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THE PERFORMANCE OF INFLATION TARGETING REGIMES IN EMERGING AND DEVELOPING COUNTRIES: A PROPENSITY SCORE MATCHING APPROACH

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The performance of inflation targeting regimes in emerging and developing countries: A propensity score matching approach

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Abstract

Inflation targeting (IT) is a widely used monetary policy. We examine the effects of it on emerging and developing countries' inflation, output growth, dollarization, real effective exchange rate (REER), REER volatility, fiscal balance, output volatility and inflation volatility via propensity score matching.

Propensity score matching is based on matching IT adopters and non-IT adopters on their propensity scores. The mean difference of the outcomes between these two is the average treatment effect (ATT). The main aim of it is to solve the self-selection problem. Propensity scores indicate the likelihood of adaptation of IT and these can be estimated via a probit model.

In our main analysis, there is evidence of a decrease in inflation after the introduction of IT. Note that there is a decrease in GDP growth. Moreover, there is a decrease in REER suggesting there is a depreciation. The increase in fiscal balance implies the government becomes more efficient in tax collection to compensate the loss of the seignorage income. There is also an increase in GDP per capita volatility and GDP volatility. Our results are robust to different probit model specifications.

By moving beyond inflation outcomes alone, this study provides new empirical evidence on the broader macroeconomic trade-offs associated with IT adoption in emerging and developing countries. The findings highlight that IT must be supported by institutional and structural reforms to achieve stable growth in these economies.

Keywords: Dollarization, emerging countries, inflation targeting, macroeconomic volatility, propensity score matching, real effective exchange rate

JEL classification: E4, E5, E6, F3, H6

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Section I. Introduction

While advanced economies began reducing inflation in the mid-1980s, emerging and developing countries generally did not begin this process until the mid-1990s. Lower and more stable inflation supports growth and development by reducing uncertainty, improving resource allocation and enhancing financial stability.

To achieve these goals, many central banks have adopted inflation targeting (IT) as their primary monetary policy framework. IT typically involves setting a medium-term inflation target, committing price stability as a main objective, specifying policy tools and enhancing transparency and accountability.

Mishkin (2000) highlights several advantages of IT: it shifts central banks' focus to domestic conditions, uses all available information rather than relying solely on monetary aggregates and improves public understanding and accountability through clear targets. However, successful IT requires strong institutional frameworks, including central bank independence, freedom from political interference and robust communication channels.

Despite these potential benefits, Mishkin (2000) and others note possible downsides: IT may increase output volatility, weaken credibility if targets are frequently missed and expose economies to exchange rate fluctuations. Brito and Bystedt (2010) argue that IT's apparent success may reflect a broader shift in policy focus rather than the framework itself i.e. there is a window dressing argument. Bernanke and Woodford (2005) emphasize that weak institutions and inconsistent fundamentals can limit the effectiveness of IT. Likewise, Batini and Laxton (2007) outline four key preconditions for successful IT: strong central bank independence, freedom from fiscal dominance, robust analytical capacity and a stable financial system. Many emerging economies still struggle with underdeveloped institutions, high dollarization and vulnerability to external shocks (Arsić et al., 2022) raising concerns about the viability of IT in such environments.

This study investigates whether inflation targeting delivers its expected benefits and what macroeconomic trade-offs arise when it is implemented in structurally constrained (weak institutions, fiscal dominance, dollarization and external vulnerability) emerging markets. It expands the literature on IT emerging and developing economies by moving beyond its effects on inflation alone. Using robust propensity score matching to address self-selection bias, it examines how IT influences a broader set of macroeconomic outcomes including GDP growth, fiscal balance, dollarization, exchange rate behavior and output volatility. The paper shows that IT's effects are often mixed i.e. there are trade-offs like lower growth and higher volatility while there are fiscal improvements. Extensive robustness checks strengthen the reliability of these findings.

Section II. A Brief Literature Review

There are various studies attempting to explain the effects of inflation targeting on various variables using the propensity score matching method. These include inflation, inflation variability, output, output volatility, real effective exchange rate volatility (Ouyang et al. (2016)), fiscal discipline (Minea & Tapsoba (2014)) and tax revenue (Lucotte (2012)). Note that the results of these analyses are mixed reflecting the heterogeneity in country samples and time periods.

IT reduces inflation mainly in developing economies via credibility gains. There might be also a decline in inflation volatility. These effects may depend on country characteristics. Lin and Ye (2007) applied propensity score matching (PSM) and found that IT has no significant effect on inflation or inflation volatility in several developed countries over 1985-1999. Their results are in line with the window-dressing view of IT. According to the window-dressing view, the adoption of inflation targeting is primarily symbolic: central banks that choose IT already have low and declining inflation, strong institutions and high credibility. Hence, the formal announcement of a target does not meaningfully affect inflation performance. Empirical studies for advanced economies are in line with this argument. In other words, the macroeconomic outcomes only seem to be weakly affected by a specific inflation target. Ball and Sheridan (2004) argue that these are not evidence against IT adoption as there is no harmful effect. This might reflect an initial credibility gap in emerging and developing countries.

On the contrary, Lin and Ye (2009) investigate whether IT makes a difference in 13 developing countries. Their results indicate the average treatment effect of IT on inflation and its variability is quantitatively large and statistically significant. They suggest the benefits of inflation targeting depends on country characteristics: the fiscal position of the government, the desire of the central banks to limit exchange rate movements, the motivation to meet preconditions of IT and the time has passed since IT adoption. The official inflation target announcement leads to more credible central bank, the alleviation of the dynamic inconsistency problem and thus, it brings lower inflation, inflation variability and expectations. Note that the benefits of credibility gain due to explicit announcement of a target might be higher for developing countries with low initial credibility.

De Mendonça and e Souza (2012) suggest the introduction of IT is useful for countries that must enhance their monetary policy credibility. IT is associated with a higher central bank transparency leading to an increase in monetary policy accountability and thus, leads to an improvement in central bank credibility. The countries that did not adopt IT have higher average inflation and average inflation volatility. The results are stronger for developing countries. When the advanced economies are investigated, there is no fall in inflation after the adaptation of IT. For distinct PSM models and different matching algorithms, the results for all sample and developing countries are strong and robust.

Vega and Winkelried (2005) examine whether IT reduces inflation, its volatility and its persistence via propensity score matching. Their robust results indicate there is a decrease in inflation and inflation volatility of IT adopters. On the contrary, the effect of IT on inflation persistence is lower. There is a

reduction in the persistence of inflation in developing countries via anchoring expectations. Their results indicate the benefits of IT are stronger for developing countries.

Roger (2009) examines the effectiveness of IT on advanced and emerging economies especially after the 2008 global financial crisis. Among IT adopters, there is a reduction in inflation levels. Inflation expectations become more anchored and are less sensitive to shocks. In advanced countries, disinflation is achieved without significant declines in output. There are also transparency and accountability enhancements. The central banks adopting IT are more transparent in communication i.e. publishing reports and forecasts and offering guidance on how they will respond to changing economic conditions. There might be an increase in credibility via stronger accountability and clarity in goals. There are institutional reforms such as central bank independence, better communication and rule-based policy behavior. IT has provided a nominal anchor in the absence of fixed exchange rate regimes.

Roger also suggests there are some challenges and constraints of IT. The most important one is that the IT performance in emerging markets is mixed. There is a decline in inflation. However, inflation volatility remains high. Due to weak institutions, credibility is incomplete. Dollarization, shallow financial markets and fiscal dominance can weaken the effectiveness of IT. There is also vulnerability to external shocks. Small open IT adopters are subjected to terms of trade shocks, capital flow volatility and exchange rate fluctuations. These shocks may lead to limited control over inflation in the short run. Many emerging markets adopted IT without the necessary institutional reforms i.e. there are incomplete central bank independence, fiscal dominance and shallow financial markets. Furthermore, there is no direct evidence that IT leads to higher GDP growth in the long run. In some emerging markets, there is persistent uncertainty and low financial depth weakening the investment response to lower inflation. Roger argues that one can take some lessons from the Global Financial Crisis (2007-9). By focusing solely on price stability, central banks may miss systemic risks such as asset bubbles and credit booms. As a response, central banks should integrate financial stability concerns into their policy frameworks possibly via macroprudential tools. Roger also has some policy recommendations. For emerging countries, IT must be complemented with stronger institutional reforms, deepening financial markets and enhancing fiscal transparency.

Arsić et al. (2022) investigate the impacts of IT in European and Asian emerging economies with a socialistic legacy. Their analysis is based on 26 small economies (12 targeters and 14 non-targeters) between 1997 and 2019. These countries had a high degree of dollarization and there are moderate differentiations in the level of development. These countries might illustrate how institutional developments can occur following a policy shift to IT. When IT was adopted, many of these nations had underdeveloped financial institutions, lower credibility in their monetary policies, fragile fiscal positions, dollarization and sudden stops in capital inflows. Additionally, their central banks were less equipped to model and forecast economic developments compared to those in developed countries. There were gradual improvements in those institutional requirements after the transition to IT and these improvements were necessary. Their conclusions suggest that IT might lead to good macroeconomic performance although the countries have not met preconditions. The results of Arsić et al. indicate there is a reduction in the inflation rate, inflation volatility and GDP volatility. After IT, the change in GDP growth is not significant. Their results indicate that IT adoption leads to a decrease in monetary uncertainty.

Despite mixed results, the literature generally argues that IT significantly reduces inflation and inflation volatility in developing countries. On the other hand, it has weaker effects in advanced economies due to pre-existing credibility.

Lin and Ye (2007) find that long term nominal interest rates and income velocity of money do not exhibit significant effects and this is consistent with window dressing view of IT. They do not find more stable money demand which is proxied by the income velocity of money among IT adopters.

Balima et al. (2017) investigate a sample of 38 emerging economies over 1993-2012. They find that IT adoption leads to lower sovereign debt risk. Their results indicate IT implementation might increase the access of emerging market economies to international financial markets. After the introduction of IT, sovereign debt ratings significantly increase and government bond yield spreads decrease in emerging countries. These results are robust to various specifications.

The economic conditions lead to different impacts of IT adoption on sovereign debt risk. One can observe the highest sovereign debt risk decrease when there is sound fiscal stance and in emerging countries with a full-fledged IT regime i.e. the primary aim of the central bank is to maintain price stability. IT adoption also leads to the diversification of the portfolio of the investors.

Lin (2010) examines the external effects of IT via a dataset of 52 developing and 22 industrial countries over the period 1985–2005, including 13 developing and 10 industrial IT adopters. He finds that IT has mixed implications across country groups. In developing economies, IT significantly increases international reserves and enhances both real and nominal exchange rate stability. Contrary, in industrial economies it tends to reduce reserves and exchange rate stability. Despite these differences, the estimated treatment effects on current account balances are insignificant for both groups. Overall, Lin concludes that IT does not exert a significant influence on the external sector of adopting countries.

Ouyang et al. (2016) examine the effect of inflation targeting (IT) on real effective exchange rate (REER) volatility for 62 countries over 2006–2012. Their findings indicate that IT adoption is associated with higher REER volatility in advanced economies and this is largely driven by external price movements. Conversely, IT does not significantly alter REER volatility in developing economies. Developing-country targeters experience lower internal price volatility. The authors highlight that without sufficient institutional capacity, IT may fail to deliver superior outcomes relative to alternative monetary frameworks. They further compare IT regimes with hard-fix exchange rate regimes and find that hard fixers exhibit significantly lower REER volatility than IT countries. This can be explained by the nominal exchange rate fluctuations inherent in IT's more flexible exchange rate arrangements.

In contrast, Rose (2007) argues domestically oriented monetary authorities can stabilize the economy without incurring clear international costs. Hence, IT may lower exchange rate volatility and reduce the likelihood of sudden stops in capital flows. Findings are mixed because exchange rate and financial outcomes depend on both credibility and institutional quality.

The fiscal effects of IT are consistently positive for emerging economies, suggesting a strong credibility-fiscal discipline channel. As argued by Lucotte (2012), there is higher central bank independence and lower levels of inflation after the adoption of IT. However, there is a decrease in seigniorage revenue.

Seigniorage revenue is an important public revenue source of developing and emerging countries as other revenue sources have higher collection costs. There might be an improvement in the collection of the domestic tax revenue of the emerging countries' governments. His sample has 59 emerging economies (19 IT and 40 non-IT countries) between 1980 to 2009. His results indicate that IT adoption has had a large and significant positive effect on public revenue collection on average. The credibility of the central bank may decrease the monetized deficit. Moreover, IT may help to contain the fiscal policy.

Minea and Tapsoba (2014) argue IT adoption has a positive and significant effect on fiscal discipline for developing countries. This suggests IT can be a beneficial device to improve fiscal discipline in those countries as they have relatively weaker fiscal position at the introduction of IT. Thus, they are more inclined to improve their fiscal stance after it. Ruling out monetizing public debt is important to ensure the credibility of central banks.

Institutional structure largely determines the magnitude of IT's macroeconomic effects. Bernanke and Woodford (2005) emphasize that weak institutions and inconsistent fundamentals can limit the effectiveness of IT. Roger (2009) argues due to weak institutions, credibility is incomplete. Dollarization, shallow financial markets and fiscal dominance can weaken the effectiveness of IT. There is also vulnerability to external shocks. Small open IT adopters are subjected to terms of trade shocks, capital flow volatility and exchange rate fluctuations.

Lin and Ye (2013) examine whether IT might reduce financial dollarization. Their sample includes 106 developing countries between 1985 and 2004. According to their conclusions, there is a large and statistically significant decline in financial dollarization after the introduction of IT. Their results are robust with alternative samples and different probit models.

First, Lin and Ye (2013) estimate the propensity scores via a probit model. Their dependent variable is the IT dummy. The first group of independent variables includes the preconditions that should be met before applying the IT. These include the lagged inflation rate, broad money growth, a five-year central bank governor turnover rate as an inverse proxy of central bank independence, real GDP per capita growth rate and Chinn and Ito's (2006) financial openness index. The second group of controls includes the factors affecting the likelihood of choosing exchange rate targeting. They include total trade-to-GDP ratio as measure of trade openness and a *de facto* fixed exchange rate regime dummy. Their results indicate that the following countries are less likely to adopt IT: countries with higher previous inflation, higher money growth, higher level of openness to trade. Faster growing ones are more likely to adopt IT. The central bank governor's turnover rate is statistically significant and has a positive effect on the probability of inflation targeting. The estimated average treatment effect on dollarization is negative, large in magnitude and statistically significant.

Our paper fills a gap in the literature as most studies solely focus on inflation. Few examine broad macroeconomic outcomes (growth, volatility, fiscal balance and exchange rate behavior) as our work. Most of these papers utilizes early samples. We also address structural constraints like fiscal dominance, weak institutions and external vulnerability.

Section III. Methodology

As argued by Lucotte (2012), PSM is a non-experimental method based on matching treated observations with untreated observations on the basis of characteristics that are observed and unaffected by the treatment. The average treatment effect is the mean difference of two groups i.e. treated and untreated. PSM is a remedy for self-selection bias: a country's targeting choice is systematically correlated with a set of observable variables that also affect the outcomes i.e. there is the non-random selection of policy adoption. As suggested by Vega and Winkelried (2005), the adoption of IT, the inflation targeters and non-inflation targeters will be referred as treatment, treated group and control group, respectively.

The PSM approach provides a sound impact assessment only if the following two assumptions are satisfied: conditional independence assumption and common support condition. The conditional independence assumption means that the choice of switching to an IT strategy is solely based on countries' observable characteristics. This assumption also implies that we must observe and include all variables that influence simultaneously treatment assignment and potential outcomes. The common support condition ensures that one can find for each IT country at every period a counterfactual in the control group i.e. an observation with the same or nearby propensity score. The propensity distribution must not differ greatly in the treatment and the control group.

Following Lin and Ye (2007, 2009 and 2013), one may consider the following during the estimation of the average treatment effect (ATT)

$$ATT = E[Y_{i1}|D_i = 1] - E[Y_{i0}|D_i = 1] \quad (1)$$

where D_i is the inflation targeting dummy, $Y_{i1}|D_i=1$ is what is actually observed in an IT country and $Y_{i0}|D_i=1$ what will be observed if the targeter country would not adopt IT. $E[Y_{i0}|D_i = 1]$ is not observable.

Under the conditional independence assumption i.e. the outcomes are independent on targeting dummy conditional on X, (1) can be written as:

$$ATT = E[Y_{i1}|D_i = 1, X_i] - E[Y_{i0}|D_i = 0, X_i] \ (2)$$

Note that $E[Y_{i0}|D_i = 0, X_i]$ is observable.

Under common support assumption, the ATT can be estimated as the following via propensity score matching:

$$ATT = E[Y_{i1}|D_i = 1, P(X_i)] - E[Y_{i0}|D_i = 0,\ P(X_i)] \ (3)$$

There are several PSM algorithms used by Lin and Ye (2007, 2009 and 2013). There are one-to-one matching, three nearest-neighbor matching (n=3) and five nearest-neighbor matching (n=5). Moreover, there is the radius matching estimator imposing a threshold on the maximum propensity score distance. There is narrow radius (0.05), medium radius (0.1) and wide radius (0.2). The kernel matching estimator is based on the weighted average of all untreated observations for each treated observation. The weight

given to each untreated observation depends negatively on the propensity score distance from a treated observation.

The estimation process of the ATT of IT on the various aspects of the economy involves two steps. In the first step, the propensity scores are estimated via a probit model. The set of covariates include observed macroeconomic and institutional characteristics that influence the likelihood of adopting IT. In the second step, treated and untreated observations are matched via different propensity score algorithms and ATT is estimated as the difference of their averages.

There is one problem: standard errors (SEs) derived from conventional statistical formulas applied to the matched sample are often incorrect—specifically, they are generally too small, leading to artificially narrow confidence intervals and inflated claims of statistical significance. There are three main problems. First of all, PSM requires estimating the propensity score using a probit model. These estimated scores are then used to match treated and control units. However, the estimated propensity score itself has sampling uncertainty. Standard errors in naive post-matching regression ignore this first-stage estimation error, treating the propensity score as if it were known with certainty.

Second, control units may be used multiple times especially in nearest-neighbor with replacement algorithms. Then, the distribution of treated and untreated observations is altered. This violates the following assumption: independent and identically distributed errors. Due to this problem, standard errors are biased downward and repeated controls artificially inflate sample size.

Last, matching involves a data dependent sampling process involving discarding observations, weighting observations, using distance metrics and sometime using replacement. Naïve standard errors incorrectly assume random sampling while estimated standard errors fail to account for variance introduced by the matching procedure.

There are two ways to correct these problems and obtain valid standard errors. First, there is bootstrap. It means re-sample with replacement, re-estimate the propensity score, re-perform the entire matching procedure and re-estimate the treatment effect. This process captures sampling uncertainty as well as uncertainty arising from propensity score estimation and the matching procedure itself. This corrects all of these problems. Bootstrapping incorporates uncertainty arising from first-stage estimation, the matching process, the use of replacement and the exclusion of observations outside common support. It is widely used for radius matching and kernel matching. However, it is not valid for non-smooth matching estimators such as nearest-neighbor matching without replacement as the matching procedure is discontinuous i.e. small changes in data drastically change matches.

Next, there is analytic variance formula (the AI standard errors) introduced by Abadie and Imbens (2006, 2011). This analytic variance estimator for matching estimators correctly accounts for matching uncertainty, allows for repeated use controls, does not require bootstrapping. There is adjustment of variance via using influence functions for the matching estimator, corrections for repeated matches and bias corrected matching to ensure consistency. It models the sampling variability that matching creates: uncertainty from estimated counterfactual outcomes, uncertainty from the matching structure and

heteroscedasticity from mismatched covariates. This yields consistent standard errors for the estimated Average Treatment Effect. Note that the AI variance formula is not applicable to kernel or radius matching.

Although the International Investment Position (IIP) is a theoretically indispensable confounder for the adoption of inflation targeting due to its central role in capturing external vulnerability and external balance sheet risks, initial nearest-neighbor matching did not achieve satisfactory balance for IIP. Therefore, instead of excluding the variable, alternative matching procedures were explored. In particular, radius and kernel matching achieved substantially better balance across all covariates, including IIP.

Section IV. Data

Main data resource is the World Bank's World Development Indicators (WDI). Consumer price inflation, annual broad money growth, real GDP, real GDP growth, real GDP per capita, real GDP per capita growth, reel effective exchange rate (REER), trade to GDP ratio and high technology exports as a percentage of total manufactured exports are obtained from WDI. Inflation volatility, real GDP volatility, real GDP per capita volatility and REER volatility are obtained by the author. The start years of inflation targeting in emerging countries obtained from the International Monetary Fund (IMF). Deposit dollarization data has been retrieved from Christiano, Dalgic and Nurbekyan (2021) and it ends in 2017. Their data is based on individual central banks and the data provided by Levy-Yeyati (2006). International investment position (IIP) data is obtained from updated and extended 2023 version of the dataset constructed by Lane and Milesi-Ferretti (2007). Fiscal balance data is based on the work of Kose et al. (2022). The popularity of IT indicator is collected by the author. Central Bank Independence weighted index obtained from Quality of Government - Basic Dataset of the University of Gothenburg (2023).

To obtain the main probit model, we use an unbalanced panel for 27 emerging inflation targeters and 35 emerging non-targeters (a total of 62 countries) between 1970 and 2022. Note that we have eliminated countries with population lower than Moldova and GDP per capita lower than Uganda.

Inflation Targeters	Start Date	Inflation Targeters	Start Date
Albania	2009	Mexico	2001
Armenia	2006	Moldova	2013
Brazil	1999	Paraguay	2011
Chile	1999	Peru	2002
Colombia	1999	Philippines	2002
Dominican Republic	2012	Russia	2015
Georgia	2009	Serbia	2006
Ghana	2007	South Africa	2000
Guatemala	2005	Thailand	2000
India	2015	Turkey	2006
Indonesia	2005	Uganda	2011
Jamaica	2017	Ukraine	2015
Kazakhstan	2015	Uruguay	2007
Kenya	2013		

Table 1. List of emerging inflation targeters and the start year of IT. **Source:** International Monetary Fund (IMF)

Non-Targeters	
Algeria	Kyrgyz Republic
Angola	Malaysia
Azerbaijan	Mongolia
Bangladesh	Morocco
Belarus	Namibia
Bolivia	Nepal
Bosnia and Herzegovina	Nicaragua
Cambodia	Nigeria
Cameroon	Pakistan
Costa Rica	Panama
Cote d'Ivoire	Saudi Arabia
Ecuador	Senegal
Egypt	Sri Lanka
El Salvador	Tanzania
Guinea	Tunisia
Honduras	Venezuela
Iraq	Zambia
Jordan	

Table 2. List of emerging non-inflation targeters

Section V. Empirical Results

The empirical analysis of this article will be based on the work of Lin and Ye (2007, 2009 and 2013). To obtain propensity scores, we must estimate a probit model. Our dependent variable is the inflation target dummy indicating the years that the countries adopted IT. Our independent variables are lagged inflation rate, broad money growth, real GDP per capita growth rate, Lane and Milesi-Ferretti's international investment position (IIP) data and trade to GDP ratio. Following Lin and Ye (2013), the following countries are less likely to adopt IT: countries with higher previous inflation, higher money growth and higher level of openness to trade. Thus, the estimated coefficients of these control variables should be negative. The positive GDP per capita growth coefficient indicates the economy has a better development level and has a higher probability of IT adoption.

Inflation target dummy	Coef. (Standard error)
Lagged inflation rate	-0.0283 (0.007) **
Broad money growth	-0.009 (0.004) *
GDP per capita growth	0.017 (0.011)
IIP /10000	−0.036 (0.005) **
Trade to GDP	-0.009 (0.002) **
Constant	0.466 (0.131) **
Pseudo R^2	0.1528 **

Table 3. The baseline probit model

p<0.05 *, p<0.01 **

Our probit results change for different analysis due to the data restrictions.

Average treatment on the treated (ATT) will be computed via the “psmatch2” and “teffects psmatch” code in the Stata17.

Empirical results of the baseline model and discussions

	Inflation	GDP growth	REER	Fiscal balance	GDP volatility	GDP per capita volatility
Nearest-neighbor matching	-1.057 (0.438) *	-1.056 (0.438) *	-6.259 (1.83) **	0.588 (0.231) *	0.368 (0.186) *	0.367 (0.184) *
Three nearest – neigbor matching	-1.209 (0.378) **	-0.899 (0.101) **	-6.037 (1.529) **	0.681 (0.207) **	0.509 (0.163) *	0.511 (0.161) *
Five nearest – neigbor matching	-1.519 (0.413) **	-0.849 (0.096) **	-6.233 (1.428) **	0.696 (0.204) **	0.506 (0.156) *	0.515 (0.154) *
Radius matching (r=0.05)	-0.486 (0.426)	-0.646 (0.143) **	-6.609 (1.618) **	1.198 (0.258) **	0.574 (0.183) *	0.569 (0.191) *
Radius matching (r=0.1)	-0.534 (0.42)	-0.638 (0.128) **	-6.762 (1.596) **	1.121 (0.253) **	0.554 (0.19) *	0.55 (0.186) *
Radius matching (r=0.2)	-0.714 (0.371)	-0.636 (0.138) **	-6.494 (1.64) **	0.952 (0.24) **	0.482 (0.178) *	0.478 (0.186) *
Kernel matching	-0.349 (0.365)	-0.654 (0.115) **	-6.548 (1.709) **	1.195 (0.249) **	0.597 (0.193) *	0.591 (0.196) *

Table 4. ATT on inflation, GDP growth, REER, fiscal balance, GDP volatility and GDP per capita volatility

A decrease in consumer price index (CPI) inflation

There is some evidence that inflation decreases after the adoption of IT. IT mainly works via anchoring of expectations, credibility and increased policy transparency. Bernanke and Mishkin (1997) argue that clear numerical inflation targets reduce uncertainty and help anchor inflation expectations under credible monetary policy. When expectations are more anchored, there is a decrease in nominal wage and price increases. Moreover, there is a decline in inflation persistence and its bias related to discretionary monetary policy. Central banks publish inflation reports, forecasts and policy explanations. Hence, there is an increase in predictability and effectiveness in monetary policy transmission. Moreover, monetary policy becomes more transparent and rule based.

According to the literature, IT leads to lower inflation and increased credibility especially in emerging economies. Mishkin and Schmidt-Hebbel (2007) suggest that IT countries may have lower inflation via an increase in credibility and expectations anchoring. Roger (2009) argues that there is an increase in forecast accuracy and a decrease in inflation expectations' dispersion after the adoption of IT. According to the results of Gonçalves and Salles (2008), there is a decrease in inflation and its volatility even after one control for global conditions. Lin and Ye (2007) show that there is a decline in inflation and its persistence in emerging economies after IT adoption via propensity score matching.

IT is associated with several institutional reforms: increase in central bank independence, improvements in analytical capacity and increase in forward-looking policymaking. These reforms lead to stronger policy credibility, decrease in fiscal dominance and support stability of prices. The literature argues that as IT provides a nominal anchor for emerging economies with previously weak institutional quality. Thus, it is more effective in these economies. The effectiveness of IT can be strengthened via strong institutions, fiscal discipline and effective central bank communication.

Decline in GDP growth

Our findings suggest that there might be a decrease in GDP growth after IT adoption. IT can increase macroeconomic stability. However, it is not a substitute for policies that enhance growth such as human capital investment and innovation. Some emerging countries' central banks may focus on reducing inflation and building credibility too heavily via tight monetary policies and high interest rates. These can result in a decrease in output, investment and aggregate demand both in short and medium term. This argument is particularly valid for emerging economies with poor fiscal discipline, weak financial systems and rigid labor markets.

IT's impact on growth is dependent on policy credibility and institutional quality. There might be no or limited improvement in growth in emerging countries after adoption of IT due to weak institutions, poor fiscal-monetary coordination and limited central bank independence following Lin and Ye (2009). Moreover, there might be a decrease in the credibility of IT regimes due to underdeveloped financial

markets and incomplete institutional reforms as argued by Roger (2009). This decline might discourage investment and weaken the connection between growth and inflation stabilization. There might be further decline in economic growth and confidence due to exchange rate instability and fiscal adjustments following Alesina and Tabellini (2005) and Reinhart et al. (2003). All in all, IT does not directly aim to GDP growth. There might be lower GDP growth in emerging economies due to limited policy flexibility, short-run disinflation costs, exchange rate risks and weak institutions.

No decrease in dollarization

Although Lin and Ye (2013) argue that IT can significantly lower dollarization in emerging markets, our results are not in line with them. When there are high inflation histories and instability of currency, foreign currency might still be preferred by households and firms even after the stabilization of inflation i.e. there is dollarization hysteresis. Uribe (1997) and Reinhart et al. (2003) argue that when there is extensive foreign currency use, there are network externalities and decreased transaction costs. Moreover, there might be conversion costs, uncertainty and limited local-currency financial instruments. These may discourage a shift towards domestic currency assets.

There is also persistent dollarization due to structural problems and weak institutional credibility in emerging markets. There might be long-term habits based on foreign currencies and skepticism in domestic monetary policy making it harder to reverse dollarization following Ize and Levy-Yeyati (2003). Calvo and Reinhart (2002) argue that the use of foreign currency may protect the agents from exchange rate volatility and depreciation in economies with unstable macroeconomic conditions and underdeveloped financial markets.

There is an increase in dollarization and limited exchange rate flexibility due to “original sin” i.e. public sector cannot borrow in domestic currency. Even if IT improves credibility of monetary policy, complete dedollarization is conditional on a change in the framework of monetary policy. Sustainable dedollarization is conditional on institutional reforms, long-term macroeconomic stability, the development of deeper local-currency financial markets and institutional reforms.

Decrease in real effective exchange rate (Depreciation)

There is a decrease in REER i.e. a depreciation after IT adoption due to higher exchange rate flexibility and changes in monetary policy credibility. According to Minea and Tapsoba (2014), currency depreciation may occur because government debt becomes less attractive due to rises in nominal interest rates following inflationary shocks and increases in debt default risk. Note that there might be lower persistence of inflation and declines in nominal interest rates as IT anchors inflation expectations and enhance policy credibility.

Countries that adopted IT are usually associated with a movement from fixed or managed exchange rate regimes toward more flexible exchange rates. As argued by Calvo and Reinhart (2002), there is a decline in "fear of floating" after IT adoption. Hence, exchange rates adjust more freely in case of external shocks. Under a flexible exchange rate regime, central banks intervene in foreign exchange markets less and exchange rates act as shock absorbers. Hence, there might be easier depreciations of currencies in economies with external vulnerabilities or trade deficits. According to Reinhart, Rogoff and Savastano (2003), there is less aggressive defense of domestic currencies after IT adoption of monetary authorities with dollarized financial systems or previously managed exchange rates.

There might be a real depreciation after IT adoption due to corrections of past macroeconomic imbalances and structural vulnerabilities. As argued by Ball and Sheridan (2004), depreciation might be due to return to equilibrium after crises or periods of exchange rate overvaluation. Furthermore, there is vulnerability of emerging economies to commodity price fluctuations, capital flow volatility and terms-of-trade shocks. As emphasized by Lin and Ye (2009), IT adopters mainly allow their exchange rates to adjust freely to external shocks rather than defending the currency at the expense of inflation targets. To summarize, there is real depreciation after IT adoption due to greater exchange rate flexibility, reduced foreign exchange intervention and correction of prior overvaluation.

No decrease in REER volatility

There is not a significant reduction in REER volatility after IT adoption in emerging markets. This is especially valid for economies with highly exposed to external shocks such as terms-of-trade changes, commodity price fluctuations and volatile capital flows. As IT adopters shift towards a more flexible exchange rate regime, central banks let exchange rates to adjust freely instead of heavy foreign exchange market intervention. Hence, there might be no change or even an increase in REER volatility after the adoption of IT. According to Ball and Sheridan (2004) and Lin and Ye (2009), there is limited evidence that IT leads to more stable exchange rates in emerging markets.

As highlighted by Calvo and Reinhart (2002), higher REER volatility can be explained by "fear of floating". Although they have flexible exchange rate regimes officially, many central banks of emerging markets periodically intervene to avoid sharp currency movements. There might be persistent REER volatility due to such inconsistent interventions. Moreover, there might be a trade-off between financial stability and inflation control due to high financial dollarization and liability dollarization which increases the sensitivity to exchange rate movements. To protect the credibility of the IT regime, many central banks tolerate greater exchange rate fluctuations rather than the stabilization of the currency.

IT might be less effective to stabilize REER due to institutional weaknesses. The ability of the central banks to anchor expectations and effectively absorb external shocks is reduced due to credibility problems, weak monetary policy transmission, poor fiscal-monetary coordination and shallow financial markets. The results of Ouyang et al. (2016) related to REER volatility in emerging markets are inconclusive. To

summarize, REER volatility may even increase after IT adoption due to exchange rate flexibility, external vulnerabilities, institutional constraints, "fear of floating" and underdeveloped financial markets.

Increase in fiscal balance

Our results are consistent with the findings of Lucotte (2012): there is a significant improvement in fiscal balance after the adoption of IT. As IT reduces seigniorage revenues, governments are forced to improve tax collection efficiency and adopt more prudent fiscal policies. Note that adoption of IT is usually accompanied by broader institutional reforms that increase fiscal transparency, reduce budget deficits and strengthen fiscal discipline.

After IT adoption, there are reductions in inflation and nominal interest rates. Due to lower inflation, the cost of serving public debt decreases, especially in countries with large domestic debt burdens. Thus, there are improvements in fiscal balances. According to Ball and Sheridan (2004), IT reduces inflation and its volatility leading to lower interest payments of the government. Moreover, there are improvements in central bank independence. There are also fiscal deficit monetization limitations reducing fiscal dominance. Note that it is argued by Sargent and Wallace (1981) that fiscal dominance leads to weakened monetary control. On the other hand, IT helps separate monetary and fiscal responsibilities.

IT might lead to stronger credibility by reducing sovereign risk premiums and allowing governments to finance deficits at lower costs as claimed by Levy-Yeyati and Sturzenegger (2005). All in all, stronger institutions, enhanced credibility, reduced inflation and improved monetary-fiscal coordination contribute to better fiscal balances of IT adopters. These gains are conditional on countries' initial institutional capacity and macroeconomic conditions.

Increase in GDP per capita volatility and GDP volatility

Our results suggest that IT may increase GDP per capita volatility and GDP volatility in emerging markets. There might be short-run output instability due to shifts from fixed to flexible exchange rate regimes, price liberalization and the removal of direct controls. Lin and Ye (2009) find that IT may even increase output volatility during periods of structural transformation. Likewise, Ball and Sheridan (2004) suggest that output volatility can rise if central banks prioritize inflation stabilization over output stabilization.

Note that IT mainly focus on inflation control rather than smoothing business cycle fluctuations. There might be short-run trade-offs between economic stabilization and inflation control leading to fluctuations in consumption, investment and economic activity. According to the conclusions of Petrevski (2023), there is no robust evidence that IT lowers output volatility. The effectiveness of IT can be reduced by fiscal dominance, inconsistent policy frameworks, political interference and weak institutional credibility.

Economic volatility may increase if IT is not supported by credible institutions and consistent macroeconomic policies.

There might be persistent GDP volatility after the adoption of IT due to external shocks and global financial conditions. Many IT adopters are small open economies and these are exposed to capital flow reversals, commodity price shocks and global economic cycles following Roger (2009). When accompanied by flexible exchange rate regimes but not by sufficient financial or institutional buffers, the external shocks might transmit more directly into domestic output fluctuations. Overall, GDP volatility of IT adopters might increase due to vulnerability to external shocks, monetary policy focused on inflation, structural reforms and weak institutional credibility.

No change in inflation volatility

Our results indicate that IT does not necessarily reduce volatility of inflation in emerging markets. One argument is that there may be improvements in inflation performance even before the official adoption of IT due to broader economic reforms. According to Ball and Sheridan (2004), many improvements are due to regression to the mean rather than the direct causal effect of IT. Hence, there might be little additional decline in inflation volatility after the adoption of targeting framework.

Another explanation might be weak institutional credibility. Economic agents do not base their expectations on inflation target in countries with weak fiscal discipline, low policy transparency and limited central bank independence.

The effectiveness of IT in inflation stabilization can also be limited by external vulnerabilities. Many emerging markets are small open economies with exposure to exchange rate fluctuations, commodity price shocks and volatile capital flows. In such economies regardless of the macroeconomic framework, external shocks may dominate domestic monetary policy and prevent a significant fall in inflation framework. To summarize, there might be persistent inflation volatility after IT adoption due to regression to mean, limited credibility, weak institutions and continued exposure to external shocks.

Section VI. Robustness tests

To check robustness of our results, we estimate probit models with different covariates. First, we estimate it with an indicator of the popularity of IT (total number of countries that have adopted inflation targeting each year). Second, we include a structural parameter i.e. Central Bank Independence Extended Index. Lastly, we added the percentage of high technology exports out of total manufactured exports. We also included central bank independence index and fiscal balance.

Inclusion of a popularity of IT indicator

The probit model indicates as popularity of IT increases, central banks become more likely to adopt IT. All of our results are robust except increase in dollarization and inflation volatility based on some of our results. There is strong evidence that there is increase in REER volatility.

	Dollarization	**REER volatility**	**Inflation volatility**
Nearest-neighbor matching	3.618 (2.545)	1.243 (0.368) **	-0.68 (0.311) *
Three nearest – neigbor matching	3.655 (2.209)	1.323 (0.335) **	-0.987 (0.284) *
Five nearest – neigbor matching	3.89 (2.24)	1.263 (0.334) **	-1.078 (0.261) **
Radius matching (r=0.05)	8.027 (2.694) *	0.754 (0.35) *	-0.959 (0.661)
Radius matching (r=0.1)	7.913 (2.573) *	0.778 (0.321) *	-1.738 (0.81) *
Radius matching (r=0.2)	7.446 (2.525) *	0.76 (0.295) *	-2.912 (1.275) *
Kernel matching	8.002 (2.782) *	0.742 (0.338) *	-0.874 (0.577)

Table 5. ATT on dollarization, REER volatility and inflation volatility

Increase in dollarization

According to our results, IT adoption may increase financial dollarization is some emerging markets. This can be explained via credibility problems and greater exchange rate uncertainty throughout the transition to a new monetary regime. Mishkin and Savastano (2001) argue that the credibility of IT frameworks might be limited by weak institutions and fiscal dominance. Policy credibility can be further weakened by the inconsistencies between de jure and de facto exchange rate regimes following Levy-Yeyati and Sturzenegger (2005). Thus, economic agents might still prefer foreign-currency assets leading to increases in deposit and credit dollarization. The policy transition toward IT is usually coupled with a move towards more flexible exchange rates. This might encourage households and firms to hedge through dollar-denominated assets due to increased perceived currency risk.

There might be exchange rate depreciation and high-interest rate policies after the adoption of IT. Emerging markets with weak monetary credibility might experience exchange rate volatility under flexible regimes leading agents to shift savings and borrowing toward dollars following Calvo and Reinhart (2002). Exchange rate adjustments frequently involve currency depreciation as new policy is adopted after financial crises or stabilization programs. These might lead to increases in liability and deposit dollarization. Furthermore, central banks might sharply increase policy rates to build credibility, increasing the cost of local-currency borrowing. Thus, dollar-denominated loans become more attractive.

Persistent dollarization after IT adoption can also be explained by structural weaknesses in domestic financial markets. Economic agents are more likely to hold assets in foreign currency due to shallow domestic financial systems and limited local-currency instruments following Ize and Levy-Yeyati (2003). Confidence in flexible exchange rate regimes can be undermined by continuous foreign exchange interventions and inconsistent policy communication. According to Reinhart et al. (2003), such conflicted policy signals may increase the demand for dollar assets. To sum up, weak institutional credibility, exchange rate uncertainty, high interest rates, shallow financial markets and persistent fear of floating may explain increased dollarization after the adoption of IT.

Increase in REER volatility

There might be an increase in REER volatility after the adoption of IT as central banks' main aim is inflation stabilization rather than exchange rate stability. There are movements toward more flexible exchange rate regimes and reductions in foreign exchange interventions. This leads to increased fluctuation of currencies as a response to market conditions under IT. Hence, REER volatility increases as the exchange rate becomes a shock absorber rather than a direct policy instrument. There might be short-term capital flows and sharper currency fluctuations as central banks respond to inflation pressures via interest rate adjustments. There might be improvements in policy credibility and transparency leading to greater capital mobility and stronger foreign investor reactions to interest rate changes. This increases exposure

to global financial shocks and portfolio reallocations amplifying exchange rate volatility. Lin and Ye (2007) propose that greater interest rate volatility of IT adopters may translate into more volatile exchange rates. Brito and Bystedt (2010) find evidence that emerging-market IT adopters have higher REER volatility.

There might be an increase in REER volatility after IT adoption due to institutional and structural changes. As the focus shifts toward stabilization of inflation, there is reduced exchange rate management and increased aggressiveness of monetary policy. There might be limited foreign exchange rate intervention leading to more market-determined exchange rates. Moreover, there might be increased integration with international capital markets due to higher credibility and transparency. Consequently, IT frameworks might increase REER volatility via more flexible exchange rates, active interest rate policies and heightened responsiveness of capital flows to domestic and external shocks.

Decrease in inflation volatility

IT's main aim is to anchor inflation expectations and stabilize prices. These may lead to a decrease in inflation volatility. Central banks commit to explicit inflation targets, transparent communication and regular forecasting under IT. This reduces inflation uncertainty and better anchor expectations. Due to more stable expectations, there is less aggressive adjustment of prices by firms and more predictable wage-setting behavior. Thus, inflation responds to shocks less strongly. There is a reduction in market uncertainty and short-run inflation fluctuations as monetary policy becomes more systematic and rule-based. Also note that interest rates react more predictably to inflation deviations.

There is also enhanced central bank credibility. After the adoption of IT, central banks obtain higher independence from political pressures and enhance their commitment to low and stable inflation. Increased credibility leads to reductions in inflation persistence, exchange rate pass-through and inflationary impact of external shocks. The monetary transmission mechanism is strengthened via improved communication and more stable policy reactions. Note that IT adoption is often accompanied by stronger budget discipline, fiscal reforms and debt reduction. This lowers the fiscal-driven inflation risk.

Inflation volatility decline may be due to broader macroeconomic stabilization programs after periods of macroeconomic instability. Thus, inflation volatility reduction may partly reflect the normalization of economic conditions after crises. To summarize, IT may decrease inflation volatility via strengthening the institutional framework of monetary policy through anchored expectations, credible commitment, systematic policy rules, transparent communication, improved monetary transmission, reduced exchange-rate pass-through and better fiscal coordination.

Inclusion of a central bank independence index

The probit models indicate as central bank independence increases, central banks are more likely to adopt IT. There is a decrease in inflation, GDP growth, inflation volatility and REER (a depreciation) after IT adoption. Fiscal balance improves. REER volatility increases. Furthermore, there is a decline in GDP per capita growth.

Inclusion of percentage of high technology exports out of total manufactured exports

According to the main probit model including percentage of high technology exports out of total manufactured exports, countries with a more technologically advanced export structure are more likely to implement inflation targeting frameworks due to better infrastructure. There are some probit models with insignificant percentage of high technology exports out of total exports.

There is a decline in inflation, GDP growth and REER. On the other hand, GDP volatility, GDP per capita volatility, dollarization and fiscal balance increases.

Inclusion of a central bank independence index and fiscal balance

The probit models indicate as central bank independence index and fiscal balance improves, central banks are more likely to adopt IT. There is a decline in GDP growth and REER (a depreciation).

There is some evidence that inflation targeting is associated with higher REER volatility, GDP volatility and GDP per capita volatility under several matching specifications.

Section VII. Conclusion

The adoption of inflation targeting (IT) is a response to the past difficulties of central banks under fixed exchange rate or monetary aggregate targeting. There is an increasing popularity of IT among emerging economies. One of the reasons for this is the IMF's efforts to support and encourage emerging countries to adopt it.

We examine the impacts of IT on emerging and developing countries' inflation, output growth, dollarization, real effective exchange rate (REER), REER volatility, fiscal balance, output volatility and inflation volatility via a propensity score matching following Lin and Ye (2007, 2009 and 2013). Our

unbalanced panel includes 27 emerging inflation targeters and 35 emerging non-targeters (a total of 62 countries) between 1970 and 2023.

There is some evidence of lower inflation after IT adoption. Moreover, our results indicate there is a decrease in GDP growth after the introduction of IT. Furthermore, there is a decrease in REER suggesting there is a depreciation. The increase in fiscal balance implies the government becomes more efficient in tax collection after the loss of the seignorage income. There is also an increase in the volatility of the economy as GDP per capita volatility and GDP volatility increase. Our results are mainly robust across the different specifications of the probit model.

This paper contributes to the literature on IT by providing robust new evidence on its varied macroeconomic impacts in emerging and developing economies. Using a propensity score matching approach, the study finds that IT might fail to deliver the expected reductions of financial dollarization. IT is frequently linked to lower GDP growth, real exchange rate depreciation and higher output volatility. These outcomes reveal the complex trade-offs for policymakers, especially when key preconditions such as strong institutions, central bank independence and deep financial markets are only partially met.

The paper shows that the success of IT is highly conditional on supporting reforms. Merely adopting IT is not enough; credible structural and institutional reforms are crucial for achieving its goals. By broadening the analysis beyond inflation alone, this study deepens the debate on IT's appropriateness for emerging markets and highlights the need for coherent policy frameworks that ensure price stability while supporting growth, fiscal discipline and economic resilience.

An improvement of this study might be the comparison of macroeconomic outcomes of early adopters and late adopters. Note that there are data limitations and thus, we cannot capture full heterogeneity in sample countries.

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Appendix

A.1. Baseline model

Table A.1.1 Probit Models

Main probit model	Dollarization	REER	REER volatility	Fiscal Balance	Inflation volatility, GDP volatility, GDP per capita volatility
Inflation target dummy	Coef. (Standard error)				
Lagged inflation rate	-0.068 (0.012) **	-0.052 (0.012) **	-0.015 (0.01)	-0.037 (0.008) **	-0.026 (0.007) **
Broad money growth	-0.018 (0.005) **	-0.005 (0.005)	-0.001 (0.006)	-0.008 (0.004)	-0.008 (0.004)
GDP per capita growth	0.021 (0.017)	0.023 (0.015)	0.039 (0.015) *	0.012 (0.012)	0.021 (0.012)
IIP/10000	-0.051 (0.008) **	-0.03 (0.005) *	-0.027 (0.005) *	-0.034 (0.005) *	-0.034 (0.005) *
Trade to GDP	-0.01 (0.002) **	-0.012 (0.002) **	-0.012 (0.002) **	-0.012 (0.002) **	-0.01 (0.002) **
Constant	0.787 (0.188) **	0.721 (0.184) **	0.784 (0.19) **	0.684 (0.146) **	0.484 (0.138) **
Pseudo R^2	0.206 **	0.143 **	0.136 **	0.173 **	0.145 **
Number of observations	808	635	476	920	924

Table A.1.2 ATT on Dollarization, REER Volatility and Inflation Volatility

	ATT		
Main probit model	**Dollarization**	**REER volatility**	**Inflation volatility**
Nearest-neighbor matching	0.257 (2.801)	-0.237 (0.475)	-0.185 (0.286)
Three nearest – neighbor matching	0.762 (2.234)	-0.091 (0.429)	-0.068 (0.201)
Five nearest – neighbor matching	-0.02 (2.46)	0.108 (0.421)	-0.175 (0.217)
Radius matching (r=0.05)	1.812 (2.338)	0.296 (0.353)	-0.058 (0.209)
Radius matching (r=0.1)	1.261 (2.313)	0.277 (0.343)	-0.103 (0.207)
Radius matching (r=0.2)	0.196 (2.173)	0.276 (0.335)	-0.2534 (0.183)
Kernel matching	1.959 (2.191)	0.285 (0.371)	-0.066 (0.214)

A.2. Popularity of IT

Table A.2.1 Probit Models Related to Popularity of IT

	Popularity of IT	**Dollarization**	**REER**	**REER volatility**	**Fiscal Balance**	**Inflation volatility, GDP volatility, GDP per capita volatility**
Inflation target dummy	**Coef. (Standard error)**					
Lagged inflation rate	-0.064 (0.017) **	-0.093 (0.02) **	-0.028 (0.013) *	-0.024 (0.014)	-0.047 (0.011) **	-.05 (.012) **
Broad money growth	-0.014 (0.008)	-0.019 (0.01) *	-0.001 (0.005)	0 (0.005)	-0.012 (0.005) *	-.013 (.005) *
GDP per capita growth	0.031 (0.022)	0.045 (0.025)	0.032 (0.015) *	0.035 (0.016) *	0.02 (0.016)	.024 (.016)
IIP/10000	-0.037 (0.006) **	-0.036 (0.008) **	-0.032 (0.006) **	0.029 (0.006) **	-0.053 (0.007) **	-0.051 (0.007) **
Trade to GDP	-0.011 (0.002) **	-0.0149 (0.003) **	-0.012 (0.002)	-0.013 (0.002) **	-0.009 (0.002) **	-0.009 (0.002) **
Popularity of IT	-0.002 (0.0145)	-0.016 (0.017)	0.048 (0.006) **	0.045 (0.007) **	0.035 (0.006) **	0.035 (0.006) **
Constant	0.819 (0.634)	1.983 (0.747) **	-0.945 (0.287) **	-0.82 (0.306) **	-0.789 (0.239) *	-0.712 (0.249) *
Pseudo R^2	0.185	0.204 **	0.231 **	0.202 **	0.244 **	0.247 **
Number of observations	484	399	639	573	980	918

Table A.2.2 ATT on Inflation, GDP Growth, Fiscal Balance REER, GDP Volatility and GDP Per Capita Volatility

	ATT					
Popularity of IT	**Inflation**	**GDP growth**	**Fiscal balance**	**REER**	**GDP volatility**	**GDP per capita volatility**
Nearest-neighbor matching	-0.267 (0.36)	-0.722 (0.425)	1.692 (0.251) **	-9.227 (2.124) **	0.393 (0.199) *	0.391 (0.196) *
Three nearest – neighbor matching	-0.282 (0.351)	-0.642 (0.245) **	1.659 (0.198)***	-10.078 (1.694) **	0.545 (0.162) **	0.552 (0.159) **
Five nearest – neighbor matching	-0.178 (0.312)	-0.603 (0.175) **	1.584 (0.203) **	-9.146 (1.728) **	0.565 (0.151) **	0.563 (0.149) **
Radius matching (r=0.05)	-0.769 (0.378) *	-0.607 (0.184) *	1.832 (0.25) **	-6.925(1.4) **	0.377 (0.157) *	0.378 (0.15) *
Radius matching (r=0.1)	-0.778 (0.353) *	-0.608 (0.168) **	1.735 (0.241) **	-6.906 (1.476) **	0.353 (0.152) *	0.35 (0.152) *
Radius matching (r=0.2)	-1.014 (0.355) **	-0.563 (0.172) *	1.443 (0.228) **	-6.509 (1.39) **	0.267 (0.145)	0.264 (0.143)
Kernel matching	-0.811 (0.391) *	-0.606 (0.181) *	1.837 (0.255) **	-7.023139 (1.508) **	0.373 (0.157) *	0.372 (0.153) *

A.3. Central bank independence index (CBI)

Table A.3.1 Probit models related to CBI

	CBI	Dollarization	REER	REER volatility	Fiscal Balance	Inflation volatility, GDP volatility, GDP per capita volatility
Inflation target dummy	**Coef. (Standard error)**					
Lagged inflation rate	-0.056 (0.01) **	-0.088 (0.02) **	-0.044 (0.014) **	-0.039 (0.016) *	-0.054 (0.01) **	-0.057 (0.011) **
Broad money growth	-0.014 (0.005) *	-0.018 (0.009)	-0.008 (0.006)	-0.009 (0.006)	-0.014 (0.005) *	-0.016 (0.005) **
GDP per capita growth	0.012 (0.015)	0.048 (0.025)	0.018 (0.021)	0.023 (0.021)	0.015 (0.016)	0.019 (0.016)
IIP/10000	-0.056 (0.007) **	-0.036 (0.008) **	-0.05 (0.009) **	-0.044 (0.009) **	-0.055 (0.007) **	-0.053 (0.007) **
Trade to GDP	-0.008 (0.002) **	-0.014 (0.003) **	-0.016 (0.003) **	-0.017 (0.003) **	-0.008 (0.002) **	-0.009 (0.002) **
CBI	0.857 (0.278) **	-0.008 (0.467)	1.543 (0.46) **	1.504 (0.486) **	0.767 (0.284) *	0.771 (0.289) **
Constant	-0.257 (0.241)	1.352 (0.422) **	-0.171 (0.328)	-0.031 (0.348)	-0.195 (0.244)	-0.115 (0.253)

Pseudo R^2	0.223 **	0.203 **	0.214 **	0.198 **	0.212 **	0.215 **
Number of observations	1037	399	496	436	980	918

Table A.3.2 ATT on Inflation, GDP Growth, Dollarization and REER

	ATT			
CBI	**Inflation**	**GDP growth**	**Dollarization**	**REER**
Nearest-neighbor matching	-0.267 (0.36)	-0.722 (0.425)	4.964 (2.415) *	-11.274 (2.401) ****
Three nearest – neighbor matching	-0.282 (0.351)	-0.642 (0.245) **	2.577 (1.736)	-8.314 (1.897) ****
Five nearest – neighbor matching	-0.178 (0.312)	-0.603 (0.175) **	-.485 (2.098)	-7.629 (1.724) ****
Radius matching (r=0.05)	-0.769 (0.378) *	-0.607 (0.184) *	8.158 (2.374) **	-4.836 (1.495) ***
Radius matching (r=0.1)	-0.778 (0.353) *	-0.608 (0.168) **	7.774 (2.239) **	-4.585 (1.481) ***
Radius matching (r=0.2)	-1.014 (0.355) **	-0.563 (0.172) *	7.419 (2.267) **	-4.165 (1.406) ***
Kernel matching	-0.811 (0.391) *	-0.606 (0.181) *	8.142 (2.435) **	-4.658 (1.637) ***

Table A.3.3 ATT on REER Volatility, Fiscal Balance, GDP Volatility, GDP Per Capita Volatility and Inflation Volatility

	ATT				
CBI	**REER volatility**	**Fiscal balance**	**GDP volatility**	**GDP per capita volatility**	**Inflation volatility**
Nearest-neighbor matching	1.231 (0.648)	1.854 (0.333) **	0.406 (0.146)	0.401 (0.142) **	-0.426 (0.362)
Three nearest – neighbor matching	0.908 (0.548)	1.827 (0.27) **	0.357 (0.154) **	0.362 (0.15) *	-0.185 (0.205)
Five nearest – neighbor matching	1.141 (0.403) **	1.575 (0.259) **	0.34 (0.154) **	0.341 (0.148) *	-0.199 (0.167)
Radius matching (r=0.05)	0.663 (0.356) *	1.303 (0.262) **	0.226 (0.144)	0.24 (0.141)	-2.148 (1.36)
Radius matching (r=0.1)	0.691 (0.338) *	1.346 (0.242) **	0.207 (0.147)	0.221 (0.144)	-2.185 (1.218)
Radius matching (r=0.2)	0.655 (0.333) *	1.096 (0.234) **	0.134 (0.139)	0.144 (0.139)	-4.768 (2.042) *
Kernel matching	0.674 (0.336) *	1.319 (0.245) **	0.235 (0.143)	0.248 (0.148)	-2.532 (1.464)

A.4 Percentage of high technology exports over total manufactured exports

Table A.4.1 Probit Models Related to Percentage of High Technology Exports over Total Manufactured Exports

	Exports	**Dollarization**	**REER**	**REER volatility**	**Fiscal Balance**	**Inflation volatility, GDP volatility, GDP per capita volatility**
Inflation target dummy	**Coef. (Standard error)**					
Lagged inflation rate	-0.063 (0.017) **	-0.05 (0.019) *	-0.034 (0.017) *	-0.035 (0.017) *	-0.048 (0.012) **	-0.05 (0.019) *
Broad money growth	-0.013 (0.008)	-0.013 (0.01)	0.006 (0.009)	0.006 (0.009)	-0.002 (0.006)	-0.013 (0.01)
GDP per capita growth	0.032 (0.022)	0.028 (0.026)	0.03 (0.018)	0.027 (0.018)	0.029 (0.014) *	0.028 (0.026)
IIP/10000	-0.036 (0.007) **	-0.033 (0.007) **	-0.024 (0.005) **	-0.023 (0.005) **	-0.028 (0.005) **	-0.033 (0.007) **
Trade to GDP	-0.012 (0.002) **	-0.011 (0.003) **	-0.01 (0.003) **	-0.01 (0.003) **	-0.012 (0.002) **	-0.011 (0.003) **
Exports	0.01 (0.007)	0.011 (0.008)	-0.004 (0.006)	-0.004 (0.006)	0.014 (0.005) **	0.011 (0.008)
Constant	0.72 (0.233) **	0.634 (0.267)*	0.682 (0.251) **	0.682 (0.253) **	0.644 (0.177) **	0.634 (0.267)*
Pseudo R^2	0.188 **	0.174 **	0.111 **	0.105 **	0.149 **	0.174 **
Number of observations	484	370	365	357	706	370

Table A.4.2 ATT on Inflation, GDP Growth, Dollarization and REER

	ATT			
Exports	**Inflation**	**GDP growth**	**Dollarization**	**REER**
Nearest-neighbor matching	-1.169 (0.43) **	-1.429 (0.549) **	10.855 (2.424) **	-11.468 (2.211) **
Three nearest – neighbor matching	-0.75 (0.423)	-1.06 (0.242) **	8.299 (2.229) **	-10.955 (2.076) **
Five nearest – neighbor matching	-0.639 (0.396)	-1.013 (0.094) **	6.571 (2.174) **	-10.314 (1.9) **
Radius matching (r=0.05)	-0.821 (0.368) *	-0.651 (0.182) **	8.008 (2.473) **	-7.828 (1.61) **
Radius matching (r=0.1)	-0.811 (0.35) *	-0.599 (0.168) **	7.733 (2.534) **	-7.315 (1.576) **
Radius matching (r=0.2)	-0.941 (0.36) **	-0.548 (0.17) **	7.653 (2.334) **	-6.7 (1.606) **
Kernel matching	-0.781 (0.375) *	-0.668 (0.186) **	8.112 (2.44405) **	-7.907 (1.63) **

Table A.4.3 ATT on REER Volatility, Fiscal Balance, GDP Volatility, GDP Per Capita Volatility and Inflation Volatility

	ATT				
Exports	**REER volatility**	**Fiscal balance**	**GDP volatility**	**GDP per capita volatility**	**Inflation volatility**
Nearest-neighbor matching	-0.321 (0.402)	1.445 (0.275) **	0.532 (0.221) *	0.53 (0.216) *	-0.183 (0.174)
Three nearest – neighbor matching	-0.054 (0.422)	1.556 (0.209) **	0.651 (0.191) **	0.663 (0.189) **	-0.285 (0.183)
Five nearest – neighbor matching	-0.219 (0.478)	1.357 (0.236) **	0.714 (0.179) **	0.708 (0.178) **	-0.252 (0.16)
Radius matching (r=0.05)	0.04 (0.348)	1.252 (0.246) **	0.581 (0.248) *	0.57 (0.243) **	-0.093 (0.226)
Radius matching (r=0.1)	0.13 (0.308)	1.209 (0.241) **	0.573 (0.243) *	0.563 (0.229) *	-0.108 (0.22)
Radius matching (r=0.2)	0.161 (0.313)	1.09 (0.238) **	0.533 (0.24) *	0.52 (0.242) *	-0.198 (0.235)
Kernel matching	-0.011 (0.316)	1.258 (0.26) **	0.595 (0.233) *	0.586 (0.237) *	-0.07 (0.247)

A.5. Fiscal balance and CBI

Table A.5.1 Probit Models Related to Fiscal Balance and CBI

	Fiscal balance and CBI	**Dollarization**	**REER**	**REER volatility**	**Inflation volatility, GDP volatility, GDP per capita volatility**
Inflation target dummy	**Coef. (Standard error)**				
Lagged inflation rate	-0.055 (0.01) **	-0.078 (0.013) **	-0.043 (0.014) *	-0.034 (0.016) *	-0.053 (0.011) **
Broad money growth	-0.015 (0.005) **	-0.02 (0.005) **	-0.011 (0.006)	-0.014 (0.007) *	-0.017 (0.005) **
GDP per capita growth	0.001 (0.016)	0.019 (0.019)	0.023 (0.022)	0.025 (0.024)	0.008 (.017)
IIP/10000	-0.058 (0.007) **	-0.051 (0.008) **	-0.05 (0.009) **	-0.045 (0.009) **	-0.0542 (0.00718) **
Trade to GDP	-0.009 (0.002) **	-0.011 (0.002) **	-0.016 (0.003) **	-0.018 (0.003)	-0.01 (0.002) **
CBI	0.771 (0.286) **	0.085 (0.33)	1.729 (0.477) **	1.662 (0.509) **	0.573 (0.302)
Fiscal balance	0.05 (0.014) **	0.051 (0.016) *	0.044 (0.024)	0.071 (0.027) **	0.058 (0.015) **
Constant	-0.002 (0.25)	0.97 (0.298) **	-0.125 (0.337)	0.172 (0.36)	0.257 (0.267)

Pseudo R^2	0.223 **	0.227 **	0.218 **	0.213 **	0.219 **
Number of observations	980	765	480	420	856

Table A.5.2 ATT on Inflation, GDP Growth, Dollarization and REER

	ATT			
Fiscal balance and CBI	**Inflation**	**GDP growth**	**Dollarization**	**REER**
Nearest-neighbor matching	-0.928 (0.527)	-1.096 (0.286) **	1.365 (2.193)	-11.404 (1.91) **
Three nearest – neighbor matching	-0.863 (0.462)	-1.49 (0.041) **	-1.578 (3.089)	-9.707 (2.597) **
Five nearest – neighbor matching	-0.925 (0.39) *	-1.126 (0.073) **	-1.471521 (2.71139)	-8.831 (2.012) **
Radius matching (r=0.05)	-2.014 (1.111)	-0.59 (0.168) **	-0.428 (1.884)	-5.854 (1.52) **
Radius matching (r=0.1)	-2.04 (1.282)	-0.577 (0.158) **	-0.326 (1.921)	-5.555 (1.461) **
Radius matching (r=0.2)	-3.822 (2.455)	-0.546 (0.141) **	-1.28 (1.962)	-5.285 (1.475) **

Table A.5.3 ATT on REER Volatility, GDP Volatility, GDP Per Capita Volatility and Inflation Volatility

	ATT			
Fiscal balance and CBI	**REER volatility**	**GDP volatility**	**GDP per capita volatility**	**Inflation volatility**
Nearest-neighbor matching	1.337 (0.656) *	0.194 (0.173)	0.208 (0.171)	-1.043 (0.386) **
Three nearest – neighbor matching	0.93 (0.4)	0.385 (0.138) **	0.396 (0.134) **	-0.408 (0.302)
Five nearest – neighbor matching	0.886 (0.407) *	0.352 (0.132) **	0.365 (0.13) **	-0.357 (0.23)
Radius matching (r=0.05)	0.332 (0.373)	0.301 (0.145) *	0.318 (0.147) *	-1.182 (0.915)
Radius matching (r=0.1)	0.393 (0.352)	0.263 (0.145)	0.276 (0.148)	-1.298 (0.898)
Radius matching (r=0.2)	0.361 (0.34)	0.181 (0.15)	0.191 (0.138)	-2.076 (1.351)
Kernel matching	0.365 (0.399)	0.307 (0.159)	0.325 (0.14) *	-1.274 (0.846)

A.6. An indicator of the popularity of IT

A.6.1 An Indicator of the Popularity of IT i.e. the Number of Countries that Adopting IT Each Year

Year	Number of IT countries	Year	Number of IT countries
1990	1	2007	28
1991	2	2008	28
1992	3	2009	30
1993	5	2010	30
1994	5	2011	32
1995	5	2012	33
1996	5	2013	36
1997	7	2014	36
1998	8	2015	40
1999	11	2016	40
2000	13	2017	41
2001	20	2018	41
2002	20	2019	41
2003	20	2020	41
2004	20	2021	41
2005	23	2022	41
2006	26	2023	41