables) that play an equally important role – perhaps even more important than the economic variables – in a successful adoption of ITR. This was already highlighted in Section 2.3, where I discussed the pre-conditions for an ITR adoption, such as the central bank independence, credibility and accountability, the data collection, modeling and forecasting capabilities. These unobservables are often neglected by the previous empirical studies on ITR.[22] It is noteworthy that this is the first study (to the best of my knowledge) that acknowledges the important role played by the institutions in the successful adoption of ITR.

Six Worldwide Governance Indicators (WGIs) that are employed in this study as proxy for the quality of institutions are described in Table 1.4.[23]

1.4.2 The Worldwide Governance Indicators (WGIs): These six WGIs are the latest version of a World Bank's project by Kaufmann et al. (2010) who look at the six

[22] Lin and Ye (2009) use a five-year central bank governor turnover rate as an inverse proxy for the CBI, while De Mendonca and De Souza (2012) use per capita income as a proxy for the overall institutional quality.

[23] All the descriptions as well as definitions are taken from the website: www.govindicators.org.

dimensions of governance over the 1996-2013 period and define governance as '*the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them.*'

Table 1.4 The Worldwide Governance Indicators (WGIs)

The W.G. Indicator	Description
Voice and Accountability	Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
Political Instability	Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
Government Effectiveness	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
Regulatory Quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
Rule of Law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Source: The Worldwide Governance Indicators, 2014 Update, www.govindicators.org

The authors, Kaufmann et al. (2010), collected the views and opinions of ordinary citizens, experts, business community and policymakers from 32 data sources in each country.

These data sources include think tanks, NGOs, international organizations, survey institutes and private corporations. Since the data on these WGIs are only available from 1996 and onward, I restrict the start of my sample's time horizon to 1996. The estimates of governance performance for each indicator range from approximately -2.5 (weak) to 2.5 (strong). However, these estimates are further transformed into the percentile ranks among all countries (that range from 0 (lowest) to 100 (highest) rank. The observations for these WGIs in the sample represent the percentile ranks among all the countries. In addition to using the six indicators separately in the regressions, a compact index is also constructed by calculating the mean average of all six indicators, and is used in the baseline model. Moreover, Kaufmann et al. (2010) compile their dataset every two years for the first seven years, 1996-2002, and do not report the estimates for years 1997, 1999 and 2001. I, therefore, interpolated and recovered those missing observations by simply taking the mean average of the two adjacent years (pre and post years). For example, the observation for the year 1997 is just a mean average of the years 1996 and 1998, and so on.[24]

1.4.3 Methodology: Previous empirical work on ITR is carried out using a difference-in-differences approach, which is a variant of fixed-effects model using aggregate data.[25] To avoid the self-selection bias criticism, often directed toward this approach, some authors have used the propensity score matching approach instead.[26] This study also employs the

[24] Appendix 'A' lists the annual average of the six percentile ranks for all the countries. For further details on the data sources, aggregation methodology and definitions, visit: www.govindicators.org.
[25] See Ball and Sheridan (2005), Batini and Laxton (2007) and Goncalves and Salles (2008).
[26] See Vega and Winkelried (2004), Lin and Ye (2009) and De Mendonça and De Souza (2012).

matching estimators approach. To be able to use the matching estimation methodology, the data sample must satisfy two assumptions:[27]

(*i*) The conditional independence assumption (CIA), also known as un-confoundedness assumption or selection on observables: this assumption states that once we control for all the variables in our covariate matrix for sample countries, the potential outcome, for the treated and the control groups, becomes independent of the ITR adoption. Formally this can be written as: $(Y^1,Y^0) \perp T \mid X$

(*ii*) The overlap assumption, also known as the common support assumption: this assumption requires that our covariate matrix contains observations that can be matched with a strictly positive probability in both the treated and control groups. Formally this can be written as: $0 < \text{prob.}\ (T=1 \mid X) < 1.$

For the purpose of our analysis, and to keep in line with previous studies, two matching estimators, namely the propensity-score matching (PSM) and the nearest-neighbour matching (NNM) are estimated, in addition to a regression adjustment through inverse-probability weighting (IPW). The idea behind these estimators is to compare the performance of countries that exhibit somewhat homogeneity with regards to their covariates, but differ in the treatment: some of them have adopted ITR (the treated) and the others did not adopt ITR (the non-treated).

PSM and NNM are basically two measurement methods that check for identical or near-identical observations: the PSM estimates predict the probability of a country adopting ITR given its covariates (propensity score), while the NNM estimates the distance among two

[27] Rosenbaum and Rubin (1983) call treatment assignment 'strongly ignorable' if these assumptions are satisfied. Appendix 'C' provides the results for testing of these assumptions.

near-identical observations (there are several options to choose from for this distance in STATA). As for the identification strategy for PSM estimators, three criteria have been applied: single match, three matches and five matches. Similarly, for NNM, three criteria have been applied: First, a narrow radius and a wide radius are applied. Second, to adjust for any bias in NNM estimator – perhaps due to a large sample – a bias correction adjustment restriction is imposed. Finally, an inverse probability weighting (IPW) regression adjustment is also applied, which takes care of the worries stemming for any model misspecification.

1.5 Results

1.5.1 The Propensity Scores: Our first task is to find out the likelihood of ITR adoption among the sample countries given the various covariates. As shown in Table 1.5 below, these results are obtained using Probit estimation model with seven different specifications. The lagged CPI inflation, unemployment and trade openness are all significantly negative: if a country has high inflation, unemployment and trade openness, it is highly unlikely that it will adopt ITR. On the other hand, income and exchange rate are significantly positive: a country enjoying high levels of per capita income is highly likely to adopt ITR. The exchange rate seems to be positively related to the ITR adoption as well. Central government debt has a significantly negative coefficient implying that a country plagued with high debt is less likely to adopt ITR. Results for the governance indicators are interesting: coefficients for regulatory quality and voice and accountability are significantly positive, while coefficient for political instability is significantly negative, confirming the important role of these institutions in the successful adoption of ITR. These

results further confirm the theoretical stance and underpinning of institutional requirement for the ITR adoption.

Table 1.5 Estimates of Propensity Scores Obtained Through Probit Regressions

Inflation Targeting Regime (ITR) Dummy is the Binary Treatment Variable Used as Dependent Variable

Control Variables	Baseline Model	Adding Six Indicators	Add Debt & M2g	Dropping CPI > 100%	Dropping CPI > 50%	Dropping CPI > 25%	Truncated Sample
Lagged CPI Inflation	-4.171***	-3.892***	-2.844	-3.954***	-3.782***	-2.904*	-4.461***
	(1.217)	(1.264)	(2.169)	(1.257)	(1.374)	(1.539)	(1.512)
Log of Per Capita Income	0.698***	0.701***	1.408***	0.724***	0.725***	0.728***	0.542***
	(0.081)	(0.106)	(0.284)	(0.104)	(0.104)	(0.104)	(0.091)
Unemployment Rate	-2.127**	-2.855***	-4.013**	-2.840***	-2.833***	-2.810***	-2.463**
	(0.925)	(0.988)	(1.741)	(0.975)	(0.977)	(0.981)	(1.035)
Trade Openness (%)	-1.153***	-0.849***	-1.091**	-0.864***	-0.857***	-0.847***	-1.432***
	(0.168)	(0.204)	(0.468)	(0.195)	(0.195)	(0.196)	(0.193)
Exchange Rate/SDR	0.104***	0.140***	0.103*	0.139***	0.136***	0.136***	0.097***
	(0.024)	(0.029)	(0.063)	(0.028)	(0.028)	(0.028)	(0.026)
Regulatory Quality		5.469***	-0.946	5.568***	5.567***	5.642***	
		(0.870)	(2.196)	(0.730)	(0.729)	(0.730)	
Rule of law		-0.755	0.386				
		(0.825)	(1.608)				
Voice/Accountability		2.234***	3.344***	2.110***	2.117***	2.082***	
		(0.578)	(1.131)	(0.549)	(0.550)	(0.552)	
No Corruption		-0.386	0.705				
		(0.820)	(2.115)				
Govt. Effectiveness		1.023	2.367				
		(0.864)	(1.953)				
Political Instability		-3.606***	-2.620***	-3.797***	-3.817***	-3.874***	
		(0.534)	(1.023)	(0.516)	(0.518)	(0.520)	
CG Debt (%GDP)			-1.883**				
			(0.752)				
M2 Growth			0.256				
			(1.420)				
Institutional Quality	3.119***						4.634***
	(0.508)						(0.621)
Constant	-6.799***	-8.521***	-11.836***	-8.591***	-8.600***	-8.688***	-5.758***
	(0.636)	(0.821)	(1.898)	(0.816)	(0.818)	(0.825)	(0.708)
Pseudo R^2	31%	46%	55%	45%	45%	44%	31%
LR (Prob > χ^2)	273***	406***	163***	398***	390***	378***	230***
Observations	977	977	252	962	941	903	692

The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures in parenthesis listed under the coefficients are Robust Standard Errors.

Due to missing observations on central government debt, this variable is dropped from the subsequent models. In addition, broad money growth and other statistically non-significant

variables are also dropped. Since the 1990s were often marred with episodes of extremely high inflation rates among MICs, particularly the economies-in-transition, various specifications have been adopted to restrict observations of inflation rates to thresholds that are practised in the literature. Frist, we drop the observations where CPI inflation is higher than 100%, 50%, and 25%. Second, we truncate the sample period before 2001. Interestingly, we do not observe any loss of significance except for some minor changes in the coefficients. These results also conform to those obtained by other studies that have employed the same methodology.

1.5.2 The Matching Estimators

1.5.2.1 Inflation: For the inflation levels, the Table 1.6 below shows results for the various estimators.[28] The first row shows coefficients for CPI inflation rates that are highly significant with a substantial magnitude. ITR adoption seems to have helped lowering inflation rates by 4 to 6 percentage points in the treatment group countries as compared with countries that did not adopt ITR. To avoid criticism for the presence of outliers in the sample, the second row shows the coefficients after dropping the outliers, and restricting the sample to observations where CPI inflation is 100% or less. Even after removing the outliers, the treatment group maintains its superior performance in combating inflation levels compared to the control group. The coefficients remain highly significant and substantial. We repeat this exercise by dropping observations where inflation rates are above 50% and 25% respectively, and find that ITR adoption has helped lower inflation by

[28] Results reported in this section are the average treatment effects on the treated (ATETs). Appendix 'B' reports the overall average treatment effects (ATEs) in population for CPI Inflation, Volatility, and GDP Deflator.

Table 1.6 Average Treatment Effects on the Treated (ATET) for CPI Inflation

	Propensity Score Matching (PSM)			Nearest Neighbor Matching (NNM)			Regression Adjustment
Model ↓ Estimator →	Single Match	Three Matches	Five Matches	Narrow R=.01	Wide R=.05	L. Sample Bias Adj.	IPW Reg. Adjustment
Inclusive Sample (1996-2013)	-.0419*** (.0122)	-.0376*** (.0086)	-.0418*** (.0089)	-.0561*** (.0109)	-.0632*** (.0118)	-.0477*** (.0119)	-.0358*** (.0070)
Confining CPI Inflation to 100 %	-.0241*** (.0084)	-.0377*** (.0097)	-.0429*** (.0095)	-.0537*** (.0109)	-.0561*** (.01089)	-.0515*** (.0110)	-.0294*** (.0056)
Confining CPI Inflation to 50 %	-.0261*** (.0068)	-.0240*** (.0050)	-.0233*** (.0050)	-.0518*** (.0103)	-.0538*** (.0102)	-.0506*** (.0104)	-.0196*** (.0048)
Confining CPI Inflation to 25 %	-.0232*** (.0060)	-.0248*** (.0048)	-.0226*** (.0047)	-.0391*** (.0105)	-.0400*** (.0104)	-.0383*** (.0104)	-.0138*** (.0046)
Truncated Sample (2001-2013)	-.0294*** (.0052)	-.0257*** (.0044)	-.0232*** (.0046)	-.0263*** (.0053)	-.0296*** (.0053)	-.0204** (.0096)	-.0162*** (.0048)
Confining CPI Inflation to 100 %	-.0293*** (.0052)	-.0257*** (.0044)	-.0232*** (.0046)	-.0182** (.0089)	-.0208** (.0098)	-.0200** (.0098)	-.0162*** (.0048)
Confining CPI Inflation to 50 %	-.0256*** (.0050)	-.0253*** (.0042)	-.0218*** (.0046)	-.0161* (.0088)	-.0185** (.0095)	-.0183** (.0095)	-.0139*** (.0045)
Confining CPI Inflation to 25 %	-.0270*** (.0047)	-.0238*** (.0046)	-.0209*** (.0055)	-.0078 (.0064)	-.0094 (.0063)	-.0138** (.0062)	-.0104** (.0043)

The Coefficients are for CPI Inflation, the Outcome Dependent Variable, while Outcome Independent Variables are Income; Unemployment; Trade; XR; and Institutional Quality. Treatment Variable is Inflation Targeting Regime (ITR) Dummy.

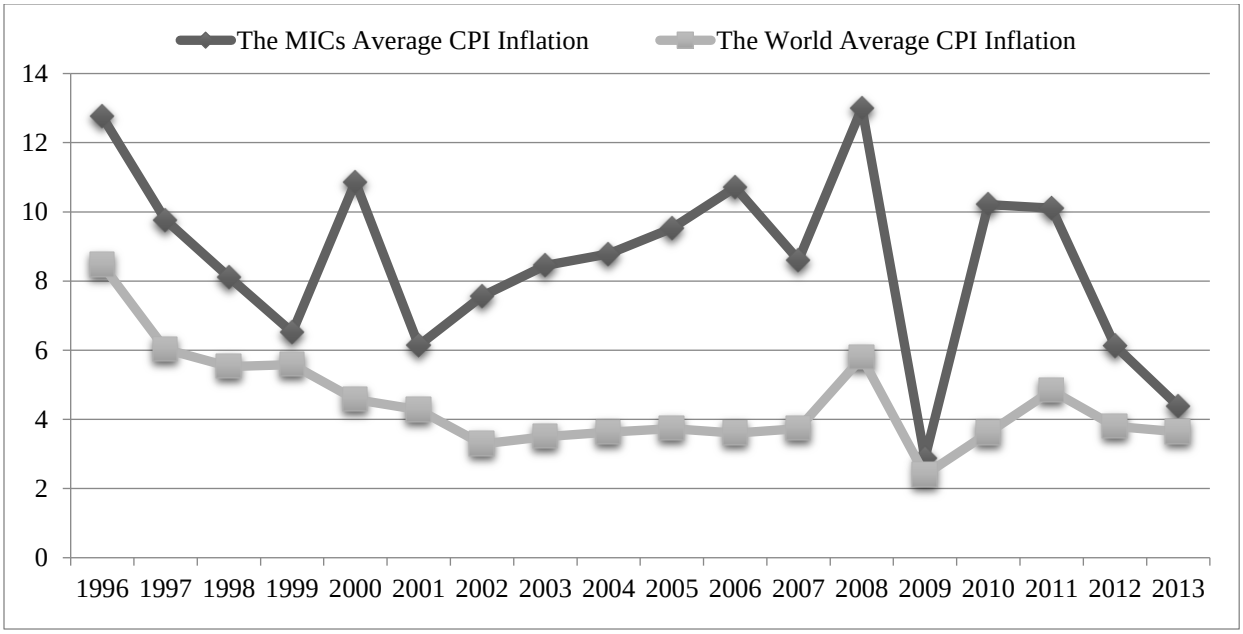
Note: The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures listed under the coefficients in parenthesis are Robust Standard Errors.

2 to 5 percentage points relative to the control group. We finally truncate the sample period, considering only the 2001-2013 period, and repeat the same regressions. Surprisingly, ITR adoption continues to lower inflation compared to the non-adopters. Even after removing

observations where inflation is greater than 25%, we still observe significant coefficients, implying a substantial reduction in inflation rates among the treatment group compared to their counterparts in the control group.

1.5.2.2 Inflation Convergence: We now analyze the impact of ITR adoption on the convergence of inflation rates among the IT adopters to the world's average inflation rates over the same period. Different studies define convergence differently. For this study, we computed a country's annual inflation rate minus the world's average annual inflation rate for that specific year. A significant negative coefficient implies convergence, whereas a significant positive coefficient signals divergence.

Figure 1.1. The Average Rates of CPI Inflation



Source: The World Development Indicators of the World Bank.

As Figure 1.1 shows, on average, CPI inflation has been in a worldwide decline since 1996, the beginning of our sample period. We, therefore, compare the performance of the treatment group in terms of these worldwide average inflation rates. The results are shown

Table 1.7 Average Treatment Effects on the Treated (ATET) for Inflation Convergence

	Propensity Score Matching (PSM)			Nearest Neighbor Matching (NNM)			Regression Adjustment
Model ↓ Estimator →	Single Match	Three Matches	Five Matches	Narrow R=.01	Wide R=.05	L. Sample Bias Adj.	IPW Reg. Adjustment
Inclusive Sample (1996-2013)	-.0378*** (.0119485)	-.0321*** (.0084)	-.0358*** (.0087)	-.0449*** (.0102)	-.0520*** (.0111)	-.0379*** (.0102)	-.0297*** (.0069)
Confining CPI Inflation to 100 %	-.0198** (.0081)	-.0321*** (.0095)	-.0369*** (.0093)	-.0424*** (.0100)	-.0446*** (.0100)	-.0409*** (.0101)	-.0232*** (.0055)
Confining CPI Inflation to 50 %	-.0223*** (.0061)	-.0188*** (.0047)	-.0174*** (.0049)	-.0403*** (.0094)	-.0421*** (.0093)	-.0399*** (.0094)	-.0136*** (.0047)
Confining CPI Inflation to 25 %	-.0178*** (.0056)	-.0187*** (.0046)	-.0162*** (.0046)	-.0282*** (.0090)	-.0291*** (.0088)	-.0286*** (.0088)	-.0079* (.0045)
Truncated Sample (2001-2013)	-.0297*** (.0050)	-.0253*** (.0046)	-.0224*** (.0047)	-.0188** (.0087)	-.0224** (.0093)	-.0215** (.0092)	-.0168*** (.0047)
Confining CPI Inflation to 100 %	-.0295*** (.0050)	-.0253*** (.0046)	-.0225*** (.0047)	-.0188** (.0087)	-.0210** (.0095)	-.0211** (.0095)	-.0167*** (.0047)
Confining CPI Inflation to 50 %	-.0254*** (.0046)	-.0247*** (.0045)	-.0211*** (.0047)	-.0166** (.0086)	-.0186** (.0093)	-.0193** (.0092)	-.0145*** (.0045)
Confining CPI Inflation to 25 %	-.0269*** (.0045)	-.0236*** (.0047)	-.0200*** (.0051)	-.0085 (.0064)	-.0098 (.0063)	-.0150** (.0063)	-.0109** (.0042)

The Coefficients are for Inflation Volatility, the Outcome Dependent Variable; Outcome Independent Variables are Income; Unemployment; Trade; XR; and Institutional Quality. Treatment Variable is Inflation Targeting Regime (ITR) Dummy.

Note: The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures listed under the coefficients in parenthesis are Robust Standard Errors.

in Table 1.7 above. As with inflation levels, ITR adoption has also helped the inflation rates among the IT adopters to converge to the world's average rates during the same period. The coefficients in Table 1.7 are highly significant with substantial magnitudes throughout various model specifications. Of course, when we remove the outliers or truncate the sample period, we do observe a drop in magnitude from around 5 percentage

points to around 3 percentage points. Nonetheless, the ITR adoption has led the inflation rates among the IT adopters to converge to the world's average inflation rates. These results also confirm the hypothesis of 'convergence' of inflation rates, among the ITR club, to those of world's average inflation rates suggested by Neumann and Von Hagen (2002).

1.5.2.3 Robustness Checks: Though our results seem robust to various model specifications as well as exclusion of outlier observations, we perform another robustness check by employing the GDP deflator as an alternative to the CPI inflation. No central bank in the ITR club, or even non-ITR adopters, takes into account the GDP deflator for monetary policy considerations. However, since MICs exhibit small open economy characteristics, and because the GDP deflator has been recommended as an alternative to CPI by Schaechter et al. (2000), it is worth checking the performance of ITR adoption in terms of maintaining stability of the GDP deflator, in addition to CPI inflation and its volatility. The results for the average treatment effects of ITR adoption on lowering the GDP deflator are presented in Table 5.4. They are pretty much in line with those obtained earlier for the CPI inflation and its volatility. The magnitudes and significance levels of the coefficients across all the estimators exhibit a resemblance to those of the CPI inflation and volatility. These results support the overall significant role of ITR adoption in combating GDP deflator inflation rates among the treatment group compared to the control group. When the inclusive sample is used, we observe that the ITR adoption has helped countries bringing the GDP deflator down by about 4 percentage points across different estimators. When we drop the outliers where inflation observations are above 100%, 50%, and 25%, we notice that the magnitude weakens although it is still significant. Similarly, when we truncate the sample at year 2001, there does not seem to be any loss of significance or

magnitude, implying that the ITR adoption has been greatly helpful in lowering the growth rate of the GDP deflator.

Table 1.8 Average Treatment Effects on the Treated (ATET) for the GDP Deflator

	Propensity Score Matching (PSM)			Nearest Neighbor Matching (NNM)			Regression Adjustment
Model ↓ Estimator →	Single Match	Three Matches	Five Matches	Narrow R=.01	Wide R=.05	L. Sample Bias Adj.	IPW Reg. Adjustment
Inclusive Sample (1996-2013)	-.0386*** (.0122)	-.0398*** (.0093)	-.0442*** (.0095)	-.0336*** (.0115)	-.0393*** (.0122)	-.0140 (.0124)	-.0355*** (.0081)
Confining CPI Inflation to 100 %	-.0217*** (.0082)	-.0423*** (.0104)	-.0436*** (.0098)	-.0324*** (.0116)	-.0330*** (.0110)	-.0151 (.0110)	-.0291*** (.0071)
Confining CPI Inflation to 50 %	-.0171** (.0078)	-.0240*** (.0072)	-.0248*** (.0066)	-.0373*** (.0106)	-.0381*** (.0102)	-.0184* (.0103)	-.0211*** (.0063)
Confining CPI Inflation to 25 %	-.0182** (.0081)	-.0268*** (.0071)	-.0262*** (.0066)	-.0353*** (.0118)	-.0368*** (.0117)	-.0183 (.0116)	-.0178*** (.0063)
Truncated Sample (2001-2013)	-.0411*** (.0145)	-.0471*** (.0099)	-.0431*** (.0094)	-.0276** (.0110)	-.0286*** (.0100)	-.0196* (.0102)	-.0230*** (.0062)
Confining CPI Inflation to 100 %	-.0413*** (.0145)	-.0471*** (.0099)	-.0431*** (.0094)	-.0277** (.0110)	-.0279*** (.0102)	-.0195* (.0105)	-.0230*** (.0062)
Confining CPI Inflation to 50 %	-.0445*** (.0152)	-.0455*** (.0099)	-.0416*** (.0096)	-.0260** (.0109)	-.0255** (.0101)	-.0175* (.0103)	-.0208*** (.0060)
Confining CPI Inflation to 25 %	-.0427*** (.0148)	-.0428*** (.0110)	-.0401*** (.0118)	-.0210** (.0107)	-.02120** (.0101)	-.0161 (.0103)	-.0179*** (.0060)

The Coefficients are for GDP Deflator, the Outcome Dependent Variable; Outcome Independent Variables are Income; Unemployment; Trade; XR; and Institutional Quality. Treatment Variable is Inflation Targeting Regime (ITR) Dummy.

Note: The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures listed under the coefficients in parenthesis are Robust Standard Errors.

1.6 Concluding Remarks

Earlier studies on inflation targeting had inconclusive verdicts on IT's performance. Later studies, however, show that when it comes to developing and emerging economies, IT can be a good remedy against chronic inflation and its volatility. All of these studies use the development-based classification when constructing their country samples, thus neglecting the vast divide of income levels among these countries. This may lead to biased results due to the 'selection-on-observables' problem often stemming from grouping together units that exhibit extreme heterogeneity in their covariates. In addition, these studies also ignore the role of institutions when assessing the impact of IT-adoption.

By adhering to an income-based, rather than a development-based, classification, this study addresses the 'selection-on-observables' problem. Moreover, this study seems to be the first one to use the World Governance Indicators as proxy for institutional quality to investigate the impact of IT-adoption on combating inflation.

Our findings suggest that the middle-income countries can benefit from IT-adoption in their fight against inflation. The results show a significant reduction in inflation rates among the IT-adopting MICs when compared to their counterparts over the same period. In fact, the estimated coefficients are significant and substantial: IT-adoption has helped MICs lower inflation by 4 percentage points more than the non-IT adopting MICs. IT adoption also helped the inflation rates converge to the world's average inflation rates. The results are robust to the exclusion of outliers, and to the use of alternative measure of inflation, the GDP deflator. More importantly, the results also confirm the pivotal role that institutions can play – particularly regulatory quality, voice and accountability and political stability– in bolstering policymakers' efforts to combat inflation.

Appendix A

Table 1.9 IT-Club Members with The Income Levels, Adoption Date and Targets

Country	Income Group	Adoption Date	Inflation Target	Country	Income Group	Adoption Date	Inflation Target
Albania	Middle (U)*	2009	3% ±1%	Moldova	Middle (L)	2010	3% ±1%
Armenia	Middle (L)*	2006	4% ±1.5%	N. Zealand	High	1989	1%–3%
Australia	High	1993	2%–3%	Norway	High	2001	2.5% Point
Brazil	Middle (U)	1999	4.5% ±2%	Peru	Middle (U)	2002	2% ±1%
Canada	High	1991	1%-3%	Philippines	Middle (L)	2002	4.0% ±1%
Chile	High	1999	3% ±1%	Poland	High	1998	2.5% ±1%
Colombia	Middle (U)	1999	2%–4%	Romania	Middle (U)	2005	3% ±1%
Czech Rep.	High	1997	2% ±1%	Serbia	Middle (U)	2009	4.0% ±1.5%
Ghana	Middle (L)	2007	8.7% ±2%	S. Africa	Middle (U)	2000	3%–6%
Guatemala	Middle (L)	2005	4.5% ±1%	S. Korea	High	1998	3% ±1%
Hungary	Middle (U)	2001	3%	Sweden	High	1995	2%
Iceland	High	2001	2.50%	Thailand	Middle (U)	2000	3.0% ±1.5%
Indonesia	Middle (L)	2005	4.5% ±1%	Turkey	Middle (U)	2006	5.0% ±2%
Israel	High	1997	1%–3%	UK	High	1992	2%
Mexico	Middle (U)	2001	5.0% ±1.5%	USA	High	2012	2%

*(U) indicates Upper Middle Income and (L) indicates Lower Middle Income Levels. Sources: Gamayel et al. (2011), Hammond (2012) and the websites of the IMF, the World Bank and some major central banks.

Table 1.10 The Quality of Institutions in the MICs (The Mean Ave. of the Six WGIs)

Year→ Country↓	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
ALB	24	25	26	26	26	30	34	33	37	35	37	41	44	46	45	44	42	44
DZA	17	15	14	14	14	19	23	25	27	33	29	26	25	23	24	22	23	24
AGO	8	6	4	4	4	6	8	10	10	11	13	12	15	15	16	15	16	15
ARG	57	56	55	54	53	43	33	39	38	44	43	43	40	38	41	43	40	39
ARM	34	34	34	34	34	38	41	45	42	42	40	41	42	44	42	43	46	47
AZE	14	15	15	16	16	17	18	22	19	23	22	22	24	26	24	23	22	28
BLR	28	27	26	25	25	22	20	23	17	18	18	20	23	23	19	18	23	24
BOL	44	47	50	47	45	42	39	38	33	28	31	31	30	29	32	32	31	32
BRA	51	51	51	53	55	56	56	54	52	50	49	49	51	54	56	55	54	51
BGR	42	47	51	53	55	57	59	57	59	59	59	59	57	59	60	59	58	57
CMR	14	16	18	19	19	18	17	22	20	21	20	20	19	21	19	20	18	19
CHN	38	37	36	37	37	35	33	36	36	35	36	36	38	37	35	36	35	36
COL	33	34	35	34	33	34	35	36	39	38	41	42	42	41	42	45	43	43
COG	11	9	7	9	10	12	14	15	16	12	12	12	12	14	15	16	15	15
CRI	70	73	76	74	72	72	72	70	69	66	66	66	66	69	70	68	71	71
CIV	42	38	35	27	19	18	17	12	9	8	9	10	10	13	12	13	18	21
DOM	44	40	36	39	41	42	42	36	37	38	40	39	39	38	36	38	40	42
ECU	33	34	35	30	25	26	26	26	26	25	21	22	21	20	22	24	26	31
EGY	43	42	41	42	42	39	37	36	36	37	32	35	36	38	35	29	28	23
SLV	34	37	40	42	43	43	43	44	48	46	47	46	46	48	49	50	47	47
GEO	17	19	22	24	25	21	17	27	33	37	43	46	48	49	51	53	56	58
GHA	42	42	42	46	50	48	45	49	49	51	55	53	54	55	55	56	55	55
GTM	28	30	33	32	32	32	33	30	31	29	30	31	32	32	31	32	30	30
HND	24	30	35	34	32	32	31	31	32	30	29	32	30	30	29	32	28	27
HUN	77	79	81	80	80	81	82	81	79	79	79	78	76	72	72	73	70	70
IND	44	44	44	45	46	44	43	44	44	47	46	45	45	44	43	42	40	41
IDN	34	27	21	25	29	26	24	22	26	28	32	35	36	35	35	36	38	40
JOR	52	53	55	55	54	51	47	53	54	53	51	53	52	52	50	50	49	47
KAZ	20	24	27	26	24	24	23	28	26	32	31	33	36	38	35	31	30	29
KGZ	33	35	37	34	31	30	29	25	23	18	18	19	21	19	22	23	24	24
LAO	28	26	25	22	19	17	15	9	13	13	16	17	18	16	18	19	22	24
MKD	30	32	33	32	32	32	33	37	43	40	44	46	50	51	49	49	51	51
MYS	66	63	60	60	61	61	62	64	65	65	61	61	57	56	61	60	61	62
MRT	44	43	42	42	42	46	50	46	38	38	33	31	21	24	21	23	23	22

MEX	43	45	46	49	51	52	53	53	52	50	49	47	45	46	46	46	48	47
MDA	48	47	46	40	35	33	31	31	29	33	35	36	36	36	38	42	42	41
MNG	53	52	52	52	53	56	60	55	51	49	48	47	46	44	44	45	45	47
MAR	50	53	56	52	49	47	45	43	47	40	41	42	40	43	45	42	43	42
NIC	33	34	35	34	32	35	37	37	37	35	32	30	29	29	28	30	31	32
NGA	13	13	14	15	16	13	11	12	11	16	16	16	18	16	16	16	16	16
PAK	23	24	25	22	20	21	22	23	19	21	25	23	21	19	20	18	18	19
PAN	52	56	60	58	56	56	56	53	55	52	53	54	57	56	55	56	54	54
PNG	36	34	32	33	33	31	29	25	24	21	24	26	25	25	27	28	28	28
PRY	28	24	19	17	15	16	17	20	20	22	21	23	25	26	29	30	28	28
PER	43	44	45	43	40	41	42	41	41	39	40	40	42	41	45	46	44	44
PHL	50	51	53	47	42	42	42	40	36	41	37	37	37	36	35	37	40	43
ROM	51	49	47	46	44	48	51	50	53	52	55	55	56	57	57	57	54	57
SEN	45	44	43	45	47	50	53	48	51	49	43	39	43	39	36	39	45	47
SRB	15	14	13	13	14	22	29	31	38	35	42	42	44	46	47	49	48	49
ZAF	63	62	61	62	62	62	62	62	64	63	64	62	61	59	60	60	58	59
LKA	43	43	42	42	43	46	48	47	45	41	42	42	40	39	40	42	42	41
THA	59	60	61	62	62	60	58	55	53	51	44	44	43	44	43	44	44	44
TUN	50	51	52	52	52	52	52	53	52	49	51	50	49	49	48	46	45	44
TUR	44	41	38	42	46	44	43	48	49	52	51	51	51	51	51	51	51	50
TKM	21	18	16	15	13	12	11	11	9	10	8	11	14	13	11	11	13	13
UKR	28	25	23	22	22	24	26	28	29	34	35	35	35	30	32	30	31	25
UZB	12	11	9	10	11	10	9	9	8	6	8	10	11	12	11	11	11	12
VNM	36	35	35	34	34	33	32	33	32	36	35	36	34	35	33	35	35	36
ZMB	28	31	33	32	31	31	31	34	34	30	35	38	40	39	38	42	45	45

Note: The numbers represent the percentile ranks among all countries that range from 0 (lowest) to 100 (highest) rank.

Table 1.11 Average Treatment Effects (ATE in Population) for CPI Inflation

	Propensity Score Matching (PSM)			Nearest Neighbor Matching (NNM)			Regression Adjustment
Model ↓ Estimator →	Single Match	Three Matches	Five Matches	Narrow R=.01	Wide R=.05	L. Sample Bias Adj.	IPW Reg. Adjustment
Inclusive Sample (1996-2013)	-.1243*** (.0449)	-.1267*** (.0446)	-.1241*** (.0446)	-.1251*** (.0445)	-.1291*** (.0445)	-.1301*** (.0446)	-.1363*** (.0531)
Confining CPI Inflation to 100 %	-.0430*** (.0073)	-.0484*** (.0060)	-.0461*** (.0059)	-.0466*** (.0052)	-.0500*** (.0050)	-.0518*** (.0050)	-.0453*** (.0060)
Confining CPI Inflation to 50 %	-.0299*** (.0067)	-.0324*** (.0045)	-.0293*** (.0045)	-.0330*** (.0043)	-.0357*** (.0040)	-.0381*** (.0040)	-.0302*** (.0051)
Confining CPI Inflation to 25 %	-.0194*** (.0061)	-.0215*** (.0041)	-.0182*** (.0038)	-.0200*** (.0039)	-.0221*** (.0037)	-.0248*** (.0037)	-.0183*** (.0046)
Truncated Sample (2001-2013)	-.0268*** (.0068)	-.0319*** (.0052)	-.0283*** (.0052)	-.0262*** (.0053)	-.0274*** (.0053)	-.0340** (.0054)	-.0337*** (.0061)
Confining CPI Inflation to 100 %	-.0232*** (.0063)	-.0283*** (.0046)	-.0247*** (.0045)	-.0229*** (.0047)	-.0256*** (.0046)	-.0302*** (.0047)	-.0288*** (.0051)
Confining CPI Inflation to 50 %	-.0168*** (.0058)	-.0232*** (.0040)	-.0197*** (.0040)	-.0175*** (.0042)	-.0202*** (.0041)	-.0248*** (.0041)	-.0230*** (.0045)
Confining CPI Inflation to 25 %	-.0126*** (.0057)	-.0188*** (.0038)	-.0154*** (.0038)	-.0116*** (.0036)	-.0140*** (.0034)	-.0195*** (.0034)	-.0179*** (.0041)

The Coefficients are for CPI Inflation, the Outcome Dependent Variable, while Outcome Independent Variables are Income; Unemployment; Trade; XR; and Institutional Quality. Treatment Variable is Inflation Targeting Regime (ITR) Dummy.

Note: The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures listed under the coefficients in parenthesis are Robust Standard Errors.

Table 1.12 Average Treatment Effects (ATE) for the Inflation Convergence

	Propensity Score Matching (PSM)			Nearest Neighbor Matching (NNM)			Regression Adjustment
Model ↓ Estimator →	Single Match	Three Matches	Five Matches	Narrow R=.01	Wide R=.05	L. Sample Bias Adj.	IPW Reg. Adjustment
Inclusive Sample (1996-2013)	-.1178*** (.0446)	-.1193*** (.0445)	-.1163*** (.0445)	-.1160*** (.0444)	-.1204*** (.0444)	-.1211*** (.0445)	-.1286** (.0530)
Confining CPI Inflation to 100 %	-.0367** (.0062)	-.0411*** (.0055)	-.0385*** (.0056)	-.0376*** (.0049)	-.0411*** (.0047)	-.0430*** (.0047)	-.0378*** (.0057)
Confining CPI Inflation to 50 %	-.0238*** (.0055)	-.0255*** (.0039)	-.0220*** (.0040)	-.0242*** (.0039)	-.0274*** (.0036)	-.0296*** (.0037)	-.0230*** (.0047)
Confining CPI Inflation to 25 %	-.0133*** (.0050)	-.0150*** (.0035)	-.0115*** (.0033)	-.0117*** (.0036)	-.0143*** (.0032)	-.0168*** (.0033)	-.0116*** (.0042)
Truncated Sample (2001-2013)	-.0282*** (.0057)	-.0316*** (.0049)	-.0279*** (.0049)	-.0258*** (.0052)	-.0294*** (.0051)	-.0337*** (.0051)	-.0337*** (.0059)
Confining CPI Inflation to 100 %	-.0245*** (.0050)	-.0280*** (.0042)	-.0244*** (.0042)	-.0224*** (.0045)	-.0255*** (.0044)	-.0299*** (.0045)	-.0289*** (.0049)
Confining CPI Inflation to 50 %	-.0180*** (.0045)	-.0230*** (.0036)	-.0194*** (.0037)	-.0170*** (.0040)	-.0200*** (.0038)	-.0244*** (.0039)	-.0231*** (.0042)
Confining CPI Inflation to 25 %	-.0138*** (.0044)	-.0186*** (.0033)	-.0151*** (.0034)	-.0112*** (.0034)	-.0139*** (.0031)	-.0191*** (.0031)	-.0179*** (.0038)

The Coefficients are for Inflation Volatility, the Outcome Dependent Variable; Outcome Independent Variables are Income; Unemployment; Trade; XR; and Institutional Quality. Treatment Variable is Inflation Targeting Regime (ITR) Dummy.

Note: The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures listed under the coefficients in parenthesis are Robust Standard Errors.

Table 1.13 Average Treatment Effects (ATE) for the GDP Deflator

	Propensity Score Matching (PSM)			Nearest Neighbor Matching (NNM)			Regression Adjustment
Model ↓ Estimator →	Single Match	Three Matches	Five Matches	Narrow R=.01	Wide R=.05	L. Sample Bias Adj.	IPW Reg. Adjustment
Inclusive Sample (1996-2013)	-.1448*** (.0579)	-.1470*** (.0577)	-.1456*** (.0577)	-.1419*** (.0576)	-.1466*** (.0576)	-.1472*** (.0577)	-.1610** (.0689)
Confining CPI Inflation to 100 %	-.0455*** (.0075)	-.0511*** (.0066)	-.0492*** (.0064)	-.0455*** (.0057)	-.0492*** (.0055)	-.0502*** (.0057)	-.0485*** (.0069)
Confining CPI Inflation to 50 %	-.0329** (.0068)	-.0362*** (.0053)	-.0339*** (.0052)	-.0342*** (.0048)	-.0379*** (.0046)	-.0383*** (.0047)	-.0347*** (.0060)
Confining CPI Inflation to 25 %	-.0254*** (.0064)	-.0278*** (.0046)	-.0251*** (.0043)	-.0249*** (.0047)	-.0281*** (.0046)	-.0285*** (.0046)	-.0250*** (.0057)
Truncated Sample (2001-2013)	-.0348*** (.0080)	-.0420*** (.0063)	-.0401*** (.0062)	-.0350** (.0062)	-.0382*** (.0060)	-.0426* (.0061)	-.0444*** (.0068)
Confining CPI Inflation to 100 %	-.0315*** (.0076)	-.0387*** (.0059)	-.0368*** (.0057)	-.0320** (.0057)	-.0346*** (.0055)	-.0390* (.0056)	-.0398*** (.0060)
Confining CPI Inflation to 50 %	-.0262*** (.0075)	-.0331*** (.0055)	-.0315*** (.0053)	-.0264*** (.0052)	-.0287*** (.0051)	-.0329*** (.0051)	-.0335*** (.0054)
Confining CPI Inflation to 25 %	-.0226*** (.0073)	-.0289*** (.0055)	-.0274*** (.0055)	-.0216*** (.0052)	-.0241*** (.0050)	-.0288*** (.0050)	-.0289*** (.0052)

The Coefficients are for GDP Deflator, the Outcome Dependent Variable; Outcome Independent Variables are Income; Unemployment; Trade; XR; and Institutional Quality. Treatment Variable is Inflation Targeting Regime (ITR) Dummy.

Note: The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures listed under the coefficients in parenthesis are Robust Standard Errors.

Figure 1.2 The Overlap Assumption Test – CPI Inflation

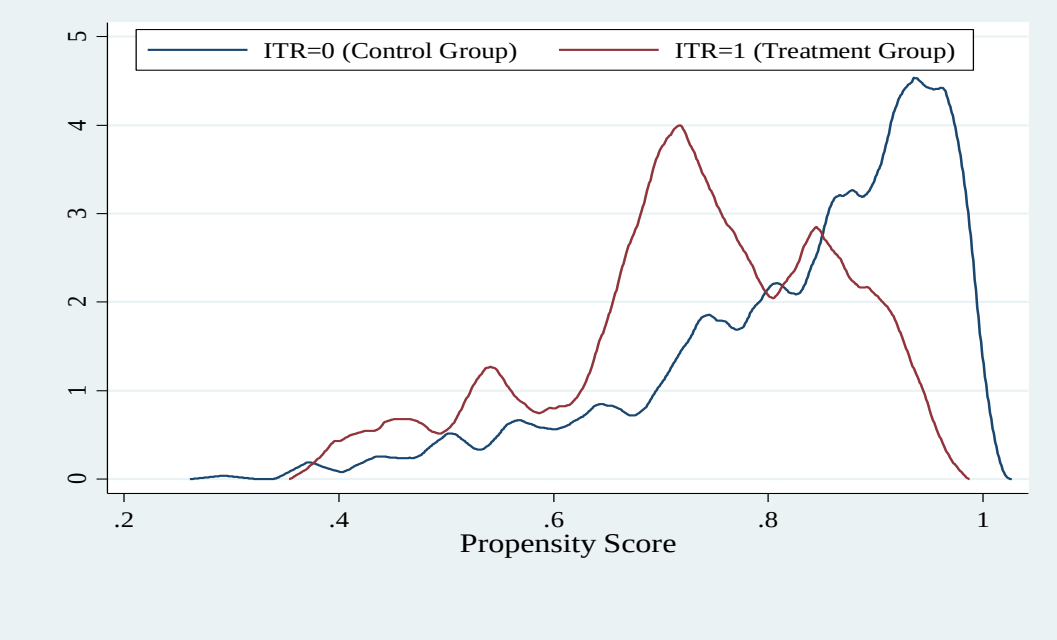


Figure 1.3 The Common Support Test – CPI Inflation

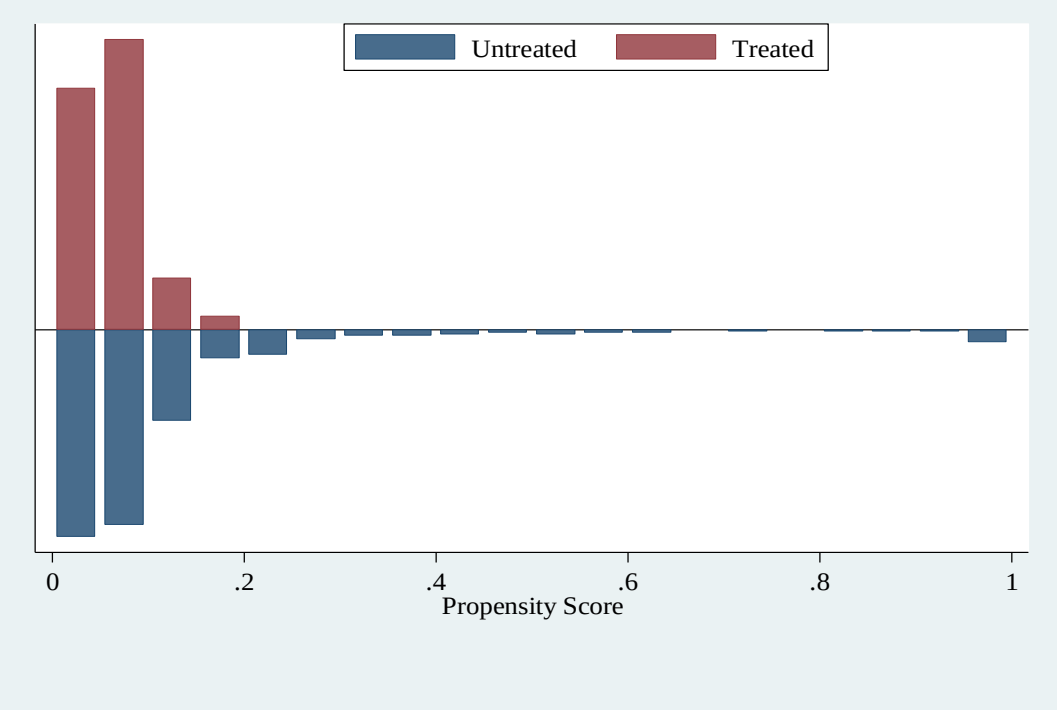


Figure 1.4 The Common Support Test – Average of Six WGIs (Institutional Quality)

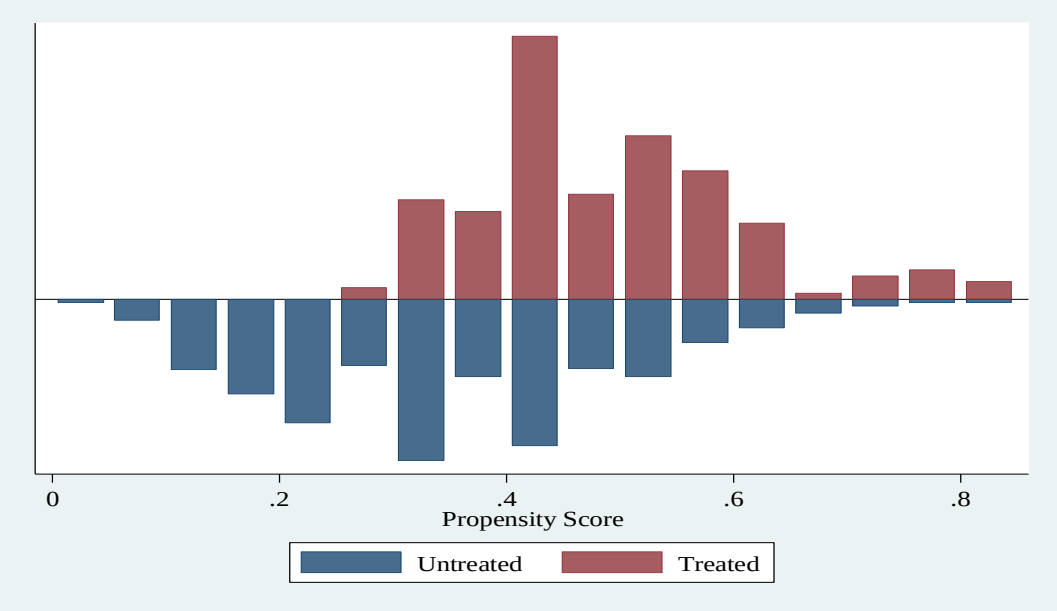
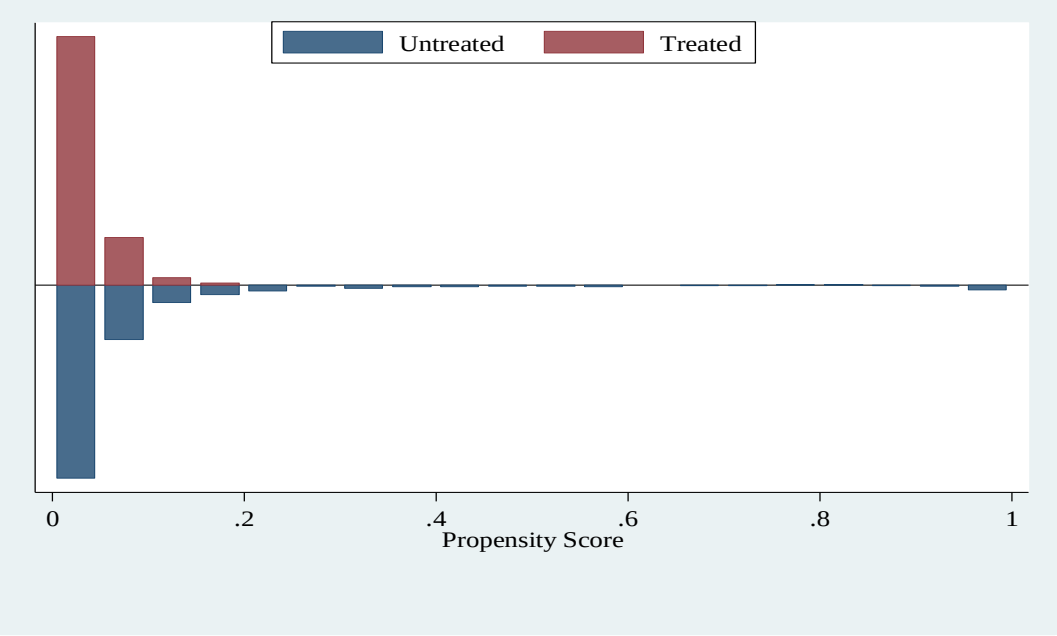


Figure 1.5 The Common Support Test – Inflation Convergence



Essay 2

Impact of Inflation Targeting, Governance and Taxation on FDI Inflows

2.1 Introduction

Many economists acknowledge the beneficial role of foreign investment for economic development and growth sustainability. The importance of this role has become even more visible in light of the historical freedom that foreign investment has enjoyed in its mobility over the past few decades. According to OECD (2014), foreign investment, particularly foreign direct investment (FDI) has been acting as a catalyst for technological change, competition and expansion. The FDI flows play a paramount role in fostering economic development and growth by integrating economies around the globe. For example, Ary Tanimoune et al. (2013) regard FDI as a crucial element behind the intense Chinese economic growth since the 1990s.

In the recent past, there has been an upward trend in the FDI flows, where countries in every category – advanced, emerging and developing – have enjoyed increased FDI inflows. The global stock of FDI in 2014 reached $25.5 trillion (about 33% of the world's GDP) while the FDI flows are expected to reach $1.87 trillion in 2016.[29]

Given this upward trend in the FDI flows and the freedom of cross-border mobility, a rigorous competition has emerged among countries to attract FDI. This competition has granted the foreign investors the luxury to select a low-risk-high-return environment for their investments. According to the literature, the key determinants of a low-risk-high-

[29] The stock of FDI at end-2013 was approximately ten times more than at end-1990 (OECD, 2014). Also see UNCTAD's annual World Investment Report 2014.

return environment in the eyes of the foreign investors are good governance, less uncertainty and macroeconomic stability. The policymakers are keen to design macroeconomic policies that signal their commitment to fostering governance, mitigating uncertainty and safeguarding macroeconomic stability. A voluminous literature has attempted to discuss both the concerns of foreign investors and the different approaches that policymakers have taken to downplay those concerns. One of these approaches is the inflation-targeting regime (ITR), a monetary policy framework. Inflation targeting has garnered an outstanding tribute for mitigating uncertainty, enhancing the governance institutions and bringing the overall macroeconomic stability to the adopting countries. These are precisely the conditions best suited for FDI in a recipient country. Thus, there seems to be a nexus between FDI and inflation targeting. This apparent nexus leads us to conjecture that the IT-adoption is conducive to FDI. We attempt to test the validity of this conjecture by empirically investigating the performance of the IT-adopting countries in attracting FDI, and then comparing them to those countries that have not adopted inflation targeting. This attempt is two-fold: First, we look at a large sample that includes the inflation-targeting countries and the non-targeters, both high and middle-income countries, due to the fact that the IT-member club is a mixture of the two kinds. The findings from this large sample indicate that the IT-adoption has increased the FDI inflows. Second, we cluster our large sample into two sub-samples: the OECD and the MIC countries. We first investigate the OECD sample, which mainly comprises advanced and rich economies, and compare the performance of the IT-OECD countries with the ones that did not adopt IT.[30] The results for this sub-sample are in line with the large sample results: IT-adoption has

[30] Except for three countries namely Hungary, Mexico and Turkey that are classified as middle income countries.

led to an increase in the FDI inflows. We then repeat the same empirical exercise for the second sub-sample that comprises only middle income countries (MICs). Surprisingly, the results for the MIC-sample are contradictory to the previous results: IT-adoption among the MICs appears to have restrained the FDI inflows.

As a consequence, the rest of the paper is organized as follows. Section 2 offers a detailed presentation on the definition of FDI, advantages and disadvantages of FDI, the theory behind FDI and the determinants of FDI. Section 3 presents a brief review of the FDI literature. Section 4 offers a brief discussion on inflation targeting and builds on the previous section to identify some of the apparent linking features between FDI and the ITR, in an attempt to find the nexus between the two and formalize the earlier conjecture. Section 5 describes the data and methodology used in this study. Section 6 presents and analyzes the empirical results and the robustness checks. Section 7 offers the concluding remarks and the future research venues.

2.2 Foreign Direct Investment (FDI)

Of all the capital flows across international borders, the most preferred flows from the standpoint of policymakers are FDI inflows. This preference stems from the fact that during economic and financial crises, FDI has demonstrated its resilience as opposed to the other types of capital flows, such as foreign portfolio investment (FPI) and the sovereign debt investments. For example, during the two notorious crises, the Mexican debt crisis and the Asian currency crisis, it was observed that the sudden fleeing of FPI exacerbated these crises.[31]

[31] Albuquerque (2003) states that in Mexico, the FPI flows dropped by 89% in just one year from 1994 to 1995, but the FDI flows dropped by 27% in two years from 1994 to 1996 only to recover fully one year later

2.2.1 What is FDI? FDI is defined in the IMF Balance of Payment Manual (1993) as '*the category of international investment that reflects the objective of a resident entity in one economy obtaining a lasting interest in an enterprise resident in another economy*'. Here the resident entity refers to the foreign investor and the enterprise resident is the firm subject to the foreign investment. The term 'lasting interest' entails a long-term relationship where the investor has decision-making powers. Ownership of 10% or more of the shares in the enterprise is required for a foreign investment to be classified as a 'direct investment'.

2.2.2 Advantages of FDI: Seldom a topic has enjoyed as much attention from academia and policymakers as did the FDI. The bulk of this literature has nothing but praise for FDI:[32] A new entry in a domestic market in the form of FDI creates a competitive environment that will enhance efficiency and productivity. FDI is well known for transferring new technology and innovative capabilities to the recipient economy, and thus boosting productivity. In addition, it also contributes to domestic human capital development either directly by hiring domestic labor and training them or through spill-over effects by doing business with the domestic suppliers. The multinational corporations (MNCs) tend to trade with their affiliates and existing customers in either home country or in other countries, and this creates more opportunities for exports of the recipient economy. FDI also helps raise the operating standards in the recipient economy, such as environment and social standards. Hausmann and Fernandez-Arias (2000) describe FDI as 'good cholesterol' and justify this labeling of FDI by the fact that during economic downturns, unlike portfolio investment, FDI has mainly demonstrated its resilience, perhaps due to the

in 1997. East Asian countries experienced a 22% drop in FPI flows during the Asian currency crisis of 1997-98 compared to a less than 5% drop in FDI flows.

[32] For a detailed look at these advantages see Igbokwe et al. (2010), Dolzer et al. (2006), Moran et al. (2005), Wei and Balasubramanyam (2004) and Beltz (1995).

fact that losses stemming from the economic downturns are considered to be a lesser evil than those resulting from disinvestment in FDI.

Disadvantages of FDI: There are also some challenges and disadvantages attached to FDI. Williams and Williams (1999) briefly summarize these disadvantages: FDI can have a 'crowding out' effect on domestic private investment and may discourage new market entrants because of fierce foreign competition. The recipient country may lose a substantial amount of revenues because of the incentive packages offered to FDI and because of an adverse reaction from domestic investors. In countries where distortions exist – both in financial and trade sectors – FDI may take advantage of these distortions, so that these additional distortions will cost more to the recipient country than the FDI contribution to benefits.[33] FDI with a small-scale infrastructure, such as an assembly plant, may abruptly wrap up its operations due to an economic downturn in the home or the recipient country, or for any other reason, which may exacerbate a potential crisis or have a negative impact on the local economy.

2.3 The Theory Behind FDI

The FDI decisions involve not only the investing firm's objectives, such as profit-maximization and cost-minimization, but they also involve the host-country's objectives, such as socio-economic welfare-maximization. Modeling of the FDI decisions, therefore, becomes quite a complex task, and this complexity makes a unified formal work on FDI nearly impossible. Given the existence of at least two players in the FDI decision-making, we see that most of the formal FDI literature takes two major approaches: the firm's

[33] There are numerous examples in the literature where MNCs have used their influential status to manipulate the weak institutions for distortional purposes, particularly in Africa and South America.

approach and the country's approach. The theoretical models of the firm's approach build on the microeconomic firm/production theory, while the country's approach utilizes the macroeconomic trade/welfare theory. These two approaches have expanded further into numerous branches. We discuss some of them here.

2.3.1 The Micro-Theory of FDI: The seminal work of Dunning (1993) provides a comprehensive analysis of the three mainstream theories on FDI that have applied the microeconomic approach: The first of them is the industrial organization (IO) theory by Hymer (1960), which is one of the earliest theories on FDI from a firm's perspective. This theory relaxes the neo-classical assumption of perfect competition, asserting that markets are imperfect, and this market-imperfection breeds economic rents. The FDI decisions are then motivated to maximize acquiring these economic rents. These decisions are aggressive, in the sense that the investing firm wants to capture and expand its market, and they are made in consideration with the entire stock of the firm's resources, including capital, technology, management and organization. The second main theory on FDI decisions from the firm's perspective is the product life cycle (PLC) theory developed by Vernon (1966), which asserts that a firm innovates and produces at home first, thanks to the healthy domestic demand, and after meeting the local demand and gaining technological maturity, it starts exporting in response to foreign demand. Subsequently, the firm decides to produce abroad to minimize its costs. The FDI decisions according to the PLC theory are made in a defensive mode, that is, to protect the firm's existing market position. Finally, the third mainstream theory on FDI is the *internalization* theory developed by Buckley and Casson (1976), which states that firms invest abroad when they

realize that the benefits of joint ownership of domestic and foreign production will exceed the benefits achieved through trade.

2.3.2 The Macro-Theory of FDI: Prior to 1960s, there were two dominant neo-classical approaches to theorize the foreign investment decisions: First, the international capital movements are a function of interest rates differentials; Second, the firms invest abroad due to the factor endowments differentials leading to either *absolute* or *comparative* advantages in costs and benefits of production. The workings of these two approaches can be seen in the Heckscher-Ohlin model that represents the neo-classical traditional theory of foreign investment. The earliest work that departs from the Heckscher-Ohlin model came from Grubel (1968), followed by Aliber (1970) and Dunning (1980). Grubel (1968) introduced his *international risk diversification* theory, which states that the capital movement across international borders, either direct or portfolio investment, is not just due to the interest rate differentials, but because these movements are motivated by positive growth rates of the asset holdings in a recipient country as well as the home country. Grubel (1968) further postulates that foreign investment activity can be observed among two countries where interest rate differentials are either non-existent or negative, while other countries that promise strictly positive interest rate differentials may not see any foreign investment activity. Aliber (1970) brought the foreign currency exchange aspect into the FDI debate. His model is basically an extension of the *international capital movement* theory, with the inclusion of the imperfect competition assumption. Aliber (1970) infers that the firms that have assets denominated in the hard currencies tend to invest abroad in

order to take advantage of exchange rate differentials.[34] Both of these earlier works have had their share of critique, since they both neglect the other more important intangible and non-financial assets affecting the FDI decisions. Dunning (1980) introduced his investment *development cycle* theory, which states that FDI follows a certain development cycle in the recipient country. With the progress in economic development of the recipient country, FDI tends to move from primary sectors to the secondary sectors, and finally to the tertiary sectors. Subsequently the recipient country reaches the development level where it starts exporting FDI.

2.3.3 The Unified (Micro-Macro) Theory of FDI: Both, micro and macro, theoretical streams of FDI appear to deal with the private or corporate benefits, thus neglecting the social benefits that the governments in recipient countries mostly care about. Some theorists have tried to synthesize the two aspects of FDI into a unified theory. Kojima and Ozawa (1984) present their formal analysis, dubbed as 'Kojima model', which asserts that there is a complementarity among FDI and international trade: A country that has a comparative advantage in a given sector is matched up with another country that has a comparative disadvantage in the same sector. As a result, this match attracts FDI from the disadvantaged to the advantaged country. The complementarity of FDI and international trade triggers the dynamics of gains for all the parties involved (a win-win situation). The Kojima theory, however, failed to attract a warm reception in the literature. Most of the criticism is directed towards its biased analysis of FDI, where the US FDI is portrayed as anti-trade and Japanese FDI is seen as pro-trade activity. A more balanced view of the

[34] The currencies that are stable, and are globally accepted and traded, are called the 'hard currencies', such as the US dollar or the Euro, as opposed to the 'soft currencies' that are not accepted globally.

unified theory on FDI is presented in Dunning (1993), who has amalgamated the features of the mainstream theories on FDI in a single paradigm called '*the eclectic paradigm*', which is also referred to as the '*OLI paradigm'*. The *eclectic* or the *OLI* paradigm asserts that FDI is a function of OLI advantages that a firm or a country has, where 'O' refers to the ownership advantages, 'L' refers to the location, and 'I' refers to the internalization advantages. After a detailed discussion of '*the eclectic paradigm*', Dunning (1993) concludes that the FDI decisions are made in the search of one or more of the six factors: natural resources, market, efficiency (either products or processes), strategic assets, trade and distribution, and support services.

2.4 The Determinants of FDI

The preceding section highlighted the various advantages that can affect the FDI decisions and activities.[35] For the investing firm, these advantages can be summarized as market diversification and growth, economies of scale, organizational control, centralization of research and development (R&D) and market allocation, and geographical asset and risk diversification. For the host country, the advantages can be summed up as natural resources, labor force (raw and skilled), the market size and growth (population and income), the host country's attitude towards foreign investment (tax incentives and property rights), and infrastructure (physical and social). In fact, it is one or more of these advantages that determine the direction of the FDI flows. Considering these various advantages, the list of all FDI determinants would become too long to accommodate here. But since the focus of our study is a country's attractiveness for the inward FDI, we limit

[35] This is a summary of Table 4.3 in Dunning (1993, p. 84).

our analysis to the country-specific determinants, widely used in the literature, and provide a theoretical justification for the inclusion of the covariates in our econometric model.

2.4.1 Growth: The potential expansion in the market of a recipient country, and to some extent the region as well, is considered as the most prominent determinant of FDI. A well-documented empirical literature shows a significant positive relationship of this determinant.[36] In our econometric model, we use per capita GDP growth as a proxy for this determinant.

2.4.2 Labor Force: The second prominent determinant of FDI, following the growth, is the labor force, both raw and skilled labor.[37] To gauge this determinant, different studies have used different variables, such as wages, size of the working-age labor force, unemployment rates, education levels, etc. Due to the data-availability constraint for certain countries in our sample, we use the size of the labor force.

2.4.3 Country's Openness: FDI is often directed at the import-substitution industries (ISI), and the lion-share of FDI goes to the globally traded intermediate and final goods. Therefore, trade openness should have a significant impact on FDI. Additionally, the investors tend to prefer financial openness as well, in the form of minimum barriers to the capital flows. Hence, it is a plausible assumption that the trade and financial openness will have a significant impact on FDI. We use the ratio of imports and exports to GDP as a proxy for the trade openness. As for the financial openness, we use the financial index of Chin and Ito (2006).[38]

[36] For example, Chakrabarti (2001), in his survey of empirical literature on the determinants of FDI, lists 18 studies that show a significantly positive effect of the host-country's market size on the FDI inflows.
[37] Chakrabarti (2001) lists another 11 studies that find a significant effect of labor cost on the FDI inflows.
[38] See for example, Resmini (2000) who uses both trade and financial openness for that purpose.

2.4.4 The Currency Stability: Following the Aliber's weak currency hypothesis, numerous empirical studies on FDI have included exchange rate in their econometric model, and have found significant relationship between the two. For example, Edwards (1990) finds a significant and positive impact of a recipient country's exchange rate on the FDI inflows, while Froot and Stein (1991) find the opposite: in their findings, exchange rate has a significantly negative impact on FDI. Our study uses PPP-based exchange rate to proxy for the currency stability.

2.4.5 Taxation: A decent amount of literature has been devoted to studying the impact of tax rates in the recipient country on FDI. Some find a significant effect of tax rates on the FDI inflows, such as Billington (1999), while others find no such effect, such as Root and Ahmed (1978).

We use the rates of corporate income tax, personal income tax and value added tax.

2.4.6 Inflation: A stable price level of the recipient country is another important determinant of FDI. A vast majority of the empirical literature on FDI includes a measure of changes in the price level (mainly CPI) and finds a significant negative relationship between the two. Since one of the benefits of inflation targeting is a low and a stable inflation, the IT-adoption should implicitly have a significant positive impact on the FDI inflows. We, therefore, include in our covariate matrix the CPI inflation. Subsequently, we also use an alternative measure of inflation, the GDP deflator, to check for the robustness of our results.

2.4.7 Governance: In general, the overall quality of governance has been cited by many authors as an important determinant of FDI, particularly since the governance is a catalyst for political stability. We review the literature on the link between governance and FDI in

the next section. As for the proxy for governance, there are many different indices available that have been used in the literature. We use as proxy for governance a comprehensive index, an average quality of governance, which we have constructed as a mean average of the six worldwide governance indicators developed by Kaufmann et al. (2010).

2.5 Literature Review

The literature on FDI seems to be infinitely large covering numerous aspects from multiple disciplines. However, we limit this section to reviewing the segment of the literature that focuses on establishing a nexus between FDI flows and a recipient country's governance institutions, taxation and monetary policy, particularly inflation targeting.

Hausmann and Fernandez-Arias (2000) investigate whether the quality of the governance institutions in a recipient country plays any role in attracting FDI. In their empirical investigation, they use two sets of indices as proxies for financial development and institutional quality, in addition to utilizing some common macroeconomic aggregates such as income, growth and trade openness. Their findings on financial development are mixed: while the index of creditor rights exhibits an insignificant relationship, the index of shareholder rights has a robust and significant positive effect on the FDI flows.[39] As for the quality of governance institutions, their results show a significantly positive coefficient of the index on governance institutions quality with regards to FDI flows.[40] They conclude that a better quality of governance institutions helps in attracting more FDI flows, and the

[39] These two indices were developed by La Porta et al. (1997).
[40] For governance quality, they construct an index using an average of Kaufman's indices (regulatory burden, accountability, government effectiveness, graft, rule of law).

same is also true for other types of foreign investment flows, such as portfolio investment and debt instruments.

Wei and Shleifer (2000) study the effect of corruption (defined as 'poor public governance') and macroeconomic policies on three types of foreign investment flows, FDI, FPI and foreign bank loans. Using a sample of 93 countries (including 20 OECD and 73 non-OECD countries) for the years 1980 to 1996, they find that corruption has significant but opposite impacts on foreign investment flows into a recipient country: it significantly reduces FDI flows, but at the same time it has a positive effect on foreign bank loans and FPI. More importantly, when they introduce macroeconomic policies in their control matrix, corruption tends to have an even worse effect on FDI, an effect which is statistically significant and quantitatively large.

Habib and Zurawicki (2002) study the impact of absolute difference in corruption levels between the home and the host (recipient) country on the FDI inflows in a recipient country. In addition to the common aggregate variables, they utilize the corruption perception index – developed by Transparency International – and an absolute difference of this index between the home and the host country to estimate the FDI inflows in a large sample of 89 countries over a three-year period. They find a significant negative effect of both corruption and the absolute difference in corruption between the home and the host country on FDI inflows.

Globerman and Shapiro (2003) investigate the importance of governance infrastructure in attracting the FDI flows from the US. Their sample includes 143 countries (of which 88 are the recipients of the US FDI flows) over a three-year period from 1995 to 1997. Their

control variables include, in addition to a matrix of traditional macroeconomic aggregates, the governance indicators and a dummy variable for the legal system – English common law. Their findings indicate a significant positive effect of the governance infrastructure on attracting the US FDI inflows. The authors conclude that English common law practice, open markets, government effectiveness and accountability are important determinants of the US FDI flows.

Grosse and Trevino (2005) conduct an empirical investigation of FDI inflows in the transitional central and eastern European economies employing a neo-institutional economics approach to testing whether FDI flows react to changes in governance institutions in these economies. Using a panel data set comprising 13 central and eastern European countries over a 10-year period, they estimate the effects of institutional quality and public policies on FDI inflows into these economies. In their regressions, they use both traditional factors, such as macroeconomic variables, and non-traditional factors, such as political and environmental factors. Their findings, in line with the literature, show that corruption constrains FDI inflows in their sample countries via increased costs for the investors in order to mitigate potential risks.

Li (2006) studies the relationship between tax incentives and rule of law in a recipient country on the FDI flows. He first develops a theoretical model and then empirically tests the validity of his model on a sample of 52 developing countries (excluding advanced countries) in the year 2001. His results show a significant negative coefficient of the rule of law index, implying that countries with better quality of rule of law offer low or no tax

incentives to attract FDI flows compared to those who have inferior quality of rule of law.[41] This negative effect seems to be even stronger in countries where democracy is practised to elect governments.

Pajunen (2008) looks at the complex and diverse causal relationships between institutions in a recipient country and the FDI of multinational corporations (MNCs). Applying a fuzzy-set analysis approach to a sample of 47 countries between the year 1999 and 2003, he analyzes the effects of institutional quality on attracting FDI.[42] His findings suggest that the institutions seem to exert a diverse influence over FDI flows in different countries. One cannot pinpoint a particular institution as having a certain relationship with FDI flows. An institution may exhibit a totally opposite and significant influence on FDI in two different countries implying that there must be other factors – such as geopolitical factors – that also play an important role in affecting FDI flows. However, in their inclusivity, institutions do play a significant role in attracting FDI flows into a recipient country. As opposed to the mainstream perception, Pajunen's findings assert that corruption and lack of property rights do not always appear to be the sufficient institutional obstacles to FDI flows.

Guerin and Manzocchi (2009) study the political regime effect on FDI flows in emerging economies coming from the advanced economies. With a country sample of 38 countries (14 advanced and 24 emerging) they apply a 'gravity model' to estimate the impact of the type of political regime – in addition to a matrix of aggregates – on the FDI inflows. They find that democracy affects in a significantly positive manner the FDI inflows from

[41] Li (2006) employs the year-2000 index for the rule of law.
[42] Pajunen (2008) uses the UNCTAD's index for the inward FDI performance and assigns the fuzzy-set score to a country based on its overall share of the global FDI flows as a ratio of its share of the global GDP.

advanced to emerging economies.[43] Moreover, democracy based on a parliamentary system is likely to attract more FDI inflows than the presidential system.

Goodspeed et al. (2010) compare the effects of government policies on the stock of FDI in advanced and developing recipient countries. The government policies include not only governance (proxied by the corruption perception index from Transparency International) and taxation (proxied by the tax rate), but they also cover the infrastructure – basic physical infrastructure, technological infrastructure and energy/environment infrastructure –proxied by a country's infrastructure ranking in the World Development Indicators (WDI). They employ a panel sample of 53 countries (28 of them are developed and 25 developing) over a 19-year period from 1984 to 2002. However, since data on all the indices for these 53 countries are not available, they limit their empirical exercise to those countries that have data available for all the variables. Their findings present a dichotomy in terms of FDI stocks: the results show a significant negative relationship between FDI stocks on one hand and the tax rate and the corruption level on the other hand, implying that countries with a low tax rate and low corruption have a larger FDI stock compared to countries that have higher tax rates and corruption. As for the infrastructure, the results appear to show a significant positive relationship with FDI stocks: countries with better infrastructure quality, mostly developed countries, tend to have a larger FDI stock than those with an inferior infrastructure, mainly the developing countries.

[43] Their regime dummy is based on the index 'Polity 2' from the Polity VI Project of the University of Maryland.

Finally, Nasir and Hassan (2011) explore the expected role played by governance institutions, macroeconomic policies and the overall market size of a recipient country in attracting FDI. Using a panel sample comprising four South Asian countries (India, Pakistan, Bangladesh and Sri Lanka) for the years 1995-2008, they investigate the effects of institutions (proxied by the Economic Freedom index), macroeconomic stabilizing policies (proxied by the real exchange-rate regime) and market size (proxied by GDP).[44] Their findings suggest a positive impact of institutional quality and market size on attracting FDI. As for the real exchange rate, currency depreciation appears to have a negative effect on the FDI inflows.

2.5.1 Monetary Policy, Inflation Targeting and FDI

We first describe below the various channels that monetary policy has access to, regardless of the framework that it adheres to. Next, we examine the possible linkages or impacts of these channels on FDI, and subsequently we review some of the literature on ITR and FDI.

Among the several channels through which monetary policy can operate and transmit its objectives, six major channels are distinguished by the literature as providing a transmission mechanism for monetary-policy operations:[45]

(*i*) The traditional interest rate channel: When a central bank announces a change in its key lending nominal interest rate, this announced change transmits the central bank's objective to the real interest rates thus affecting the overall cost of capital in the economy.

[44] This index is developed by the Heritage Foundation and is constructed from a set of measures such as business environment, trade policy and other macroeconomic policies, fiscal and monetary policy.
[45] This is a summary of an in-depth analysis of these channels in Kuttner and Mosser (2002).

Households and firms react to this change, and make their consumption and investment decisions accordingly.

(*ii*) The wealth channel: A change in the interest rates can have a direct impact on asset prices, both real and financial assets, leading to altering the wealth-related expectations, which act as a catalyst for transmitting the policy objectives to the decisions over consumption and investment.

(*iii*) The broad credit channel: Since households and firms often use their assets as collateral, changes in asset prices can also affect their consumption and investment decisions.[46]

(*iv*) The bank lending channel (the narrow credit channel): Monetary policy can affect credit availability through domestic commercial banks, assuming reserve requirements are in place.

(*v*) The exchange rate channel: Assuming the uncovered interest rate parity (UIP), the changes in the domestic interest rates can affect the expected movements in exchange rate.

(*vi*) The monetarist channel: Assuming the imperfect asset substitutability, monetary policy can affect the outstanding asset values that will translate into relative asset prices. The interest rate is just one of the many relative prices, according to the proponents of this channel, the monetarists.

[46] This channel is linked to the wealth channel, and the impact on consumption and investment through this channel is also referred to as '*financial accelerator*' effect.

The transmission mechanism comprising the aforementioned channels seems to work essentially for the domestic economy. It is a complex task to disentangle these channels and study the specific effects on the decisions of the domestic consumers and the investors.[47] However, for the analysis of FDI, it may seem implausible to look at these channels in their globality. Some of the channels may not affect foreign investors at all, particularly those with 100% foreign funding and those who do not intend to finance partially via the recipient country's financial markets.

Under the assumption of 100% foreign funding, the narrow and broad credit channels are likely to be irrelevant, but the remaining four channels can impact the investment decisions. However, the 100% foreign funding for FDI may not hold ground since most FDI ventures seek financing through the domestic financial markets along with their foreign funding resources. Hence, almost all channels seem to be relevant for FDI, perhaps with a different level of each channel's impact.

As for the link between ITR and FDI, one factor that seems to bond the two together is macroeconomic stability in a recipient country. Proponents of inflation targeting passionately argue that ITR mitigates uncertainty and brings overall macroeconomic stability to the adopting country. For example, Svensson (1997) credits ITR for enabling the public and the markets to evaluate the credibility of policymakers and hold them accountable for their commitments. In addition, Bernanke et al. (1999) admire ITR for its explicitly defined objectives, greater transparency, and enhanced accountability due to the fact that the general public is periodically briefed about the policy objectives. They also

[47] Kuttner and Mosser (2002).

credit ITR for mitigating the 'pass through' effects of unexpected shocks and keeping the nominal interest rates stable. Mishkin (1999) credits ITR for obliging the policymakers to increase the level of transparency by openly communicating with the general public and the markets regarding policymakers' objectives. Mishkin also adds to ITR the enhanced level of accountability of policymakers' announced objectives.

Several other benefits have been also attributed to the inflation-targeting regime: ITR rejuvenates the motivations for institutional reforms; ITR reduces uncertainty and the confusion over the policy stance; ITR builds and lends credibility to the policymakers; and ITR has '*state of the art*' nature, which helps in combating the prevailing uncertainty in the economy and enhances macroeconomic stability.[48]

In light of the benefits stated above, the IT-adoption should favor and attract more FDI.

As for the impact of ITR on FDI, there are a handful of studies on the topic, perhaps because inflation targeting is considered to be an inward-looking policy framework. A summary of these studies follows, which portrays the nexus among foreign investment, the governance institutions, and macroeconomic policies, particularly monetary policy in the form of inflation targeting.

Kopits (2001) provides an early analysis of the important role played by the government institutions in the success or failure of macroeconomic policies. He first analyzes the fiscal reforms adopted by advanced and emerging economies to lend credibility to their fiscal policy regime, and then compares these reforms to those necessary for the adoption of an inflation-targeting regime. He suggests that the recent fiscal rules can serve as a useful

[48] See for example, Schaechter et al. (2000), Gavin (2003), Truman (2003) and Hammond (2012).

policy framework, particularly for countries that lack credibility and wish to adopt the inflation-targeting regime.

Blanchard (2004) develops a theoretical model on a macroeconomic proposition which states that changes in the real interest rates induced by a monetary policy stance trigger similar movements in the real exchange rates. These movements imply that an increase (decrease) in the real interest rate will lead to an increase (decrease) – a real appreciation (depreciation) – in the domestic currency's value against other currencies in the foreign exchange (forex) markets. His model is formulated on an interaction between the interest rate and the exchange rate – the two of the six channels of monetary policy transmission mechanism – and a country's default probability. The model predicts that an increase in the interest rate – under a contractionary monetary policy – will lead to an increase in the probability of default. This effect becomes even stronger when the initial level of debt is assumed to be higher.

Blanchard (2004) also puts his model to an empirical test using Brazil as a case study (Brazil has been an inflation-targeting country since 1999). His sample comprises monthly observations of Brazilian C-bonds (with the credit ratings of Baa) and a difference (spread) between Brazilian T-bonds and the US Treasury bonds of similar credit ratings over a time period of February 1995 to January 2004. His main quest, apart from testing the validity of his own model, is to investigate empirically how a country's debt level and composition – coupled with the global risk-aversion phenomenon – react to a contractionary monetary policy of an ITR country like Brazil. He finds that the two channels affect the domestic inflation rate perversely as opposed to what policymakers would believe or expect to realize. He concludes that under adverse fiscal conditions, the traditional macroeconomic

proposition will not hold ground: an increase in the interest rate under a contractionary monetary policy is more likely to have a negative effect on real exchange rates and will result in fueling inflation instead of containing it.[49]

Prasertnukul et al. (2010) study the exchange rate channel and its effectiveness in terms of the real exchange rate volatility and the pass-through to the domestic price level under an inflation-targeting regime. Their panel sample includes four Asian countries that adopted the ITR, namely Indonesia, South Korea, the Philippines and Thailand. Using monthly observations covering January 1990 to June 2007, they investigate the impact of the IT-adoption on the variability of the real exchange rate as well as the pass-through from the exchange rate to the price level in the domestic markets. Their results suggest that generally inflation targeting has helped all four countries to reduce exchange-rate variability. As for the exchange-rate pass-through to the domestic price level, their findings indicate a significant reduction of pass-through in South Korea and Thailand, but insignificant results in the case of Indonesia and the Philippines.

Combes et al. (2012) study the possible interaction between the fiscal-rule regime and the inflation-targeting regime and their combined effects on changes in the price level and the fiscal health of an economy. They do so by first exploring joint and isolated effects of the two regimes, and then investigating the possible role played by the time or sequence of the regime adoption. Using a System-GMM estimation methodology on a large sample of 152 countries over a 20-year period from 1990 to 2009, they find interactive and

[49] Blanchard (2004) states symptoms of these conditions as in Brazil: a higher level of debt, denomination of a larger proportion of this debt in foreign currency and an unusually higher risk aversion of foreign investors.

complementary effects of the two regimes on the price level and the fiscal balance in the sample countries.

Finally, Tapsoba (2012), which is the closest to our study, investigates the impact of the inflation-targeting adoption on attracting FDI. His sample includes 53 developing countries over a 28-year period (1980-2007). Employing the treatment effects methodology, he finds a significant positive impact of the IT-adoption on attracting FDI inflows. His results show that the IT-adoption in developing countries has increased the FDI inflows by 2 percentage points.[50]

Interestingly, as explained in the next section, we also get the same results for our grand sample, but once we use clustering method, the results turn out to be different!

2.6 Empirics

2.6.1 Data: We use panel data with the annual time series covering 90 countries over a period of 18 years from 1996 to 2013.[51] The sample is further clustered into two sub-samples: the OECD sample, which includes 34 OECD member countries: 16 of them have adopted inflation-targeting regime, while the remaining 18 countries are non-IT adopters.[52] According to the latest World Bank's classification, the OECD countries are classified as high income countries (HICs) except for three of them – Hungary, Mexico and Turkey – which are classified as middle income countries (MICs).[53] Our second clustered sample

[50] This positive effect of IT-adoption on FDI inflows is apparently due to the study's inclusive sample of both rich and poor economies under the label of 'developing countries'.
[51] See appendix 'A' for a complete list of all the 90 countries in our sample.
[52] Two of these 18 countries, Finland and Spain, had initially adopted ITR but soon abandoned it after joining the European Union, so they are considered as non-IT countries in our sample.
[53] We also perform robustness checks by excluding these three countries from the OECD and MICs samples.

contains 59 MICs: 17 have adopted ITR thus far, and the remaining 42 MICs are non-IT adopters.[54]

For our MIC sample, the income-based grouping is plausible because the development-based grouping often ignores the income-level differences. This clearly violates the assumption of 'selection on observables' (also referred to as imbalance in observed confounders).

More importantly, this study also includes in its covariate matrix an index of the worldwide governance indicators. Since the quality of governance institutions plays a key role in the outcome of any policy implementation, the inclusion of a proxy for such quality would satisfy the often violated assumption of 'selection on non-observables' (imbalance due to non-observed confounders, such as institutional quality). The major sources of the data are the World Bank's world development indicators (WDI), the worldwide governance indicators (WGI), the international financial statistics (IFS) and the world economic outlook (WEO) of the International Monetary Fund (IMF).[55] Data on some aggregates were also downloaded from the Heston et al. (2012). We use a comprehensive dataset that includes, in addition to the normal macro variables, the worldwide governance indicators, the latest data on personal and corporate income tax rates and value added tax rate provided by the IMF's Fiscal Affairs Department. We also use the Chinn and Ito (2006) index to proxy for financial openness. We use two time horizons: the inclusive time horizon of an

[54] Three countries – Hungary, Mexico and Turkey – appear in both samples, because they are middle-income countries, and at the same time they are also OECD member countries. To enhance the quality of our analysis, we restrict our sample on MICs to 59 countries after dropping those that have too many missing observations or those classified by the World Bank as small states (SST) or fragile and conflict-affected states (FCS).
[55] These indicators were initially developed by Kaufmann et al. (2010). For further details on the data sources, aggregation methodology and definitions, visit: www.govindicators.org.

Table 2.1 The Variables with the Definitions

Variable	Description	Source
Inflation Targeting Regime (ITR)	Binary variable used as dummy for inflation targeting, equals 1 for the years when a country has had ITR in place, and 0 otherwise.	Gemayel et al. (2011), Roger (2009) and the websites of various central banks and the IMF.
FDI Inflows	Foreign direct investment net inflows (as % of GDP).	IMF, IFS and Balance of Payments, World Bank and OECD, International Debt Statistics, and GDP estimates.
CPI Inflation	Annual percentage change in the consumer price index (using Laspeyres method).	World Development Indicators, The World Bank (Last Updated: 03/12/2015).
Output Growth	Annual growth rate of GDP at market prices based on constant 2005 U.S. dollars.	World Bank national accounts data, and OECD National Accounts data files.
Work Force	The total population aged 15-64 (% of total population, ILO estimates).	The United Nations Population Division's World Population Prospects.
Financial Openness	The Chinn and Ito (2006) index for the openness in capital accounts transactions.	Chinn and Ito (2006).
PPP Exchange Rate	Price level ratio of PPP conversion factor (GDP) to market exchange rate.	World Bank, International Comparison Program database.
Trade Openness	Total exports and imports as a % of GDP.	World Bank/OECD National Accounts.
Corporate Income Tax	The percentage rate of corporate income tax officially reported to the IMF.	International Monetary Fund, Fiscal Affairs Department database.
Personal Income Tax	The percentage rate of personal income tax reported to the IMF.	International Monetary Fund, Fiscal Affairs Department database.
Value Added Tax	Tax rate on goods and services (% value added of industry and services) reported to the IMF.	International Monetary Fund, Fiscal Affairs Department database.
GDP Deflator	Annual growth rate of the GDP implicit deflator.	World Bank/OECD National Accounts.

18-year period from 1996 to 2013, and a truncated time horizon of a 13-year period from 2001 to 2013. The justification for this truncation is two-fold: First, the vast majority of MICs joined the ITR club at the beginning of 21st century. Second, during the 1990s, a number of financial crises must have had some impact on the FDI inflows to some of our

sample countries. So the time stratification enables us to check for any bias stemming from the impact of these crises.[56]

An important feature of these crises was that they were specific to a country or a region, as opposed to a global crisis, such as the financial crisis of 2009, which was not specific to a certain country or a region, but it engulfed the entire world.

2.6.2 Methodology: This study employs the treatment-effects matching estimation. We use various categories of two matching estimators: the propensity-score matching (PSM) and the nearest-neighbour matching (NNM). For the PSM, we use both the 'single match' and the 'multiple matches' and for the NNM we apply a 'narrow' radius and a 'wide' radius.[57] Finally, we test the robustness of these estimators by applying a large sample bias correction estimation and a regression adjustment through inverse-probability weighting (IPW).

Moreover, two additional robustness checks are also performed: First, the sample-related robustness checks are performed, such as the exclusion of outlier observations, using an alternative specification of inflation, and truncating the sample's time horizon to account for abnormal shocks. Second, and more importantly, the data-related and the methodology-related robustness checks are performed, such as the post-estimation tests. In this vein, we test for the unobserved heterogeneity using the Rosenbaum sensitivity analysis tests and

[56] Three of these crises are the Mexican financial crisis of 1994 ('Tequila crisis'), the Asian financial crisis in 1997-98 ('Asian flu') and the Russian financial crisis in 1998 ('Russian virus').

[57] PSM and NNM are two measurement methods that check for identical or near-identical observations: the PSM estimates predict the probability of a country adopting ITR given its covariates (propensity score), while the NNM estimates the distance among two near-identical observations. For more on this, see Rosenbaum (2002).

we check for the satisfaction of the two key assumptions: the overlap assumption and the common support assumption. The results for all the tests are given in Appendix 'B'.

2.7 Results

In the following, we analyze our empirical results for our inclusive sample, as well as for the clustered samples, the OECD and the MICs samples, separately.[58]

2.7.1 The Grand Sample

The results in Table 2.2 for the grand sample paint an encouraging picture for the IT-adoption. The coefficients for the inclusive sample (the first row) are all significant at the 90% confidence level. IT-adoption appears to have helped the adopters increase the FDI inflows by about two to three percentage points as compared to the non-adopters. These results remain about the same when we drop the outlier observations where the CPI inflation is higher than 100%, 50% and 25%. However, the coefficients for the truncated sample – rows 5 to 8 – show even a better performance: the IT-adoption has helped the adopting countries increase the FDI inflows by about 3 ½ percentage points more than their counterparts, the non-adopting countries.

The results imply that the inflation-targeting adoption helps the adopting countries attract more FDI, because as claimed by the IT-proponents that inflation targeting mitigates uncertainty and enhances macroeconomic stability, thus creating an environment that is conducive to FDI. But without further investigation, these results may be misleading because the sample has both high-income and middle-income countries grouped together. Given that our country sample includes the OECD countries – that are mainly high-income

[58] As for the likelihood of IT adoption results based on a probit model, see appendix, tables 6.1, 6.2 and 6.3.

countries – and the middle-income countries (MICs), we therefore cluster our grand sample into two subsamples: the OECD and the MICs.

Table 2.2 The Treatment Effects (ATET) on FDI Inflows for the Grand Sample

	Propensity Score Matching (PSM)		Nearest Neighbor Matching (NNM)		Regression Adjustment	
Model ↓ Estimator →	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Sample Bias Adj.	Reg. Adjustment
Inclusive Sample	.0294* (.0157)	.0286* (.0156)	.0253* (.0157)	.0244 (.0157)	.0268* (.0158)	.0275* (.0160)
Dropping CPI > 100 %	.0294* (.0157)	.0286* (.0156)	.0260* (.0158)	.0245 (.0157)	.0261* (.0158)	.0275* (.0160)
Dropping CPI > 50 %	.0274* (.0158)	.0274* (.0158)	.0264* (.0157)	.0250 (.0157)	.0270* (.0157)	.0275* (.0160)
Dropping CPI > 25 %	.0269* (.0159)	.0273* (.0157)	.0264* (.0158)	.0250 (.0157)	.0262* (.0158)	.0275* (.0160)
Truncated Sample	.0345* (.0188)	.0296* (.0174)	.0316* (.0171)	.0297* (.0171)	.0314* (.0171)	.0339** (.0176)
Dropping CPI > 100 %	.0345* (.0188)	.0296* (.0174)	.0316* (.0171)	.0297* (.0171)	.0314* (.0171)	.0339** (.0176)
Dropping CPI > 50 %	.0351* (.0186)	.0319* (.0174)	.0313* (.0171)	.0291* (.0171)	.0307* (.0172)	.0342** (.0176)
Dropping CPI > 25 %	.0352** (.0186)	.0299* (.0175)	.0313* (.0171)	.0295* (.0171)	.0307* (.0172)	.0343** (.0176)

The Coefficients are for FDI Inflows (Outcome Dependent Variable). The Independent Variables are CPI inflation, Output Growth, Financial Openness, Trade, PPP Exchange Rate, CIT, PIT, VAT and an index for the Overall Institutional Quality. Treatment Variable is Inflation Targeting Regime (ITR) Dummy.

Note: The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. Also note that the 'Inclusive Sample' covers 18 years from 1996-2013 while the 'Truncated Sample' covers 13 years from 2001-2013.

2.7.2 The OECD Sample: Table 2.3 below presents the treatment effects of IT-adoption on attracting FDI inflows for our OECD sample.

All the coefficients are positive and a vast majority of them are significant, implying that the OECD countries that adopted ITR have outperformed their counterparts in attracting FDI over the sample period: an increase in the FDI inflows by 3 ½ to 4 ½ percentage points more compared to the non-IT OECD countries during the same time period.

Table 2.3 The Treatment Effects (ATET) on FDI Inflows for the OECD Sample

	Propensity Score Matching (PSM)		Nearest Neighbor Matching (NNM)		Regression Adjustment	
Model ↓ Estimator →	Single Match	Multi Matches	Narrow Radius	Wide Radius	Sample Bias Adj.	Reg. Adjustment
Inclusive Sample	.0350* (.0212)	.0346* (.0211)	.0358* (.0209)	.0350* (.0207)	.0376* (.0212)	.0479* (.0253)
No CPI > 100 %	.0350* (.0212)	.0346* (.0211)	.0358* (.0209)	.0350* (.0207)	.0376* (.0212)	.0479* (.0253)
No CPI > 50 %	.0354* (.0212)	.0347* (.0211)	.0363* (.0208)	.0318 (.0209)	.0377* (.0211)	.0479* (.0253)
No MICs Members	.0301 (.0241)	.0319 (.0241)	.0381 (.0242)	.0393* (.0242)	.0403* (.0245)	.0534** (.0276)
Truncated Sample	.0415* (.0251)	.0334 (.0248)	.0448* (.0239)	.0398* (.0239)	.0344 (.0240)	.0609** (.0291)
No CPI > 100 %	.0415* (.0251)	.0334 (.0248)	.0448* (.0239)	.0398* (.0239)	.0344 (.0240)	.0609** (.0291)
No CPI > 50 %	.0375 (.0252)	.0339 (.0249)	.0445* (.0239)	.0402* (.0239)	.0277 (.0240)	.0609** (.0291)
No MICs Members	.0205 (.0293)	.0293 (.0288)	.0476* (.0287)	.0474* (.0287)	.0363 (.0288)	.0646** (.0323)

The Coefficients are for FDI Inflows (Outcome Dependent Variable). Independent variables are CPI inflation, Output Growth, Financial Openness, PPP Exchange Rate, Trade, Labor Force, CIT, PIT, VAT and Average Quality (an index for Institutional Quality). Treatment Variable is Inflation Targeting (ITR) Dummy.

Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The 'Inclusive Sample' covers 18 years (1996-2013) and the 'Truncated Sample' covers 13 years (2001-2013).

2.7.3 The MICs Sample: Table 2.4 below presents the treatment effects of IT-adoption among MICs on attracting FDI. One clear contrast seen here is the negative sign attached to all the coefficients across the various estimators as opposed to what we observed earlier in Table 6.2. In the inclusive sample (rows 1 to 4), we notice that IT-adoption has had an adverse impact on the FDI inflows among the MICs: the FDI inflows have decreased by about 2 to 3 percentage points among the IT-adopting MICs compared to the non-adopting MICs. This adverse effect is consistent across different model specifications though losing statistical significance at times.

Table 2.4 The Treatment Effects (ATET) on FDI Inflows for the MIC Sample

	Propensity Score Matching (PSM)		Nearest Neighbor Matching (NNM)		Regression Adjustment	
Model ↓ Estimator →	Single Match	Multi Matches	Narrow Radius	Wide Radius	Sample Bias Adj.	Reg. Adjustment
Inclusive Sample	-.0278** (.0132)	-.0180* (.0102)	-.0232* (.0135)	-.0239**(.0114)	-.0233** (.0118)	-.0152*(.0090)
No CPI > 100 %	-.0278** (.0132)	-.0180* (.0102)	-.0214 (.0156)	-.0267**(.0124)	-.0236* (.0127)	-.0189** (.0094)
No CPI > 50 %	-.0200* (.0117)	-.0145 (.0103)	-.0252* (.0153)	-.0290**(.0125)	-.0318***(.0126)	-.0183**(.0092)
No OECD Members	-.0073 (.0095)	-.0098 (.0083)	-.0236 (.0162)	-.0257* (.0141)	-.0450***(.0142)	-.0080 (.0074)
Truncated Sample	-.0319* (.0184)	-.0153 (.0111)	-.0057 (.0141)	-.0085 (.0096)	-.0161* (.0096)	-.0103 (.0090)
No CPI > 100 %	-.0319* (.0184)	-.0153 (.0111)	-.0057 (.0141)	-.0085 (.0096)	-.0161* (.0096)	-.0103 (.0090)
No CPI > 50 %	-.0335** (.0171)	-.0147 (.0097)	-.0041 (.0140)	-.0068 (.0098)	-.0148 (.0098)	-.0094 (.0089)
No OECD Members	-.0021 (.0079)	-.0052 (.0074)	-.0068 (.0102)	-.0033 (.0097)	-.0223** (.0107)	-.0058 (.0064)

The Coefficients are for FDI Inflows (Outcome Dependent Variable). Independent variables are CPI inflation, Output Growth, Financial Openness, PPP Exchange Rate, Trade, Labor Force, CIT, VAT and Average Quality (an index for Institutional Quality). Treatment Variable is Inflation Targeting Regime (ITR) Dummy.

Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. Note that 'Inclusive Sample' covers 18 years (1996-2013) while 'Truncated Sample' covers 13 years (2001-2013).

2.7.4 Robustness Checks: The results presented in the previous two subsections seem robust to various model specifications as well as the exclusion of outlier observations. However, we have performed some additional robustness checks as follows:

First, we employ the GDP deflator as an alternative to the CPI inflation as recommended by the IMF.[59] The results are presented in Tables 2.5 and 2.6. The results for the treatment effects of ITR adoption on attracting the FDI inflows – when the GDP deflator

[59] CPI measures the cost of a standard basket of consumer goods and services, including the imported goods and services. Whereas, GDP deflator measures the price level of all the final goods and services produced domestically.
See Schaechter et al. (2000) and for further details on this.

Table 2.5 Robust Treatment Effects (ATET) on FDI Inflows for the MICs Sample

	Propensity Score Matching (PSM)		Nearest Neighbor Matching (NNM)		Regression Adjustment	
Model ↓ Estimator →	Single Match	Multi Matches	Narrow Radius	Wide Radius	Sample Bias Adj.	Reg. Adjustment
Inclusive Sample	-.0049 (.0068)	-.0066 (.0078)	-.0246* (.0138)	-.0249** (.0114)	-.0242** (.0117)	-.0151* (.0090)
No Deflator > 50 %	-.0006 (.0061)	-.0011 (.0056)	-.0220 (.0151)	-.0260** (.0122)	-.0237** (.0123)	-.0182** (.0094)
No OECD Members	-.0121 (.0124)	-.0102 (.0099)	-.0238 (.0161)	-.0250* (.0141)	-.0323** (.0142)	-.0079 (.0075)
Truncated Sample	-.0149 (.0108)	-.0093 (.0093)	-.0054 (.0142)	-.0053 (.0096)	-.0122 (.0097)	-.0085 (.0089)
No OECD Members	-.0149 (.0108)	-.0126 (.0105)	-.0054 (.0142)	-.0053 (.0096)	-.0122 (.0097)	-.0085 (.0089)
The Coefficients are for FDI Inflows (Outcome Dep. Variable). The Independent Variables are GDP Deflator, Output Growth, Financial Openness, PPP Exchange Rate, Unemployment, Trade, Labor Force, CIT, VAT and Average Quality (an index for the Overall Institutional Quality). Treatment Variable is Inflation Targeting (ITR) Dummy.						
The asterisks next to the coefficients (*, **, ***) represent the significance levels: 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The 'Inclusive Sample' covers 18 years (1996-2013) and 'Truncated Sample' covers 13 years (2001-2013).						

Table 2.6 Robust Treatment Effects (ATET) on FDI Inflows for the OECD Sample

	Propensity Score Matching (PSM)		Nearest Neighbor Matching (NNM)		Regression Adjustment	
Model ↓ Estimator →	Single Match	Multi Matches	Narrow Radius	Wide Radius	Sample Bias Adj.	Reg. Adjustment
Inclusive Sample	.0205 (.0211)	.0225 (.0207)	.0260 (.0214)	.0244 (.0214)	.0281 (.0214)	.0318 (.0211)
No Deflator > 50 %	.0155 (.0212)	.0215 (.0208)	.0250 (.0214)	.0211 (.0215)	.0258 (.0215)	.0319 (.0212)
No MICs Members	.0288 (.0245)	.0341 (.0242)	.0342 (.0244)	.0355 (.0243)	.0346 (.0244)	.0396* (.0247)
Truncated Sample	.0331 (.0271)	.0331 (.0268)	.0403* (.0244)	.0372 (.0246)	.0260 (.0245)	.0464* (.0257)
No MICs Members	.0215 (.0296)	.0273 (.0292)	.0463 (.0289)	.0463* (.0287)	.0334 (.0286)	.0602** (.0298)
The Coefficients are for FDI Inflows (Outcome Dependent Variable). Independent Variables are GDP Deflator, Output Growth, Financial Openness, PPP Exchange Rate, Unemployment, Trade Openness, Labor Force, CIT, PIT, VAT and Ave. Quality (an index for Institutional Quality). Treatment Variable is Inflation Targeting (ITR) Dummy.						
Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. Note that 'Inclusive Sample' covers 18 years (1996-2013) and 'Truncated Sample' covers 13 years (2001-2013).						

is considered as a measurement for inflation – paint an interesting picture: despite the vast majority of the coefficients lacking statistical significance, the signs and magnitudes of these coefficients exactly resemble those in Tables 2.3 and 2.4.

Second, we drop the two outlier countries, China and India, from our control group, and find that the results are unaffected by their exclusion.

Our findings therefore seem to be robust to using GDP deflator as an alternative to CPI inflation, as well as to excluding China and India from the control group.

Third, we check whether our samples satisfy the following two key assumptions:

(*i*) The conditional independence assumption (CIA), also known as un-confoundedness assumption or selection on observables, which states that once we control for all the variables in our covariate matrix for sample countries, the potential outcome, for both the treated and the non-treated, becomes independent of whether a country adopted ITR or not.

Formally this can be written as: $(Y^1, Y^0) \perp T \mid X$

(*ii*) The overlap assumption, also known as the common support assumption: this assumption requires that our covariate matrix contains observations that can be matched with a strictly positive probability in both the treated and control groups.

Formally this can be written as: $0 < \text{prob.}\ (T=1 \mid X) < 1.$

Appendix 'B' displays the figures that show the satisfaction of these assumptions in both of our sub-samples, the OECD sample and the MICs sample.

Finally, we verify that our results are not sensitive to the unobserved heterogeneity due to the fact that countries in our sample do exhibit heterogeneity. To do so, we utilize the Rosenbaum Bounds sensitivity test developed by Rosenbaum (2002). Table 2.7 below presents the results for the Rosenbaum sensitivity tests showing the upper and lower

bounds which are all significant at 5% and 10% confidence intervals. Note that the 'gamma' here represents a threshold for the outcome being affected by the unobserved heterogeneous factors in the sample. In other words, when gamma is 3, the odds ratios of the results being affected by the hidden bias due to heterogeneity are 1 to 3 (200% more). In social sciences, a value of 2 for the 'gamma' is reasonable, implying a doubling of the odds; however, we have applied a value of 3 for 'gamma'.

There is no hidden bias due to the unobserved heterogeneous factors in our samples.[60]

Table 2.7 Sensitivity Tests for the Unobserved Factors in the Two Samples

Rosenbaum Bounds for FDI for the Various Matches

Sample Bounds → ↓	gamma*	Upper Bound Significance Level (sig+)	Lower Bound Significance Level (sig-)	Upper Bound Point Estimate (t-hat+)*	Lower Bound Point Estimate (t-hat+)*	Upper Bound Confidence Interval (CI+)	Lower Bound Confidence Interval (CI-)
The OECD Sample Inclusive (1996-2013)	1	0	0	.03	.03	.027	.033
(598 Matched Pairs)	3	0	0	.017	.0535	.015	.0595
The OECD Sample Truncated (2001-2013)	1	0	0	.03	.03	.027	.034
(439 Matched Pairs)	3	0	0	.0165	.0555	.014	.0645
The MICs Sample Inclusive (1996-2013)	1	0	0	.035	.035	.033	.037
(1060 Matched Pairs)	3	0	0	.022	.0535	.0205	.057
The MICs Sample Truncated (2001-2013)	1	0	0	.0345	.0345	.0325	.037
(766 Matched Pairs)	3	0	0	.022	.0535	.02	.0575

*gamma - log odds of differential assignment due to unobserved factors
sig+ - upper bound significance level
sig- - lower bound significance level
t-hat+ - upper bound Hodges-Lehmann point estimate
t-hat- - lower bound Hodges-Lehmann point estimate
CI+ - upper bound confidence interval (a = .95)
CI- - lower bound confidence interval (a = .95)

[60] See Rosenbaum (2002) for a detailed analysis of these sensitivity tests.

2.8 Concluding Remarks

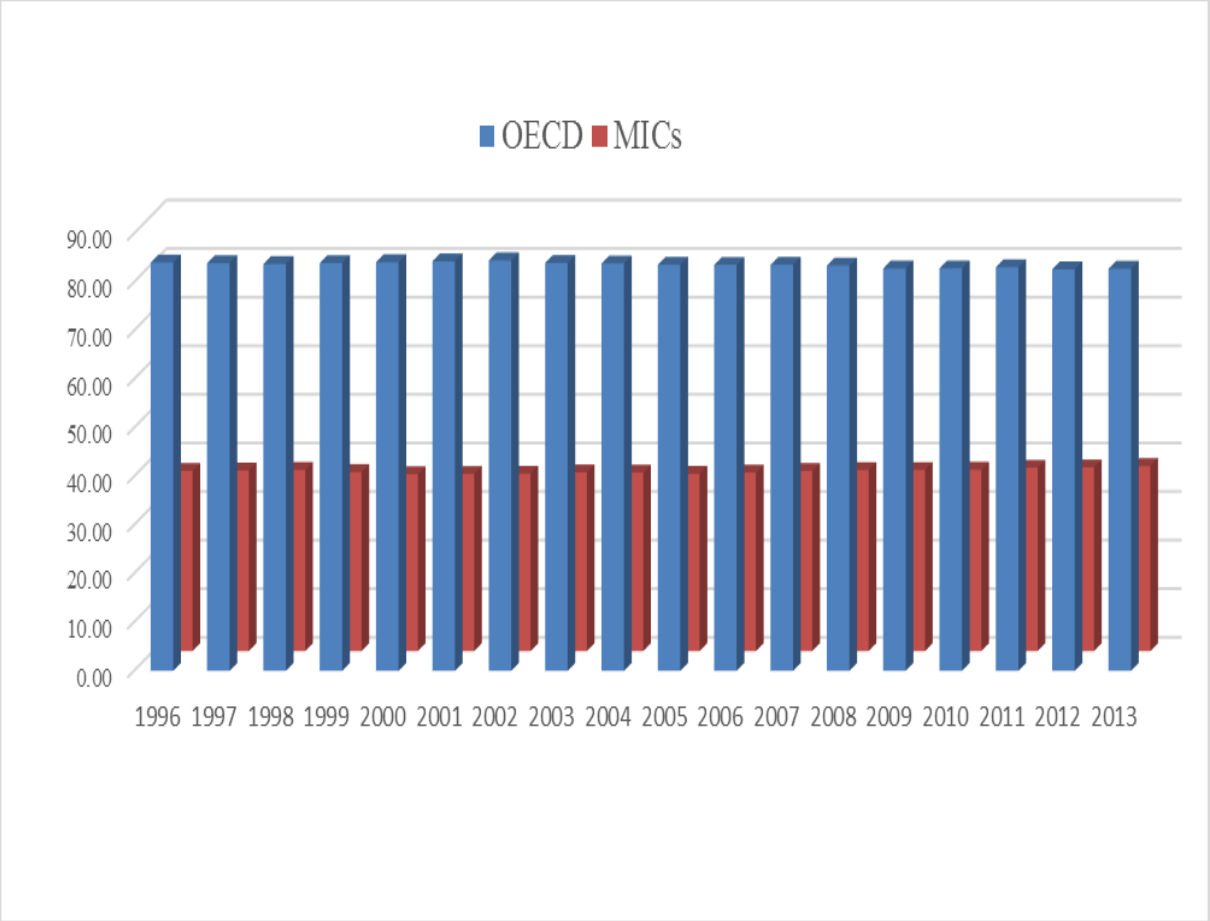
The beneficial role of foreign investment for development and growth has been recognized by many in the literature. It has also been acknowledged that foreign investment, particularly FDI is attracted to countries with better governance, greater macroeconomic stability and the least uncertainty. Monetary economists who favor inflation targeting, as a policy framework, believe that what attracts FDI – namely good governance, lower uncertainty and greater macroeconomic stability – can be achieved by adopting inflation targeting. Hence, one can conjecture that the IT-adopting countries should be the most successful in attracting FDI. Indeed, the initial look at a broader sample confirms that IT-adoption has helped the adopting countries increase the FDI inflows by about 3 percentage points as compared to the non-IT adopters. However, a closer look reveals these findings to be misleading when we cluster our sample into two by separating high-income countries from the middle-income countries. Surprisingly, the results for our clustered samples exhibit a contradicting pattern. Among the high-income countries, the results are in favor of the IT-adoption: the IT-adopting OECD countries have enjoyed a significant increase in the FDI inflows by about 3 ½ to 4 ½ percentage points compared to the non-IT OECD countries. Whereas, among the middle-income countries, the results paint a grim picture of the IT-adoption: the MICs that adopted inflation targeting have suffered a significant reduction in the FDI inflows by about 2 to 3 percentage points as compared to the non-IT adopting MICs. One suspect behind the contradictory outcomes of the same policy regime may be the fact that the MICs simply do not have the quality institutional settings needed to successfully implement inflation targeting, which might have helped their richer

counterparts, the OECD group, in reaping the benefits of inflation targeting. Figure 2.1 lends support to this suspicion.

However, given that the results are obtained from panel regressions – which are known for imperfections – caution must prevail when interpreting these results. Perhaps, a case-study approach to further verify our findings should enable us to have a clear verdict on the effectiveness of inflation targeting in attracting or distracting FDI.

Nevertheless, the results do vindicate the stance of those who negate the '*one-size-fits-all*' approach, and advocate for the provision of good quality institutions prior to IT-adoption.

Figure 2.1 The Average Institutional Quality (The Mean Average of the Six WGIs)



Appendix B

Table 2.8 The Grand Sample – Propensity Scores

The Dependent Variable is a Dummy of Inflation Targeting Regime (ITR), the Binary Treatment Variable.					
Control Variables	Baseline Model	Add Six Indctors.	Drop CPI > 50%	Drop CPI > 25%	Truncated Sample
Lagged CPI Inflation	-2.691***(0.784)	-3.378***(0.933)	-2.312***(0.897)	-0.968 (1.119)	-2.505**(1.067)
FDI (%GDP)	1.251** (0.603)	1.308** (0.645)	1.233** (0.602)	1.186**(0.604)	1.501**(0.661)
Output Growth	-1.732 (1.247)	-1.024 (1.374)	-1.785 (1.258)	-1.798 (1.272)	-0.998 (1.352)
Work Force (15-64)	5.206***(1.179)	6.772***(1.506)	5.188***(1.177)	5.268***(1.182)	3.097**(1.327)
Trade Openness (%)	-1.213***(0.141)	-1.098***(0.157)	-1.210***(0.141)	-1.203***(0.141)	-1.331***(0.155)
Financial Openness	-0.079 (0.157)	-0.604***(0.196)	-0.070 (0.156)	-.057 (0.157)	-.197 (0.175)
Exchange Rate/PPP	-0.921***(0.229)	-0.892***(0.258)	-0.911***(0.229)	-0.862***(0.231)	-1.273***(0.261)
CIT Rate	-1.100 (0.708)	-0.879 (0.793)	-1.128 (0.710)	-1.085 (0.710)	-1.099 (0.833)
PIT Rate	-1.388***(0.439)	-2.179***(0.509)	-1.320***(0.442)	-1.228***(0.444)	-1.162** (0.499)
VAT Rate	-0.137 (0.831)	0.546 (0.917)	-0.175 (0.832)	-0.231 (0.832)	0.248 (0.948)
Institutional Quality	2.237***(0.361)	-	2.240***(0.360)	2.215***(0.360)	2.949***(0.431)
Govt. Effectiveness	-	2.892***(0.874)	-	-	-
Corruption	-	-0.266 (0.758)	-	-	-
Political Stability	-	-2.474***(0.317)	-	-	-
Regulatory Quality	-	5.517***(0.829)	-	-	-
Rule of Law	-	-3.484***(0.753)	-	-	-
Voice/Accountability	-	2.048***(0.500)	-	-	-
Pseudo R^2	15%	30%	14%	13%	14%
LR (Prob > χ^2)	228.63***	454.01***	211.60***	195.31***	174.80***
Observations	1252	1252	1229	1200	955
The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively. Figures in parenthesis listed under the coefficients are Robust Standard Errors.					

Table 2.9 The OECD Sample – Propensity Scores

The Dependent Variable is a Dummy of Inflation Targeting Regime (ITR), the Binary Treatment Variable.					
Control Variables	Baseline Model	Add Six Indctors.	Drop CPI > 25%	Drop MICs	Truncated Sample
Lagged CPI Inflation	-4.747***(1.504)	-5.022***(1.564)	-0.886 (2.425)	-0.475 (3.064)	-8.967** (4.302)
FDI (%GDP)	2.319***(0.868)	2.116** (0.911)	2.168** (0.864)	2.141** (1.016)	2.433***(0.942)
Output Growth	1.414 (2.107)	0.370 (2.172)	1.947 (2.135)	4.574* (2.450)	5.328** (2.536)
Work Force (15-64)	-4.929 (3.129)	0.674 (3.933)	-5.054* (3.147)	-4.866 (3.492)	-12.495***(4.12)
Trade Openness (%)	-1.252***(0.245)	-1.462***(0.276)	-1.270***(0.246)	-1.534***(0.278)	-1.457***(0.293)
Financial Openness	-1.223***(0.312)	-1.669***(0.361)	-1.039***(0.319)	-1.502***(0.350)	-1.980***(0.458)
Exchange Rate/PPP	-1.132***(0.317)	-1.376***(0.357)	-1.036***(0.322)	-0.868***(0.339)	-1.467***(0.406)
CIT Rate	-1.387 (1.021)	-1.160 (1.132)	-1.509 (1.026)	-0.858 (1.093)	-1.203 (1.343)
PIT Rate	-3.319***(0.656)	-3.953***(0.711)	-3.212***(0.657)	-2.901***(0.731)	-3.578***(0.787)
VAT Rate	0.064 (1.175)	1.775 (1.319)	-0.280 (1.183)	-0.900 (1.234)	0.234 (1.413)
Institutional Quality	1.302** (0.663)	-	1.211* (0.667)	2.365***(0.832)	2.607***(0.876)
Govt. Effectiveness	-	4.880** (2.201)	-	-	-
Corruption	-	-3.285* (1.955)	-	-	-
Political Stability	-	-1.842***(0.488)	-	-	-
Regulatory Quality	-	4.357***(1.537)	-	-	-
Rule of Law	-	0.909 (1.660)	-	-	-
Voice/Accountability	-	0.257 (1.466)	-	-	-
Pseudo R^2	16.7%	22.6%	16.2%	19.1%	26.1%
LR (Prob > χ^2)	121.89***	165.13***	117.19***	124.28***	150.76***
Observations	542	542	534	491	421

The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively.

Figures in parenthesis listed next to the coefficients are Robust Standard Errors.

Table 2.10 The MICs Sample – Propensity Scores

The Dependent Variable is a Dummy of Inflation Targeting Regime (ITR), the Binary Treatment Variable.					
Control Variables	Baseline Model	Add Six Indctors.	Drop CPI > 25%	Drop OECD	Truncated Sample
Lagged CPI Inflation	-4.225***(1.305)	-4.990***(1.534)	-3.490**(1.547)	-4.887***(1.813)	-4.522**(1.921)
FDI (%GDP)	-0.821 (1.125)	-0.796 (1.361)	-1.034 (1.138)	-1.182 (1.209)	-0.941 (1.291)
Output Growth	-6.807***(1.925)	-5.523***(2.171)	-7.308***(2.004)	-6.444***(2.146)	-8.133***(2.235)
Work Force (15-64)	8.095***(1.608)	11.182***(2.261)	8.230***(1.608)	9.038***(1.700)	5.422***(1.732)
Trade Openness (%)	-1.130***(0.232)	-0.744***(0.277)	-1.112***(0.232)	-1.447***(0.261)	-1.298***(0.262)
Financial Openness	0.818***(0.223)	0.526* (0.286)	0.841***(0.224)	0.641***(0.231)	0.731***(0.246)
Exchange Rate/PPP	2.109***(0.564)	1.876***(0.673)	2.073***(0.562)	0.886 (0.611)	1.293** (0.606)
CIT Rate	1.439 (1.231)	2.088 (1.491)	1.453 (1.237)	1.871 (1.367)	0.383 (1.402)
PIT Rate	0.803 (0.782)	1.319 (1.013)	1.086 (0.806)	-0.096 (0.931)	1.774** (0.918)
VAT Rate	-2.204 (1.539)	1.144 (1.936)	-2.137 (1.544)	-4.962*** (1.752)	-2.821 (1.783)
Institutional Quality	2.627***(0.608)	-	2.572***(0.605)	2.387***(0.666)	3.953***(0.726)
Govt. Effectiveness	-	2.021* (1.144)	-	-	-
Corruption	-	-1.015 (0.972)	-	-	-
Political Stability	-	-3.727***(0.598)	-	-	-
Regulatory Quality	-	5.829***(1.179)	-	-	-
Rule of Law	-	-3.066***(1.076)	-	-	-
Voice/Accountability	-	3.152***(0.664)	-	-	-
Pseudo R^2	29.2%	47.3%	27.3%	23.2%	28.0%
LR (Prob > χ^2)	220.33***	356.68***	199.44***	143.26***	174.89***
Observations	708	708	664	620	516

The asterisks next to the coefficients (*, **, ***) represent their significance levels of 10%, 5%, and 1% respectively.

Figures in parenthesis listed under the coefficients are Robust Standard Errors.

Table 2.11 The List of the Grand Sample (90) Countries

The Treatment (IT) Group		**The Control (Non-IT) Group**			
Albania	New Zealand	Algeria	Egypt	Luxembourg	Spain
Armenia	Norway	Angola	El Salvador	Macedonia	Sri Lanka
Australia	Peru	Argentina	Estonia	Malaysia	Switzerland
Brazil	Philippines	Austria	Finland	Mauritania	Tunisia
Canada	Poland	Azerbaijan	France	Mongolia	Turkmenistan
Chile	Romania	Belarus	Georgia	Morocco	Ukraine
Colombia	Serbia	Belgium	Germany	Netherlands	Uzbekistan
Czech Rep	South Africa	Bolivia	Greece	Nicaragua	Vietnam
Ghana	Sweden	Bulgaria	Honduras	Nigeria	Zambia
Guatemala	Thailand	Cameroon	India	Pakistan	
Hungary	Turkey	China	Ireland	Panama	
Iceland	UK	Congo Rep	Italy	P. N. Guinea	
Indonesia	United States	Costa Rica	Japan	Paraguay	
Israel		Cote d'Ivoire	Jordan	Portugal	
South Korea		Denmark	Kazakhstan	Senegal	
Mexico		Dom. Rep.	Kyrgz Rep	Slovak Rep	
Moldova		Ecuador	Lao PDR	Slovenia	

Sources: Gamayel et al. (2011), Hammond (2012), the OECD and the World Bank.

Figure 2.2 Common Support for the MICs Sample

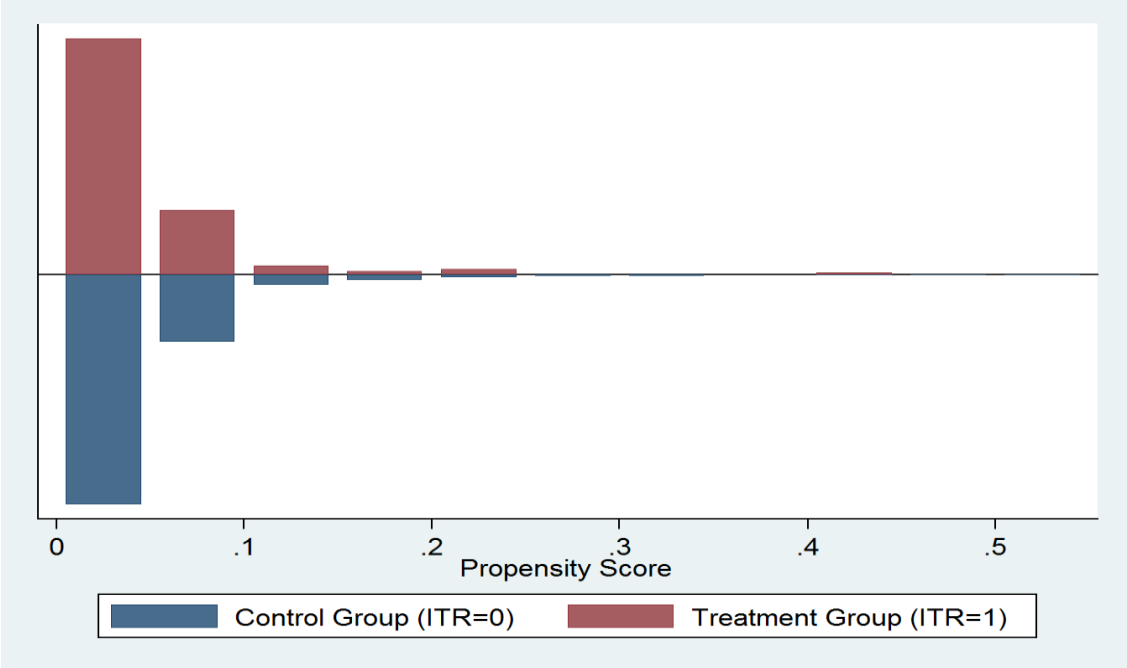


Figure 2.3 Common Support for the OECD Sample

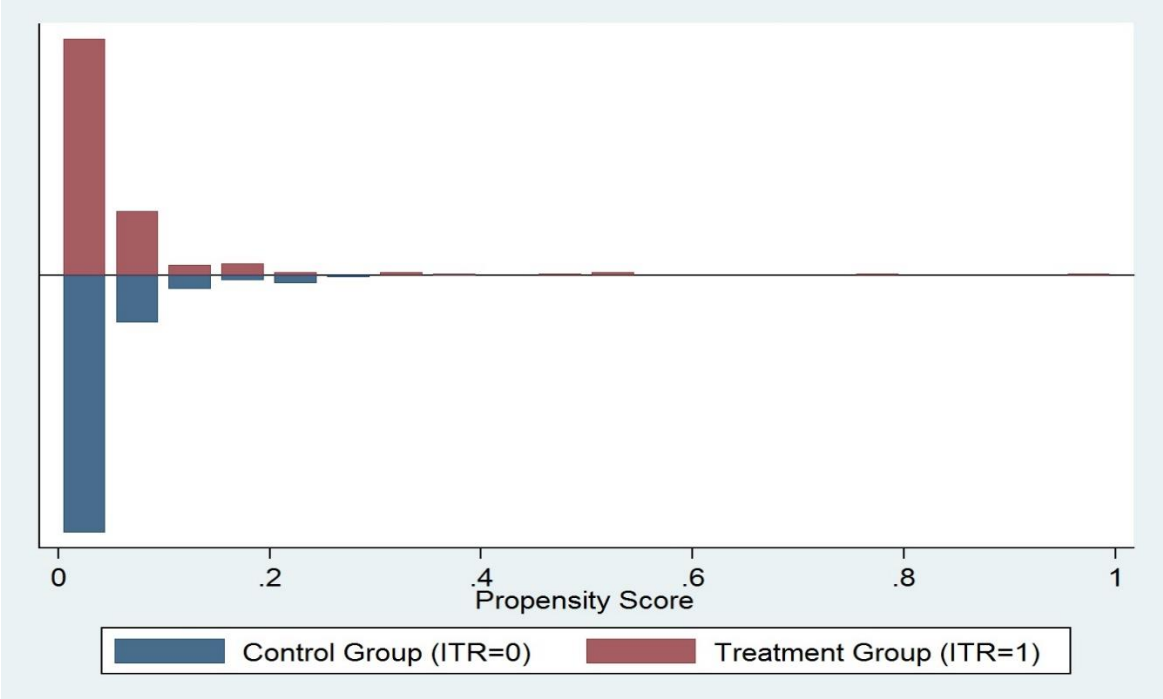


Figure 2.4 Overlap Plot for the MICs Sample

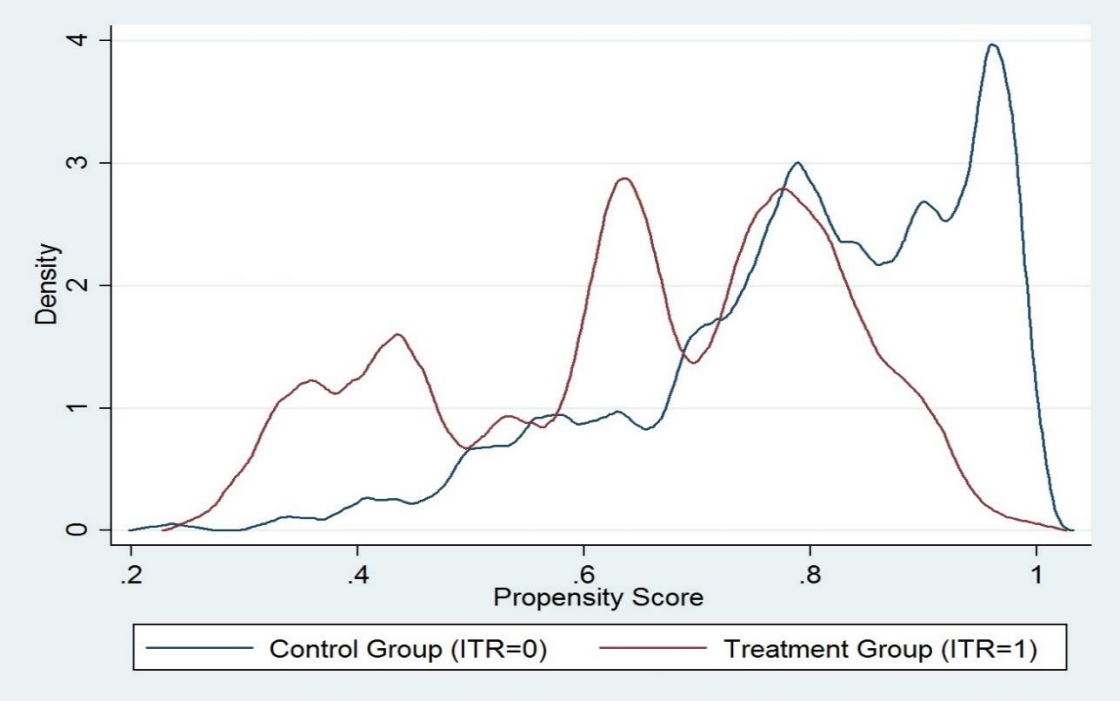
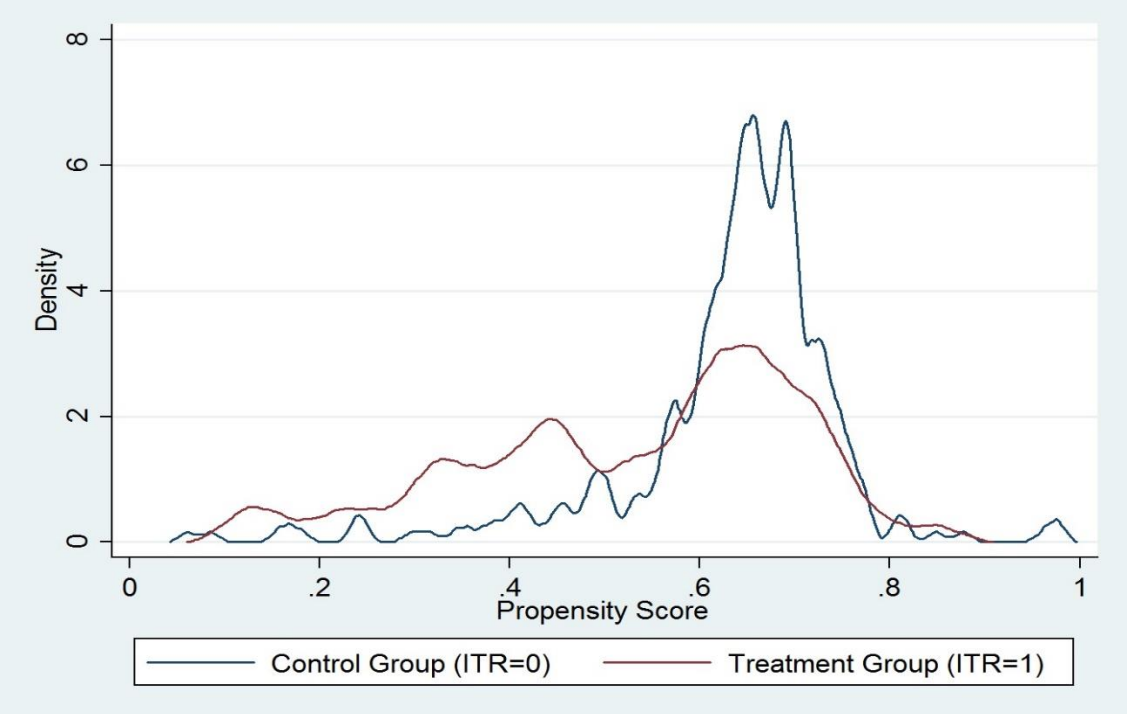


Figure 2.5 Overlap Plot for the OECD Sample



Essay 3

Does Inflation Targeting Promote Economic Growth?

3.1 Introduction

'*Economic theory and evidence both support the idea that low and stable inflation promotes economic growth and efficiency in the long run……Thus inflation targeting, perhaps together with other fiscal and structural reforms, can help create an environment in which the economy can prosper*,' (Bernanke et al., 1999, pp.297-298).

It has been almost three decades since inflation targeting (IT), as a monetary-policy framework, was first adopted by the Reserve Bank of New Zealand in 1989. Ever since many other countries – both advanced and not-so-advanced – have followed New Zealand in adopting IT. The US was the latest and the 30th country to join the IT-member club in 2012.[61]

Inflation targeting can be defined as a monetary policy regime that candidly commits itself to a low and stable inflation rate, as its primary policy objective, in the medium-to-long run, by amalgamating the monetary policy rule and the policy-makers' discretion.[62]

Much has been researched and documented about inflation targeting over the past two decades or so. There has been some criticism, but IT has mainly garnered praise from academia and policymakers alike. A common theme, or claim, that stands out throughout the literature is that inflation targeting promotes economic efficiency and growth by

[61] For a complete list of these thirty countries, refer to Table 6.1 in section 6.
[62] Bernanke et al. (1999) call IT a '*constrained discretion*'.

stabilizing inflation and locking-in inflation expectations.[63] Numerous studies have been carried out to assess the macroeconomic performance of inflation targeting, and this assessment often suffices to studying either the dynamics of inflation or the costs attached to reducing inflation, the so-called sacrifice ratios. No doubt that the inflation-targeting regime has been a successful story in combating inflation and volatility. The question, however, arises as to whether the scope of IT is limited to fighting inflation and its volatility only. Should countries be persuaded to adopt IT simply because it can help them fight inflation? In fact, the literature cautions against using IT as a disinflationary tool.[64] Accordingly, IT has much more to offer than simply combating inflation. After all, many countries have successfully contained inflation without adopting IT.[65] The main argument in favor of the IT-adoption rests on the claim that inflation targeting promotes economic efficiency, by achieving and then safeguarding macroeconomic stability, which is necessary for long-term economic and employment growth. This argument, although it might appear to be intuitively appealing to a majority of economists, has not been backed by much concrete empirical evidence thus far. As mentioned above, in order to gauge IT's performance as a monetary policy framework, most of the empirical literature only looks at inflation and its volatility. Some authors go a bit farther and compute the expected costs – also referred to as sacrifice ratios – attached to taming the inflation. However, there seems to be a wide gap in the IT literature when it comes to verify its core claim, which states that inflation targeting promotes economic efficiency. There is no assessment of what happens to the main macroeconomic indicators, such as economic growth and unemployment, in

[63] See Svensson (1997), Bernanke et al. (1999) and Mishkin (2011).
[64] See Bernanke et al. (1999).
[65] See Ball and Sheridan (2003).

the medium-to-long run after a country opts for the IT adoption. Are the IT- adopting countries better-off, the same, or worse-off when compared to the non-IT adopters in terms of output growth and job creation?

As for measuring the so-called sacrifice ratios of disinflation, a possible objection can be raised against using sacrifice ratios as a performance gauge for inflation targeting: [66] One cannot judge IT's success or failure by simply looking at these sacrifice ratios, particularly since the 1970s and 1980s were marred with persistently higher rates of inflation, and most of the early IT adopters were experiencing high inflation rates, so the sacrifice ratios computed from the data samples during these two decades should not translate in success or failure of inflation targeting . More importantly, as we will see in the following pages, the methodology of computing these ratios has come under some serious criticism.

The literature on inflation and growth shows that low and stable inflation rates over the long run are considered to be conducive to economic and employment growth. Hence, it seems that an appropriate way to gauge the success of inflation targeting, which claims to stabilize inflation, would be to compare the performance of two macroeconomic variables, growth and employment, between the adopters and the non-adopters over the past two and a half decades of IT's appearance. Indeed, this is precisely the objective of our study: We want to check whether there is any empirical evidence supporting the claim that inflation targeting promotes efficiency. This is done by comparing output growth and unemployment rates among the IT adopters and the non-IT adopters.

[66] For example, Ball (1994) and Bernanke et al. (1999) compute the sacrifice ratios for the early IT adopters.

The rest of the paper is organized as follows: Section 2 presents a brief review of the anti-inflation or the inflation-averse attitude. Section 3 summarizes the formal work on inflation targeting that highlights the connection between inflation expectations and macroeconomic stability. Section 4 reviews the literature in three different segments: first, the link between an independent central bank and macroeconomic stability; second, monetary policy design under inflation targeting and its impact on macroeconomic stability; third, the impact of monetary policy on economic and employment growth. Section 5 summarizes the costs associated with disinflation, and a brief discussion of the so-called sacrifice ratios. Section 6 presents and explains the sample and methodology. Section 7 offers the empirical results and analysis. Section 8 concludes the study.

3.2 The Inflation-Averse Attitude

The aversion to inflation is not specific to the monetary-policy framework of IT. In fact, long before the birth of IT, some of the most illustrious economists were already advocating macroeconomic policies that could tame both the level and the volatility of inflation, since inflation volatility is often said to be the real culprit behind the uncertainty that causes macroeconomic instability.

Almost a century ago, Knut Wicksell proposed a monetary framework that was similar to the present-day inflation-targeting regime, '*So long as prices remain unaltered the banks' rate of interest is to remain unaltered. If prices rise, the rate of interest is to be raised; and if prices fall, the rate of interest is to be lowered; and the rate of interest is henceforth to*

be maintained at its new level until a further movement of prices calls for a further change in one direction or the other,' (Wicksell 1898, p. 189).[67]

John Maynard Keynes specified the inflation expectations as the real culprit that shrouds the uncertainty in a macro-economy, '*For it is not the fact of a given rise of prices, but the expectation of a rise compounded of the various possible price movements and the estimated probability of each, which affects money rates,*' (Keynes,1924, pp.21-22).

Friedrich Hayek also highlighted the role of inflation expectations in creating problems for central bankers: '*Monetary policy is then faced with an unpleasant dilemma. In order to maintain the degree of activity it created by mild inflation, it will have to accelerate the rate of inflation, and will have to do so again and again at an ever increasing rate every time the prevailing rate of inflation comes to be expected,'* (Hayek, 1976, p.97).[68]

Later, monetary economists, such as Miguel Sidrauski, also held inflation expectations responsible for causing a great deal of uncertainty in the economy, '*The increase in the rate of inflation, in turn, raises the rate of change in the expected rate. The increase in the rate of change in the expected rate further increases the actual rate, and the possibility of having a self-generating acceleration in the rate of inflation is not at all remote*,' (Sidrauski, 1967, p.805).

Thomas Sargent in his influential studies of the hyperinflation episodes during the 1920s in Europe also laments the role of inflation expectations in acting as 'fuelling the fire'.[69]

Robert Barro advocates a strong anti-inflationary monetary policy, and suggests that a high degree of inflation variance is always accompanied by higher rates of inflation, hence

[67] For more on the Wicksellian theory and the modern central banking, see Secceraccia (1998).
[68] For more on Hayek's view on central banking, see Ferris and Galbraith (2006).
[69] Sargent (1982)

arguing that it is more efficient to focus on the inflation variance to tame a persistent inflation.[70]

In addition to the academia, monetary policymakers were also wary of inflation and its expectations long before the revelation of inflation-targeting regimes. For example, the former Chair of the US Federal Reserve, Paul Volcker, has advocated an anti-inflationary monetary policy that not only reduces the current rate of inflation but also tames inflation expectations, saying that: '*Inflation feeds in part on itself, so part of the job of returning to a more stable and more productive economy must be to break the grip of inflationary expectations.'* [71]

The above statements are just a small sample of similar statements that could be found throughout the literature. They clearly exhibit the belief of macroeconomists and policymakers in the paramount role that inflation, its volatility and its expectations play in achieving macroeconomic stability, which is a necessary condition for a prosperous economy.

3.3 The Theory of Inflation Targeting

In light of the previous section's recommendations coming from the best-known members of the economics discipline, the formal work on IT has maintained that anchoring (or locking-in) inflation expectations was the best thing that monetary policy could do to help stabilize inflation and its volatility over the medium to long run.[72]

[70] Barro (1996)

[71] In a statement before the Joint Economic Committee of the U.S. Congress on October 17, 1979.

[72] See for example, Svensson (1997), who uses the term 'inflation forecast targeting' because, in his view, policymakers do not have control over inflation; instead they try to influence the inflation expectations of agents.

When reviewing the formal work on IT, it seems obvious that the key objective of an inflation-targeting regime is to lock-in inflation expectations. We briefly discuss here the objective function of an IT-central bank and the optimal monetary policy under an IT-mandate, as presented in detail by Clark et al. (1999), and by Orphanides and Williams (2005). For simplicity, we analyze the model with the perfect information assumption. Thus, inflation can be thought of as being determined by the following Lucas-type supply function (an augmented Phillips curve), which also considers agents' expectations about the inflation based on the previous period.

$$\pi_{t+1} = \alpha E(\pi_{t+1}) + (1 - \alpha)\pi_t + \beta y_{t+1} + \varepsilon_{t+1} \quad (1)$$

where π_{t+1} is the inflation rate, $E(\pi_{t+1})$ represents the agents' inflation expectations, y_{t+1} is the output gap, the deviation of the real GDP from its potential, $(Y - Y^P)$, and ε_{t+1} is the error term. The parameter α can take any value between [0, 1], and $\beta > 0$. The output gap, y_{t+1}, is determined by the following aggregate demand curve that has a policy effect, x_t, (after one lag).

$$y_{t+1} = x_t + \eta_{t+1} \quad (2)$$

$$x_t = -\gamma (r_t - r^N) \quad (3)$$

where x_t is the current gap between the short term real interest rate, r_t, and the natural interest rate, r^N, and parameter γ is the policy choice parameter. However, as mentioned earlier, the monetary policy under an IT-mandate regards inflation expectations as the main source of uncertainty. Therefore, an IT-central bank considers the variance between the current and the target rate of inflation as the gauge that determines its optimal response. As

a result, equation (3) can be modified, and rewritten in terms of the variance of the current inflation and its target rate:

$x_t = -\gamma\,(\pi_t - \pi^T)$ (4)

where x_t can be thought of as the monetary policy rule under an inflation-targeting mandate.[73]

Given these settings, the objective function of an IT-central bank is to minimize the loss:

$L = (1-\lambda)Var\,(y_t) + \lambda\, Var\,(\pi_t - \pi^T)$ (5)

The parameter λ can take any value between [0, 1], and *Var* (…) is the unconditional variance.

The solution to this model is the following optimal monetary policy, denoted by γ^{OMP}, assuming that the central bank is an explicit inflation targeter that cares only about the inflation volatility (the policy parameter λ takes the value of 1), and ignores the volatility of the output gap.[74]

$\gamma^{OMP} = (1-\alpha)/\beta$ (5)

The optimal reaction function of an IT-central bank in equation (5) clearly states that the response is positively related to the ratio $(1-\alpha)/\beta$, and this response is greater in the case of a persistent departure of the actual inflation rate from its target rate, thus '*justifying a strong interest in price stability*' in the words of Barro (1996, p.7).

3.4 The Macroeconomic Effects of Monetary Policy

According to the IT literature, the macroeconomic effects of monetary policy can be traced to a single channel: the inflation expectations. The decisions of households and firms are

[73] Orphanides and Williams (2005, pp.206).
[74] A general solution to this type of model is basically the variance that can be traded-off among the inflation and the output gap, depending on the policymaker's preferences; see Orphanides and Williams (2005).

greatly influenced by the inflation expectations, which are in turn a function of both the level and the variability of the present and the past inflation. In this context, macroeconomic stability depends solely on inflation expectations. In what follows, we discuss how the inflation-targeting regime empowers a central bank in designing a policy that will manipulate inflation expectations and bring about macroeconomic stability, thus providing a fertile ground for the economy to grow and flourish.

3.4.1. An Independent Central Bank and Macroeconomic Stability: '*Indeed, the evidence is that economies with independent central banks enjoy lower rates of inflation than other countries, with no higher volatility in employment and output,*' Bernanke et al. (1999, p.312).

A central feature of the monetary-policy framework under inflation targeting is central bank independence. In fact, a key requirement for any central bank prior to IT adoption is that it must be granted autonomy so that it can design and implement its goals and instruments free from any political influence or interference. The literature is filled with studies on the significant impact of central bank independence for macroeconomic stability. For example, Rogoff (1985) builds a theoretical model, as an extension of the earlier formal work, on central bank independence. The aim of his theoretical work is to find the optimal degree of commitment that can be placed on a monetary target, such as the money supply, real interest rates or the trade-off between the variance of inflation and output growth. His findings reveal that policymakers who are inflation-averse tend to discard the variance of output growth and unemployment. This is because they believe that price stability is the catalyst to macroeconomic stability, which ultimately leads to growth and employment; so any loss in the output or employment as a result of the strict adherence

to contractionary monetary policy will be recovered once the economy rebounds. Similarly, Alesina and Summers (1993) also study the central bank independence and its impact on macroeconomic performance. They state several reasons for which they expect central bank independence to improve the overall macroeconomic performance: a central bank that is not influenced by politicians can set goals and objectives in the best interest of the economy, and this in turn alleviates uncertainty, which translates into more economic stability and less risk for investors. In their view, policymakers seem to agree that inflation and its volatility cause distortions, rent-seeking behavior and higher risk premiums, which all together hinder the performance of an economy. Therefore, if policymakers are allowed to apply their discretionary powers, regardless of any political opposition, then they would try to mitigate these adverse effects in order to improve economic performance.

In addition, on the empirical front, Alesina and Summers (1993) also compare the performance of a rule-based versus a discretion-based monetary policy, by examining the dynamics of inflation. They find that there exists a significant negative relationship between central bank independence and the dynamics of inflation. They also find that the monetary policy designed by a non-politically-influenced central bank can tame inflation more efficiently than a monetary-rule based and politically-influenced central bank. Given their findings, they conclude that the payoff stemming from central bank independence in the form of lower rates of inflation and lower inflation volatility is far greater than the anticipated loss in output, which in their view is non-existent. A key recommendation of their paper, for the countries that struggle in taming the inflation, is to adopt discretion-based monetary policies by letting their central banks free from any political influence, and by avoiding the strict rule-based monetary policies.

Another study by Debelle and Fischer (1994) also examines the impact of central bank independence on inflation and its volatility, as well as output growth and its volatility. Their findings suggest that central bank independence appears to be a *free lunch* for two reasons: First, the central bank independence helps in winning the battle over inflation by taming both inflation and its volatility. Second, this fight against inflation, in the presence of central bank independence, does not come at the cost of output loss or of increased output volatility. Down (2004), however, disagrees with the notion of central bank independence being a *free lunch*. He contends that the assumption that the central bank's autonomy bears no costs is a flawed assumption, particularly when an autonomous central bank implements a costly contractionary monetary policy just to curb inflation. The costs associated with a disinflationary policy under an independent central bank are much higher as compared to a politically-influenced central bank, because the latter takes into account the sensitivity of the disinflation costs.

3.4.2 Monetary Policy Design and Macroeconomic Stability: *'The ultimate objective of Canadian monetary policy is to promote good overall economic performance. Monetary policy can contribute to this goal by preserving confidence in the value of money through price stability. In other words, price stability is a means to an end, not an end in itself,'* (Bank of Canada, 1995, p.3).

An independent central bank can design its monetary policy in a way that the inflation expectations of households and firms are anchored around a specific target. By announcing a target rate of inflation, an inflation-targeting central bank basically offers an open and transparent commitment, and can be held accountable in the case of reneging. This commitment can have a significant impact on anchoring inflation expectations. For

instance, Levin et al. (2004) investigate the role of an inflation-targeting regime in anchoring inflation expectations as well as stabilizing output volatility. Their sample consists of 12 advanced economies and 13 emerging economies. Among the advanced economies, the five IT-adopters – Australia, Canada, New Zealand, Sweden and the UK – outperform their counterparts in the sense that inflation expectations are anchored, i.e., there is no correlation between the inflation forecasts and lagged inflation. As for the emerging economies, they find that the adoption of IT has helped in bringing down inflation and its volatility, although, expectations do not seem to be anchored in those economies. In the same way, Orphanides and Williams (2005) show formally that the strict adherence to an explicit inflation target can lead the economy to perform superbly, thus stabilizing the two most important macroeconomic indicators: inflation and output. They argue that the strict inflation-targeting regime can break up persistency in both inflation and its volatile variance from the target, which in turn safeguards against '*costly stagflationary episodes*' in the future. Another attribute that Orphanides and Williams (2005) commend the IT adoption for is the transparent communication of an explicit numerical inflation target, which clearly conveys to the public what is the ultimate inflation objective of the policymakers. Their theoretical findings point to a greater impact of policymakers' communication and vigilance in locking-in inflation expectations and stabilizing the overall macro-economy.

One can deduce from the above analyses that an IT-central bank would have the ability to combat inflation and its volatility more efficiently compared to the non-IT-central banks. According to the literature on inflation targeting, the central bank independence,

transparency, clearly committed and announced goals and objectives, and accountability to the public are all hallmarks of the inflation-targeting regime.

3.4.3 Monetary Policy and Growth: '*A priority for low long-run inflation derives not so much from a belief in its intrinsic value relative to other goals such as full employment and economic growth, but from theory and evidence suggesting that monetary policy encourages employment and growth in the long run mostly by controlling inflation*,' Goodfriend (2005, p. 323).

There are different accounts of an aggressive monetary policy that seeks price stability, and the overall impact of such policy on growth and employment.

For example, Alesina and Summers (1993) study the relationship between inflation and output growth. Although they find a significant negative relationship between these two variables, they caution that if monetary policy puts too much emphasis on price stability as its main objective, in the form of low inflation rates and a low variance of inflation, it can only achieve its objective by diminishing output growth and exacerbating unemployment.

Barro (1996) also finds a significant negative relationship between inflation and output growth, and shows that an expansionary monetary policy that induces an increase of 1% in the inflation rate can cause a reduction of 0.4% to 0.7% in real GDP over the long run. He throws his support behind a strong policy stance on fighting inflation and its volatility, in order to mitigate their dire impact on output growth in the long run.[75]

Moreover, Dollar and Kraay (2002) present evidence on how monetary policy can induce growth by showing that macroeconomic stability breeds price level stability, while this

[75] Barro (1996) actually mentions that a 10% increase in the inflation rate causes a reduction of 4 to 7% in real GDP.

stability in turn spurs per-capita income growth by providing a healthy environment and opportunities for low-to-middle income families to enhance their output and income. They suggest a strong positive relationship between tight monetary policy and growth, as well as employment. In the same way, Loayza et al. (2002) study growth and its determinants in Latin America and Caribbean. They proxy macroeconomic stability by two variables, the variance of inflation and that of output. Their findings suggest that macroeconomic instability in the form of higher rates of inflation and a volatile output have adverse effects on economic growth.

Finally, Lopez (2005) highlights the important role that monetary policy can play in contributing towards the economic welfare of a society. First, stability brought about by monetary policy is the key determinant of economic growth. Although stability alone cannot guarantee the provision of a superior growth performance, however, the opposite of it, instability, for sure does erect a barrier to any prospects of economic growth. Lopez (2005) gives two examples of how the absence of macroeconomic stability can become detrimental to economic growth: Bolivia suffered an uncertain and volatile price level, an average rate of 100% annual inflation, during the first half of the 1980s, which coincided with a drastically negative 4.3% rate of annual growth on average. Likewise, Zambia experienced an average rate of inflation above 100% annually during the first half of the 1990s, which hammered its annual growth rate to the negative territory of 3.5%. These two examples show the devastating effect of macroeconomic instability and uncertainty on economic welfare. Second, and perhaps more importantly, macroeconomic policy is the main driving force behind the income distribution in any given economy. Lopez (2005) goes on to state that inflation is thought to have an adverse impact on income distribution

by distorting the purchasing power of the low-to-middle income households. A macroeconomic policy in the form of inflation targeting for example can produce the desired welfare outcomes by stabilizing and safeguarding the households' purchasing power, according to Lopez (2005).

3.5 The Cost of Disinflation

This section discusses the costs attached to both inflation and reducing it, or disinflation. There are numerous studies that analyze the costs attached to inflation. Briault (1995) presents a comprehensive survey of these studies on both the costs of inflation and the costs of taming it (disinflation). In addition to the normal costs, such as menu costs and shoe-leather costs, Briault divides the literature into two types. First, there are studies that have developed models on expected (anticipated) inflation. In these models, inflation is shown to act as a tax on currency balances that results in a welfare loss. Second, there are studies that have developed models based on unexpected inflation. The costs attached to unexpected inflation are shown to be the redistribution costs, decision-taking costs, the impact on the relative price movements, etc.

As for the costs of disinflation, the experience of the 1970s and 1980s suggests that price level stability commands sacrifice in the form of a loss in output and employment. This trade-off between inflation and output, and between inflation and employment, is called the *sacrifice ratio*.

3.5.1 Sacrifice Ratios: Gordon and King (1982, p. 206) define the sacrifice ratio as a measurement of '*the output loss required to eliminate permanently one point of inflation*.' Ball (1993, p.18) interprets the sacrifice ratio as, '*the total output losses during disinflation, measured as a percent of a year's output, to the decrease in inflation*.' He considers this

ratio, between the loss in annual GDP and the corresponding reduction of inflation, as the price of reducing inflation by one percentage point. A more precise definition of the sacrifice ratios is given by Bernanke et al. (1999, p. 254) as the '*measures of the loss of output or employment that an economy must sustain in order to achieve a reduction in inflation.*' Finally, an inclusive definition is given by Down (2004, p. 401) who states that '*the sacrifice ratio is the cost, in terms of either output or unemployment, of a point reduction in inflation. It thus measures the relative cost of a reduction in inflation: the higher the ratio, the greater the relative cost*.'

Okun (1977) was perhaps the first study to investigate what later became known as the sacrifice ratio, that, the trade-off between inflation and output or the sacrifice that an economy would have to make in order to curb inflation. His findings, which were based on surveys of the US economy, suggest unbelievably high sacrifice ratios: a total loss of almost 10% of the gross national product (GNP) in the US against a permanent reduction of 1% in the rate of inflation. Okun's findings were subjected to sharp criticisms, and were dubbed as *pessimistic* by academia and policymakers alike, and the subsequent empirical studies refuted Okun's findings. Among them are three influential studies: Gordon and King (1982) who use a vector autoregressive (VAR) approach to measure the sacrifice ratio for the post-war data of the US national accounts over the period 1947-81. They find that the sacrifice ratio for the US is about half of what Okun (1977) proposed.

Sargent (1982) is the second study that examines the European hyperinflation episodes of the 1920s, and the macroeconomic policies that brought down those hyperinflations, in four countries: Austria, Germany, Hungary and Poland. His comparison of the output growth between the pre and the post era of the hyperinflation episodes in all four countries

reveals that the output losses arising from a reduction in inflation were minor as compared to the Okun's findings.

The third seminal work in this vein is by Romer and Romer (1989). They study a series of episodes of the post-war monetary disturbances in the US. These episodes reveal that the US Federal Reserve, in its fight against a persistent inflation, '*deliberately'* followed very strict contractionary monetary policies that resulted in recessions. Each one of these deliberate recession-inducing policies created a sharp decline in US industrial output, which fell by 12% on average while the unemployment shot up by 2% on average. These negative effects started to arise immediately, but their severity appeared with a lag, taking about 7 to 8 quarters to reach their maximum value. Moreover, they also find that the impact of these negative effects was persistent, and the economy showed little signs of recovery or rebound towards the pre-shock levels, in contrast to what is usually claimed in the literature.

Later studies, such as Ball (1994), Bernanke et al. (1999) and Down (2004) have applied more sophisticated techniques in computing the sacrifice ratios, which are discussed in the following.

3.5.2 Computing the Sacrifice Ratios: Ball (1994) is widely regarded as the best account of the sacrifice ratio thus far. He first determines the trend inflation for every country in his data sample as the moving average inflation rate taken from nine quarters. He chooses the quarter as peak and trough where the inflation rate has been the highest or the lowest in both the preceding as well as the following four quarters. He then considers the fall of inflation from the peak towards the trough as one episode of disinflation, provided the fall

in inflation from peak to trough is at least 2 percentage points. The next step is to estimate the drop in the output due to the disinflation. A key assumption of Ball's analysis is that the output is considered to be at its trend level both before and after the trough of a particular episode. Finally, he computes the sacrifice ratio by dividing the difference between the trend and the real level of output over the change in the average rate of inflation for that particular episode. Mathematically,

$$SR = \Delta Y / \Delta \pi \qquad (6)$$

$$SR = \Sigma (y_t - y_t^T) / (\pi_t - \pi_{t-1}) \qquad (7)$$

Many studies have adopted Ball's approach in computing sacrifice ratios over the past two decades. However, Down (2004) has levelled some serious criticism at his approach, stating that there is clearly a selection bias, since Ball considers the successful episodes of disinflation only, thus ignoring episodes where monetary policy failed in reducing the inflation rate or failed to achieve a reduction of 2% and more.

In addition, according to Alesina (1987), some important factors behind the dynamics of inflation and disinflation are the institutional setup and the political environment; omitting these factors may contaminate the empirical results.

3.6 Empirics

As the objective of this study is to compare the economic efficiency of the inflation-targeting regime, we are going to match one set of countries (the IT-adopters) to another set of countries (the non-IT adopters), and find out which group outperforms the other in output growth and the long-term unemployment. A positive and significant coefficient of our inflation-targeting dummy for the output growth will mean that the IT-adopters have

outperformed their counterparts. Whereas, a negative and significant coefficient of our IT dummy for the long-term unemployment will signal a better performance of the IT-adopters over their counterparts in lowering the unemployment rate.

3.6.1 Data: The main reference for constructing our sample is Barro (1996) who includes 100 countries in his sample. Our sample differs from Barro's in two respects: First, since the objective of this empirical exercise is to draw a comparison between the IT adopters versus the non-IT-adopters, we will have to include all the 30 countries that have adopted inflation targeting. Second, because none of the IT-adopters is a low-income country, we delete from Barro's sample the countries that are classified by the World Bank as low-income countries. In addition, to enhance the quality of our sample, we also drop countries that have too many missing observations or that are classified as small states (SST) or fragile and conflict-affected states (FCS). Thus, we are left with 68 countries. Table 6.1 below presents all the countries in our sample, along with the income-based classification of each country and whether it is an IT or a non-IT country. Because the IT-club includes both high and middle-income countries, we had no choice but to include in our control group both high and middle-income countries as well. Among the 68 countries, we have 29 high-income countries (HICs) and the remaining 39 are middle-income countries (MICs), which further diverge into two group: 17 are upper while 22 are lower middle income countries.[76] Nonetheless, we do cluster this sample in two subsamples, high and middle-income countries, and verify whether the signs of the coefficients differ across the two clusters from the sample. The time period of our analysis spans over 25 years (1990

[76] To check whether our empirical findings are robust to this heterogeneity, we subject our sample to the sensitivity test proposed by Rosenbaum (2002), and the results are presented in Table 7.1.

to 2014), the approximate age of inflation targeting, and provides ample time to evaluate the performance of IT.

Table 3.1 The Sample Countries with their Income-Based Classification

The Treatment (IT) Group (30 Countries)				**The Control (Non-IT) Group (38 Countries)**					
Country	Class	Country	Class	Country	Class	Country	Class	Country	Class
Albania	U-MIC	Moldova	L-MIC	Algeria	U-MIC	Germany	HIC	S. Arabia	HIC
Armenia	L-MIC	N. Zealand	HIC	Austria	HIC	Greece	HIC	Senegal	L-MIC
Australia	HIC	Norway	HIC	Belgium	HIC	Honduras	L-MIC	Singapore	HIC
Brazil	U-MIC	Peru	U-MIC	Bolivia	L-MIC	India	L-MIC	Sri Lanka	L-MIC
Canada	HIC	Philippines	L-MIC	Botswana	U-MIC	Ireland	HIC	Switzerland	HIC
Chile	HIC	Poland	HIC	Bulgaria	U-MIC	Italy	HIC	Tunisia	U-MIC
Colombia	U-MIC	Romania	U-MIC	Cameroon	L-MIC	Japan	HIC	Uruguay	HIC
Czech R.	HIC	Serbia	U-MIC	China	U-MIC	Malaysia	U-MIC	Vietnam	L-MIC
Ghana	L-MIC	S. Africa	U-MIC	Congo Rep.	L-MIC	Morocco	L-MIC		
Guatemala	L-MIC	S. Korea	HIC	Costa Rica	L-MIC	Netherlands	HIC		
Hungary	U-MIC	Sweden	HIC	C. d'Ivoire	L-MIC	Nigeria	L-MIC		
Iceland	HIC	Thailand	U-MIC	Denmark	HIC	Pakistan	L-MIC		
Indonesia	L-MIC	Turkey	U-MIC	Ecuador	U-MIC	Paraguay	U-MIC		
Israel	HIC	UK	HIC	Egypt	L-MIC	Portugal	HIC		
Mexico	U-MIC	USA	HIC	France	HIC	Russia	HIC		

*U-MIC indicates the upper middle-income country, L-MIC indicates the lower-middle-income country, and HIC indicates the high-income country.

Sources: Gamayel et al. (2011), Hammond (2012) and the World Bank (2015).

Table 3.2 The Variables with the Definitions

Variable	Description	Source
Inflation Targeting Regime (ITR)	Binary variable used as a dummy for inflation targeting, equals 1 for the years when a country has had ITR in place, and 0 otherwise.	Gemayel et al. (2011), Roger (2009) and the websites of various central banks and the IMF.
Output Growth	Annual percentage change in the rate of aggregate gross domestic product (GDP) at market prices based on constant 2005 U.S. dollars.	The World Bank and the OECD National Accounts Data files, downloaded from the website of the World Bank (WB).
Log of GDP	Natural log of GDP at market prices based on constant 2005 U.S. dollars.	Same as above.
Investment (% of GDP)	Gross Domestic Investment or Capital Formation, a ratio of GDP that consists of outlays on additions to the economy's fixed assets.	Same as above.
Savings (% of GDP)	Gross Savings are calculated as gross national income less total consumption, plus net transfers.	Same as above.
Trade (% of GDP)	The sum of total exports and imports (of both goods and services) as a ratio of GDP.	Same as above.
Government Size	Government final consumption including current expenditures for purchases of goods and services (including compensation of employees).	Same as above.
GDP Deflator	Annual growth rate of the GDP implicit deflator, which is another measurement of the rate of price change in the economy as a whole, in current local currency to GDP in constant local currency.	Same as above.
CPI Inflation	Annual percentage change in the consumer price index (using the Laspeyres method).	The World Development Indicators (WDIs) of the World Bank.
Long -Term Unemployment	Long-term employment is a percentage of the total unemployed with continuous periods of unemployment extending for a year or longer.	International Labor Organization, Key Indicators of the Labor Market database, downloaded from the WB WDIs.
Population Growth (annual%)	Annual population growth rate based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.	United Nations Population Division, downloaded from the website of the World Bank (WB).
ICRG	International country risk guide is an index of political risk developed by Howell (2001).	The PRS Group, Inc., downloaded from the website: www.prsgroup.com

3.6.2 The Determinants of Growth: The economic growth literature is enormously rich where countless authors have contributed to the formal and empirical aspects of growth. As Barro and Sala-i-Martin (2004) admit, given a large number of growth theories, there is also a large variety of proposed determinants of growth. Hence, it becomes almost an impossible task to decide on a unique set of explanatory variables to be included in growth regressions. They summarize their findings from the survey of a number of growth theories as follows. Growth is positively related to per capita GDP, the investment to GDP ratio, trade openness and rule of law; while it is negatively related to the government consumption to GDP ratio and the rate of inflation. Note that the same variables have been already used by Barro (1996) as explanatory variables in his seminal work on growth and inflation. As a result, we take Barro (1996) as a reference point for the explanatory (control) variables in our empirical model. We do, however, omit a few qualitative variables from his list, such as male schooling, female schooling, fertility rate, life expectancy, black-market premium, a democracy index and a Latin American dummy. The rationale for this omission is evident from the above mentioned summary of Barro and Sala-i-Martin (2004), who argue that these variables play no or little role. Additionally, there seems to be a consensus in the literature in considering per capita GDP as an inclusive proxy for the variables that we have omitted from Barro's list.[77] Instead, we add the IT dummy, and we replaced his rule-of-law index with the international country risk guide (ICRG) index. More importantly, we also employ two of the prominent variables in Solow's growth model, namely population and saving, as in Mankiw et al. (1992). However, both of these Solow variables either leave the results unchanged, or end up contaminating the

[77] See for example, De Mendonça and De Guimarães e Souza (2012).

significance of Barro's variables in our study. Hence, we drop these two variables from our growth regressions. We do use them subsequently for the unemployment regressions, as will be discussed later. Table 3.2 above provides a list of the variables used, with their definition and their source.

3.6.3 The Determinants of Unemployment: The literature on labor economics provides an extensive insight into the determinants of unemployment, but the discussion mainly evolves around the narrow definition of unemployment, such as cyclical, frictional, and structural unemployment, so that the emphasis is usually drawn from the microeconomic aspects of unemployment. By contrast, the macroeconomic aspect of unemployment is often linked to a broad definition of unemployment, such as the long-term unemployment or the natural rate of unemployment, the so-called NAIRU. Ours is the macroeconomic context, so we employ the macro-determinants of unemployment, such as growth, inflation, saving and population growth, as done by the majority of researchers in this field. [78]

3.6.4 Methodology: In order to match the performance of two different groups, the most appropriate econometric methodology seems to be the one that utilizes matching estimators. We use the propensity score matching technique developed by Rosenbaum and Rubin (1983). Vega and Winkelried (2005) were the first one to use this methodology in the monetary-economics literature.

Before embarking on estimation, we need to check the compatibility of our dataset to satisfy the two necessary assumptions for such an analysis:[79]

[78] See Bassinini and Duval (2006) and Dogan (2012) for a rich survey of the determinants of unemployment for advanced as well as developing and emerging countries.

[79] Rosenbaum and Rubin (1983) call treatment assignment 'strongly ignorable' if these assumptions are satisfied.

(*i*) The first assumption is the conditional independence assumption (CIA), which is sometimes referred to as the *un-confoundedness* assumption and *selection-on-observables*. Under the CIA, the potential outcome is independent of whether a country adopted ITR or not, provided that we control for all the relevant variables in our covariate matrix for both the treated and the control groups. Mathematically, the CIA assumption is written as,

$$(Y^1, Y^0) \perp T \mid X$$

(*ii*) The second assumption is the common support assumption. In order for us to match two units, the covariate matrix must contain observations that can be matched with a strictly positive probability in both the treated and control groups. Mathematically:

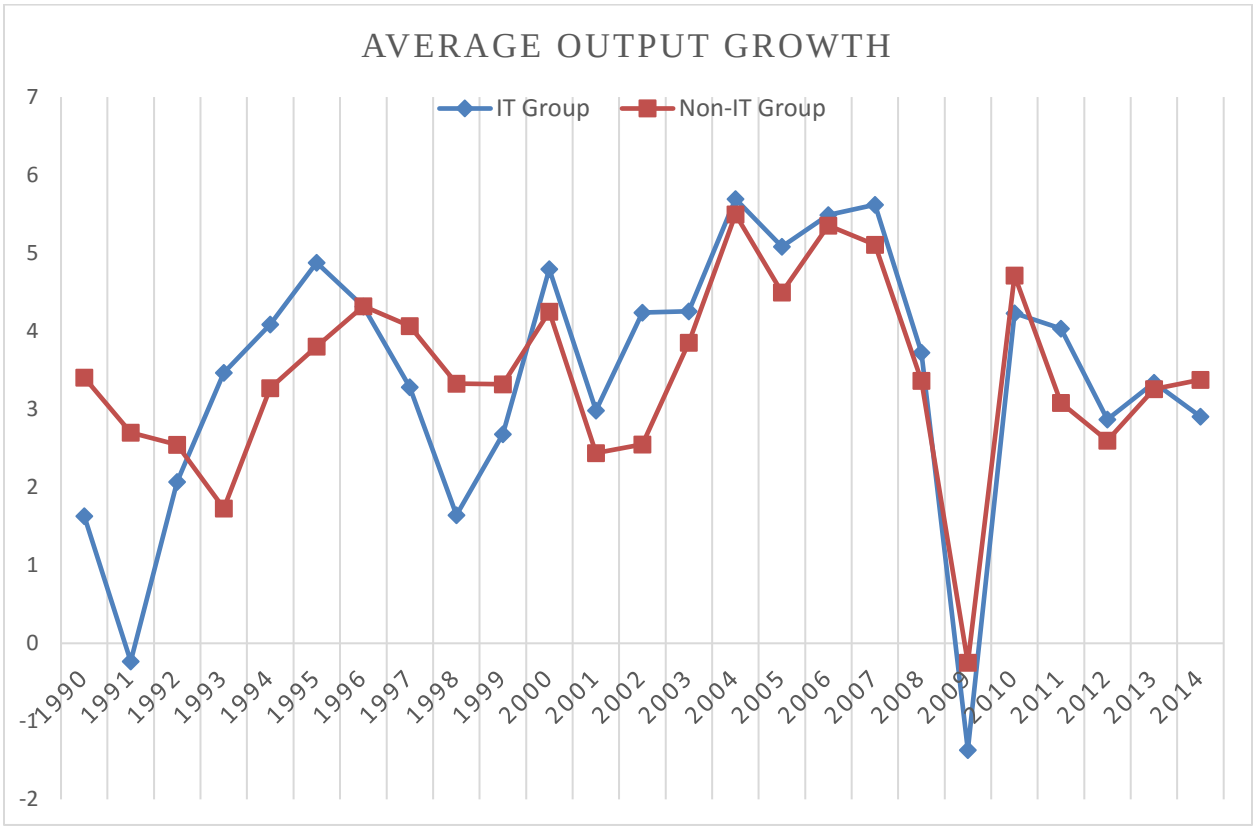
$$0 < \text{prob.}\ (T=1 \mid X) < 1.$$

As for the estimator, there is a variety of estimators proposed by the literature on treatment-effects methodology. We employ the nearest-neighbour matching (NNM) estimator along with the regression adjustment techniques. These estimators match the performance of the outcome variable among the two groups, the treated and the control group, via assigning propensity score to each covariate observation in the treatment group, and matching it with another observation having a similar or near-similar propensity score from the control group. The NNM estimator measures the distance between two near-identical observations (there are several options to choose from for this distance). For the identification strategy, four criteria have been applied. First, matching is based on a single match or multiple matches; second, matching based on different measure of the radius, a narrow and a wide radius; third, a bias correction adjustment restriction is imposed to adjust for any bias in the NNM estimator due to a large sample; fourth, a linear regression adjustment is applied, for the verification of the correct sign on the outcome coefficient.

3.7 Results

3.7.1 Output Growth: Figure 3.1 below displays the average growth rate of the two groups over the sample period. It appears that the average growth in both groups has a similar trend. But one cannot tell which group outperforms the other by simply looking at this figure alone.

Figure 3.1 Average Output Growth over the Sample Period (1990-2014)



To get a deeper insight into the output growth performance, we look at the regression results presented in Table 3.3. The first row displays the coefficients of the different estimators for the output growth when we use the raw sample, inclusive of the outlier observations. The negative sign on the coefficient means that the treated (IT) group

Table 3.3 Average Treatment Effects on the Treated (ATET) for the Output Growth

	NNM Matching Estimation				Regression Adjustment	
Model ↓ / Estimator →	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Large Sample Bias Adjustment	Regression Adjustment
Inclusive Sample						
Observations = 1666	-.00600* (.00341)	-.00604** (.00287)	-.00600* (.00341)	-.00597* (.00341)	-.00673** (.00339)	-.00353 (.00343)
Dropping the Outliers						
No CPI > 100 % Observations = 1636	-.00675* (.00364)	-.00622* (.00322)	-.00675* (.00364)	-.00678* (.00364)	-.00500* (.00290)	-.00744*** (.00286)
No CPI > 50 % Observations = 1603	-.00629* (.00376)	-.00592* (.00332)	-.00622* (.00375)	-.00629* (.00376)	-.00479 (.00308)	-.00775*** (.00282)
No CPI > 25 % Observations = 1544	-.00702* (.00377)	-.00628* (.00349)	-.00702* (.00377)	-.00707* (.00377)	-.00556* (.00317)	-.00691*** (.00289)

The coefficients are for the output growth (Outcome Dependent Variable). Independent variables are CPI Inflation, Log of GDP, Investment, Government Size, Trade and International Country Risk Guide (an index for political stability). The Treatment Variable is Inflation Targeting (ITR) Dummy.

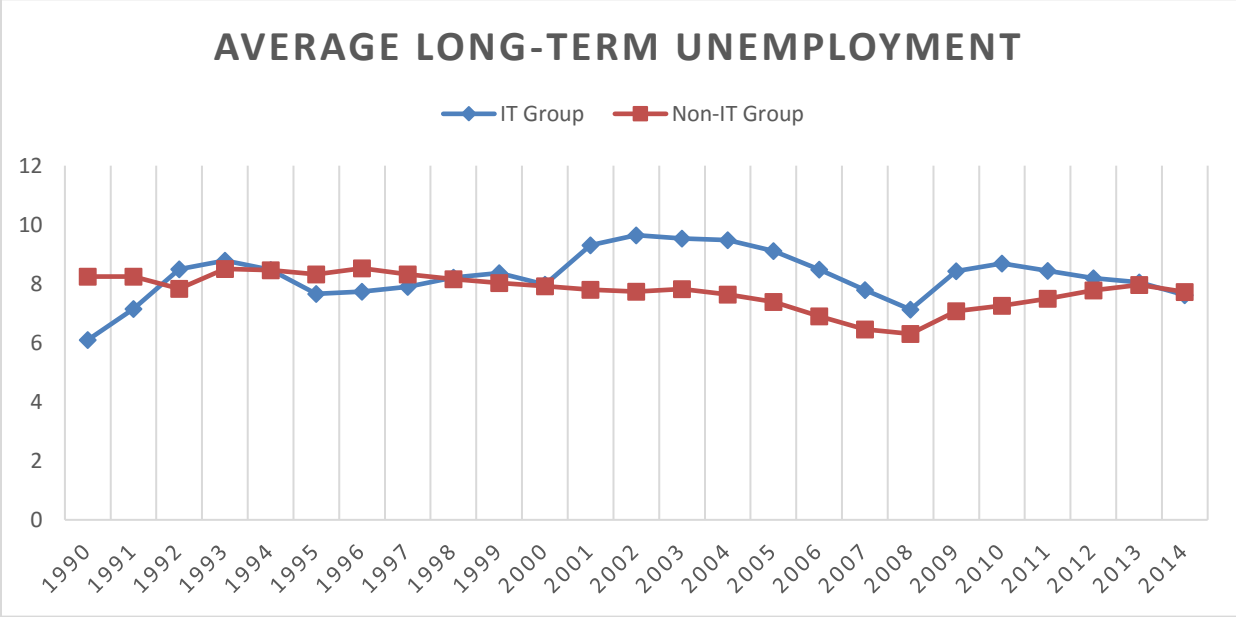
Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The sample covers 25 years (1990-2014) with 1700 of observations.

has less output growth than the control (non-IT) group: a significant difference of more than ½ (0.6) percentage point, implying that the non-IT countries outperform the inflation-targeting countries by more than ½ percentage point over the sample period. Economically

this difference may seem negligible, but when compounded over several years, this ½ percentage point difference can translate into a vast income disparity, as highlighted in the growth literature. The remaining three rows display the coefficients for the output growth when we delete the outlier observations. The sign and the significance of the coefficients remain the same, except that the linear regression adjustment estimator is now significant both statistically and economically.

3.7.2 Unemployment: We repeat the same exercise for the long-term rate of unemployment, as we did for output growth. We first look at the sample average rate of unemployment for the two groups as depicted in Figure 3.2 below.

Figure 3.2 Average Long-Term Unemployment over the Sample Period (1990-2014)



Prior to 1998, it looks like the IT-group has a lower rate of unemployment compared to the non-IT group. Whereas after 1998, the opposite seems to be true. Nevertheless, by just looking at the Figure 3.2 alone, one cannot judge how inflation targeting has affected long-

term unemployment among the adopters compared to the non-adopters. Once again, to find out, we turn to our regression results presented in Table 3.4.

Table 3.4 Average Treatment Effects on the Treated (ATET) for the LT Unemployment

	NN Matching Estimation				Regression Adjustment	
Estimator → Model ↓	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Large Sample Bias Adjustment	Regression Adjustment
Inclusive Sample	.01255***	.01132***	.01255***	.01250***	.02036***	.02267***
Observations = 1663	(.00434)	(.00401)	(.00434)	(.00435)	(.00428)	(.00347)
Dropping the Outliers						
No CPI > 100 %	.01862***	.01848***	.01862***	.01861***	.02128***	.02705***
Observations = 1633	(.00700)	(.00620)	(.00700)	(.00699)	(.00697)	(.00346)
No CPI > 50 %	.01742***	.01528***	.01742***	.01742***	.01827***	.02773***
Observations = 1600	(.00569)	(.00532)	(.00569)	(.00569)	(.00563)	(.00346)
No CPI > 25 %	.02008***	.01569***	.02008***	.01985***	.01957***	.02853***
Observations = 1543	(.00518)	(.00483)	(.00518)	(.00516)	(.00511)	(.00346)

The coefficients are for the Long-Term Unemployment (the Outcome Dependent Variable). The independent variables are CPI Inflation, Log of GDP, Investment, Output Growth, and Trade. The Treatment Variable is Inflation Targeting (ITR) Dummy.

Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The sample covers 25 years from 1990 to 2014 with 1700 observations.

The results for the long-term unemployment rate paint a bleak picture for IT-adopters. Once more, the first row displays the coefficients for the unemployment estimators obtained from the regressions of the raw dataset, which includes the outlier observations for the CPI inflation. The coefficients for the four NNM estimators are significant at the

99% confidence level, and imply that the long-term unemployment among the IT-adopting countries has worsened over the sample period, resulting in a rise of about 1.5 percentage point compared to the non-IT-adopting countries. The coefficients' magnitude rises to over 2 percentage point once we adjust for the large sample bias and the linear regression. More importantly, when we delete the outlier observations from our sample, the magnitude of the coefficients improves throughout all the specifications. These results seem to convey that inflation targeting may have had a negative impact on the labor market of the adopting countries compared to the non-adopting countries over the sample period.

3.7.3 Robustness Checks: We have already done some preliminary checks when we omitted outlier observations from our sample. Now we employ some additional checks. First, we use an alternative measurement of inflation, the GDP deflator; second, we check our dataset for the presence of any effect coming from unobserved factors due to the heterogeneous nature of the sample: finally, we cluster our sample into two sub-samples: high-income and middle-income countries, and rerun the same regressions to verify the signs of our coefficients of Tables 3.3 and 3.4.

(*i*) The Effects of Unobserved Factors: The coefficients for the Rosenbaum Bounds tests presented in Appendix 'C' are all significant, implying that our results are robust to the effects of unobserved factors due to heterogeneity of the sample.

(*ii*) GDP Deflator: There is hardly any central bank that does not use the consumer price index (CPI) to measure the price level. But since the literature also provides support for the use of the GDP deflator as an alternative measure of inflation, particularly in the case of data unavailability on CPI, we re-run our regressions by replacing CPI inflation with the

GDP deflator.[80] This replacement has some effect on the magnitude and the significance level of our coefficients, but more importantly, we do not observe any ambiguity in the sign of any coefficient. The result tables are presented in Appendix 'C'.

(*iii*) Clusters: Table 3.1 shows that the countries in our sample are both high and middle-income countries, and this income heterogeneity may have some impact on the coefficients of the results. We, therefore, cluster our sample in two subsamples, thus dividing the countries based on their income levels, high-income countries (HICs) and middle-income countries (MICs). The results for these two clusters, or subsamples, are presented in Appendix 'C'. A closer look at these results reveal an interesting story:

For output growth, we observe that the coefficients in Table 3.9 are insignificant both statistically and economically, though the sign of the coefficients remains negative across all the estimators. This implies that the inflation-targeting adoption does not seem to have a noticeably adverse effect on output growth among the IT-adopting HICs. However, the coefficients in Table 3.11 are mainly significant both statistically and economically, implying that the IT-adopting MICs have suffered a significant reduction of more than 1 percentage point in the output growth rate as compared to the non-IT adopting MICs.

For long-term unemployment, the results are interestingly different for the two clusters: Table 3.10 shows that the coefficients for long-term unemployment are significant both statistically and economically: the IT-adoption by HICs has increased the rate of long-term unemployment by 1.6 to 2 percentage points compared to the non-IT adopting HICs. But the coefficients in Table 3.12 are insignificant both statistically and economically, though

[80] Barro (1995) uses the GDP deflator in his sample when there are no data on CPI.

the sign remains positive. This implies that the long-term unemployment rate does not seem to have been affected by the IT-adoption among MICs.

3.8 Concluding Remarks

The proponents of inflation targeting generally claim that, as a catalyst to price stability, inflation targeting promotes economic efficiency and growth, as in Bernanke et al. (1999, p.325): '*Price stability promotes high rates of economic growth and employment in the long run*.' But when it comes to judging the performance of inflation-targeting regime, we observe that the entire empirical work on IT is devoted to either studying the dynamics of inflation and its volatility, or to measuring the so-called sacrifice ratios.

There is a wide gap in the assessment of the core claim that inflation targeting promotes efficiency and growth. Our study fills this gap by comparing the IT-adopting countries to the non-adopters in terms of their performance as measured by output growth and the rate of long-term unemployment. Using a cross-country panel data over a 25-year horizon, we find that the IT-adopting countries perform poorly compared to the non-IT countries: There is a significant reduction in output growth among the IT-adopting countries by over ½ percentage point compared to the non-adopters. There is also a significant higher rate in long-term unemployment among the IT-adopting countries compared to the non-IT countries, to the tune of 2 percentage points.

These results seem to refute the claim of IT proponents that inflation targeting promotes economic efficiency and growth. For this claim to be valid, we should witness the opposite in our findings: the IT-adopters should be outperforming their counterparts in growth and employment, not the other way around!

However, we need to exercise some caution when interpreting these results, as they are obtained from cross-country regressions. More importantly, a negative coefficient on growth does not necessarily translate into negative growth *per se*; instead it tells us that one group has lesser growth than the other, even though both groups may have been enjoying positive rates of growth. The same logic applies to the coefficients of unemployment. Still, our findings do have some serious policy implications for the central banks that may be contemplating the adoption of inflation targeting: a more in-depth analysis, such as a case-study approach specific to the concerned country, should be carried out.

We therefore conclude, in line with what Sims (2005) has suggested, that inflation targeting should not be '*oversold'* as a panacea to the chronic macroeconomic ills.

Appendix C

Table 3.6 Sensitivity Test Results for the Unobserved Factors in the Entire Sample

Rosenbaum Bounds for Output Growth & Unemployment for the Various Matches

Sample Bounds → ↓	gamma*	Upper Bound Significance Level (sig+)	Lower Bound Significance Level (sig-)	Upper Bound Point Estimate (t-hat+)*	Lower Bound Point Estimate (t-hat-)*	Upper Bound Confidence Interval (CI+)	Lower Bound Confidence Interval (CI-)
The Inclusive Sample							
Output Growth	1	0	0	.0355	.0355	.0339	.0370
(1687 Matched Pairs)	3	0	0	.0199	.0505	.0180	.0522
Unemployment	1	0	0	.0721	.0721	.0702	.0742
(1693 Matched Pairs)	3	0	0	.0550	.0967	.0533	.0994
Dropping CPI >100%							
Output Growth	1	0	0	.0363	.0363	.0348	.0378
(1645 Matched Pairs)	3	0	0	.0215	.051	.0196	.0528
Unemployment	1	0	0	.0717	.0717	.0697	.0737
(1645 Matched Pairs)	3	0	0	.0547	.0955	.053	.0994
Dropping CPI > 50%	1	0	0	.0365	.0365	.0350	.0380
Output Growth	3	0	0	.0219	.0510	.0200	.0529
(1612 Matched Pairs)							
Unemployment	1	0	0	.0715	.0715	.0695	.0735
(1612 Matched Pairs)	3	0	0	.0545	.0953	.0527	.0990
Dropping CPI > 25%							
Output Growth	1	0	0	.0367	.0367	.0352	.0383
(1552 Matched Pairs)	3	0	0	.0223	.0515	.0205	.0533
Unemployment							
(1552 Matched Pairs)	1	0	0	.0710	.0710	.0689	.0730
	3	0	0	.0540	.0948	.0520	.0985

*gamma - log odds of differential assignment due to unobserved factors
sig+ - upper bound significance level
sig- - lower bound significance level
t-hat+ - upper bound Hodges-Lehmann point estimate
t-hat- - lower bound Hodges-Lehmann point estimate
CI+ - upper bound confidence interval (a= .95)
CI- - lower bound confidence interval (a= .95)

Robustness Checks (Replacing CPI Inflation by GDP Deflator)

Table 3.7 ATET (with GDP Deflator) for the Output Growth

	NNM Matching Estimation				Regression Adjustment	
Estimator → / Model ↓	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Large Sample Bias Adjustment	Regression Adjustment
Inclusive Sample						
Observations = 1666	-.00457	-.00513*	-.00496*	-.00497*	-.00292	-.03198*
	(.00361)	(.00318)	(.00292)	(.00291)	(.00359)	(.01894)
No CPI > 50 %	-.00431	-.00418	-.00497*	-.00487*	-.00173	-.00540**
Observations = 1603	(.00393)	(.00348)	(.00299)	(.00300)	(.00391)	(.00282)
No CPI > 25 %	-.00397	-.00453	-.00586**	-.00596**	-.00254	-.00622**
Observations = 1544	(.00437)	(.00369)	(.00287)	(.00288)	(.00434)	(.00278)
The coefficients are for the output growth (Outcome Dependent Variable). Independent variables are GDP Deflator, Log of GDP, Investment, Government Size, Trade and International Country Risk Guide (an index for political stability). The Treatment Variable is Inflation Targeting (ITR) Dummy.						
Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The sample covers 25 years (1990-2014) with 1700 of observations.						

Table 3.8 ATET with GDP Deflator for the Long-Term Unemployment

	NN Matching Estimation				Regression Adjustment	
Estimator → / Model ↓	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Large Sample Bias Adjustment	Regression Adjustment
Inclusive Sample						
	.0137***	.01281***	.00930**	.01061**	.00175***	. 00205
Observations = 1663	(.00441)	(.00408)	(.00436)	(.00430)	(.00428)	(.00400)
No CPI > 50 %	.01044**	.01196***	.01054**	.01078**	.01466***	.00427
Observations = 1600	(.00450)	(.00436)	(.00450)	(.00489)	(.00434)	(.00441)
No CPI > 25 %	.0118***	.01354***	.01162**	.01167***	.01500***	.00362
Observations = 1543	(.00484)	(.00445)	(.00484)	(.00480)	(.00443)	(.00455)
The coefficients are for the Long-Term Unemployment (the Outcome Dependent Variable). The independent variables are GDP Deflator, Log of GDP, Investment, Output Growth, Trade and ICRG. The Treatment Variable is Inflation Targeting (ITR) Dummy.						
Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The sample covers 25 years from 1990 to 2014 with 1700 observations.						

Table 3.9 ATET for the Output Growth among the HICs Cluster

	NNM Matching Estimation				Regression Adjustment	
Estimator → / Model ↓	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Large Sample Bias Adjustment	Regression Adjustment
Inclusive Sample						
Observations = 1666	-. 00589	-.00431	-.00592	-.00544	-.01050*	-.01618***
	(.00559)	(.00464)	(.00559)	(.00546)	(.00575)	(.00449)
No CPI > 50 %	-.00051	-.00001	-.00051	-.00001	-.01006**	-.01252***
Observations = 1603	(.00413)	(.00407)	(.00413)	(.00407)	(.00512)	(.00282)
No CPI > 25 %	-.00149	-.00170	-.00149	-.00170	-.01251***	-.00997**
Observations = 1544	(.00401)	(.00402)	(.00401)	(.00402)	(.00289)	(.00419)
The coefficients are for the output growth (Outcome Dependent Variable). Independent variables are CPI Inflation, Log of GDP, Investment, Government Size, Trade and International Country Risk Guide (an index for political stability). The Treatment Variable is Inflation Targeting (ITR) Dummy.						
Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The sample covers 25 years (1990-2014) with 1700 of observations.						

Table 3.10 ATET for the LT Unemployment among the HICs Cluster

	NN Matching Estimation				Regression Adjustment	
Estimator → / Model ↓	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Large Sample Bias Adjustment	Regression Adjustment
Inclusive Sample						
Observations = 1663	.02111***	.0198***	.0167***	.01681***	.03467***	.01594***
	(.00513)	(.00454)	(.00544)	(.00550)	(.00528)	(.00339)
No CPI > 50 %	.02000***	.0192***	.	.02020***	.03410***	.01598***
Observations = 1600	(.00573)	(.00494)	02016***	(.00570)	(.00561)	(.00332)
			(.00568)			
No CPI > 25 %	.01954***	.0199***	.0197***	.01999***	.03400***	.01711***
Observations = 1543	(.00638)	(.00545)	(.00639)	(.00632)	(.00629)	(.00336)
The coefficients are for the Long-Term Unemployment (the Outcome Dependent Variable). The independent variables are CPI Inflation, Log of GDP, Investment, Output Growth, and Trade. The Treatment Variable is Inflation Targeting (ITR) Dummy.						
Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The sample covers 25 years from 1990 to 2014 with 1700 observations.						

Table 3.11 ATET for the Output Growth among the MICs Cluster

	NNM Matching Estimation				Regression Adjustment	
Model ↓ Estimator →	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Large Sample Bias Adjustment	Regression Adjustment
Inclusive Sample						
Observations = 1666	-.00424	-.00448	-.00424	-.00411	-.00818	-.06488
	(.00606)	(.00457)	(.00606)	(.00605)	(.00605)	(.04263)
No CPI > 50 %	-.01184*	-.01133**	-.01185*	-.01205*	-.00360	-.06280***
Observations = 1603	(.00631)	(.00521)	(.00632)	(.00376)	(.00613)	(.02325)
No CPI > 25 %	-.01060*	-.01089**	-.01064*	-.01092*	-.00049	-.06538***
Observations = 1544	(.00636)	(.00528)	(.00636)	(.00623)	(.00617)	(.02318)
The coefficients are for the output growth (Outcome Dependent Variable). Independent variables are CPI Inflation, Log of GDP, Investment, Government Size, Trade and International Country Risk Guide (an index for political stability). The Treatment Variable is Inflation Targeting (ITR) Dummy.						
Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The sample covers 25 years (1990-2014) with 1700 of observations.						

Table 3.12 ATET for the LT Unemployment among the MICs Cluster

	NN Matching Estimation				Regression Adjustment	
Model ↓ Estimator →	Single Match	Multiple Matches	Narrow Radius	Wide Radius	Large Sample Bias Adjustment	Regression Adjustment
Inclusive Sample						
Observations = 1663	.00421	.00887*	.00402	.00462	.02326***	.00865
	(.00579)	(.00494)	(.00581)	(.00577)	(.00573)	(.00615)
No CPI > 50 %	.00621	.00838	.00621	.00585	.00400	. 01039
Observations = 1600	(.00836)	(.00609)	(.00836)	(.00826)	(.00819)	(.00688)
No CPI > 25 %	.00291	.00815	.00291	.00349	.00256	.00953
Observations = 1543	(.00985)	(.00639)	(.00985)	(.00971)	(.00968)	(.00711)
The coefficients are for the Long-Term Unemployment (the Outcome Dependent Variable). The independent variables are CPI Inflation, Log of GDP, Investment, Output Growth, and Trade. The Treatment Variable is Inflation Targeting (ITR) Dummy.						
Asterisks next to the coefficients (*, **, ***) represent significance levels of 10%, 5%, and 1% respectively. Figures listed in parenthesis are Robust Standard Errors. The sample covers 25 years from 1990 to 2014 with 1700 observations.						

Figure 3.3 The Common Support for the Output Growth

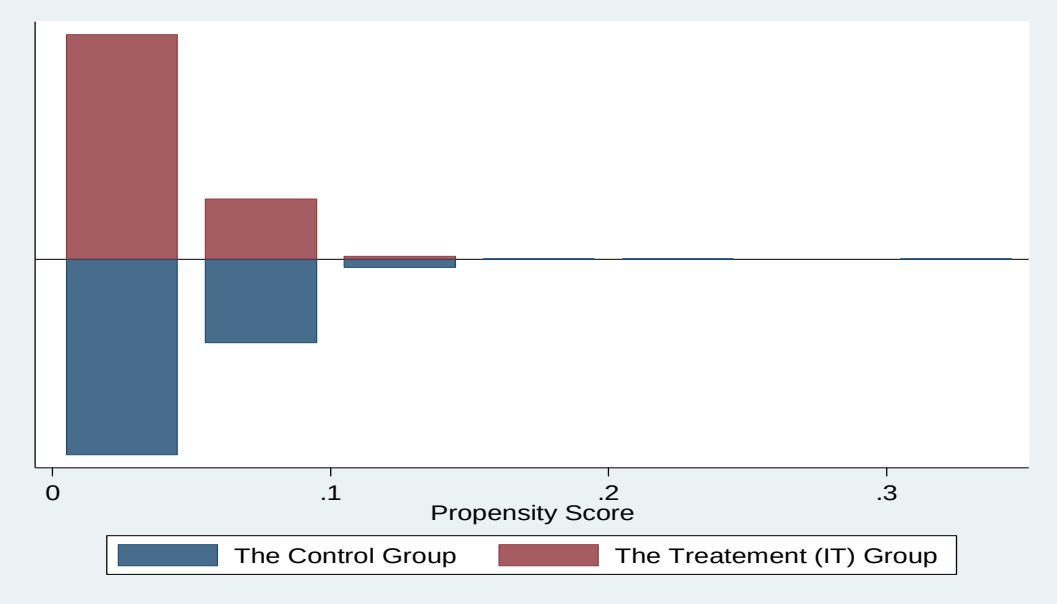
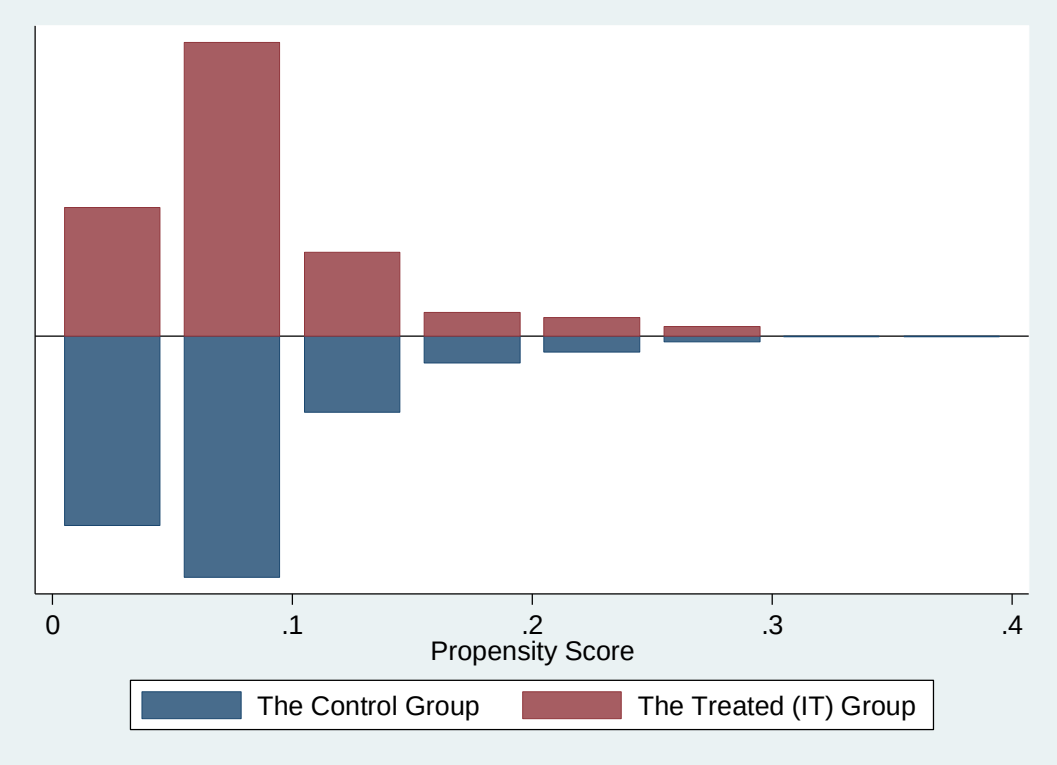


Figure 3.4 Common Support for the Long-Term Unemployment



Thesis Conclusion

Inflation targeting as a monetary-policy framework has been applauded for several benefits, such as taming inflation and its volatility by locking-in inflation expectations, mitigating uncertainty, enhancing stability, and promoting economic efficiency and growth.

As for taming inflation and its volatility, earlier empirical work on inflation targeting has had inconclusive verdicts on verifying this claim, although later studies have found that inflation targeting can be a good remedy against chronic inflation and its volatility among developing countries. However, the development-based classification in constructing country samples by these studies neglected the vast divide of income levels among the countries, which may have led to the 'selection-on-observables' problem often stemming from grouping together units that exhibit extreme heterogeneity in their covariates. These studies also ignored the role of institutions when assessing the impact of IT-adoption.

By adhering to an income-based, rather than a development-based, classification, the first essay of this thesis has addressed the 'selection-on-observables' problem. The findings suggest that middle-income countries can benefit from IT-adoption in their fight against inflation. The results show a significant reduction in inflation rates among the IT-adopting MICs. The results also confirm the convergence of their inflation rates to the world's average inflation rates. In fact, the estimated coefficients are significant and substantial, implying that IT-adoption has helped these countries to lower their inflation rates by over 4 percentage points more than their counterparts who chose not to adopt IT. These results are robust to excluding outliers and using alternative measure of inflation, such as the GDP deflator. More importantly, the results confirm the pivotal role that institutions play –

particularly regulatory quality, voice and accountability and political stability – in bolstering policymakers' efforts to combat inflation.

The literature acknowledges that FDI is attracted to countries with good governance, greater macroeconomic stability and the least uncertainty, which are precisely the benefits attributed to IT-adoption by its proponents. Hence, one can conjecture that IT-adopting countries should be the most successful in attracting FDI. The second essay of this thesis investigates the validity of this conjecture. The initial look at a broader sample confirms that IT-adoption has helped the adopting countries increase the FDI inflows by about 3 percentage points as compared to the non-IT adopters. However, a closer look reveals these findings to be misleading when we cluster our sample into two groups by separating high-income countries from the middle-income countries. Surprisingly, the results for our clustered samples exhibit a contradicting pattern. Among the high-income countries, the results are in favor of IT-adoption: the IT-adopting OECD countries have enjoyed a significant increase in FDI inflows by about 3 ½ to 4 ½ percentage points compared to the non-IT OECD countries. Whereas, among the middle-income countries, the results paint a grim picture of the IT-adoption: the MICs that adopted inflation targeting have suffered a significant reduction in the FDI inflows by about 2 to 3 percentage points as compared to the non-IT adopting MICs. One suspect behind the contradictory outcomes of the same policy regime may be the fact that the MICs simply do not have the quality institutional settings needed to successfully implement inflation targeting, which might have helped their richer counterparts, the OECD group, in reaping the benefits of inflation targeting.

Finally, the core claim of the inflation-targeting proponents is that IT promotes economic efficiency and growth. We have tested the validity of this claim in the third chapter by

comparing the IT-adopting countries to the non-adopters in terms of their performance as measured by output growth and the rate of long-term unemployment. The findings reveal that IT-adopting countries perform poorly compared to non-IT countries: There is a significant reduction in output growth among IT-adopting countries by over ½ percentage point compared to non-adopters. There is also a significant higher rate in long-term unemployment among IT-adopting countries compared to non-IT countries, to the tune of 2 percentage points. These results seem to refute the claim of IT proponents that inflation targeting promotes economic efficiency and growth. For this claim to be valid, we should witness the opposite in our findings: the IT-adopters should be outperforming their counterparts in growth and employment, not the other way around!

We have used cross-country panel data when conducting empirical investigation throughout the three essays of this thesis. Given that the results are obtained from panel regressions – which are known for imperfections – caution must prevail when interpreting these results. To address these imperfections, perhaps a case-study approach in the future research to further verify our findings among IT-adopters should enable us to have a clear verdict on the effectiveness of inflation targeting in reaping the benefits claimed by IT-proponents, namely that inflation targeting is a good remedy for high inflation and its volatility, that inflation-targeting adoption can enhance governance and macroeconomic stability, the key factors behind attracting FDI, and that inflation targeting promotes economic efficiency and growth.

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