PANOECONOMICUS, 2014, 1, Special Issue, pp. 79-106
Received: 14 September 2013; Accepted: 16 November 2013.

UDC 336.748.12 (100)
DOI: 10.2298/PAN1401079J
Original scientific paper

Kosta Josifidis

Department of European Economics and Business,
Faculty of Economics Subotica,
University of Novi Sad,
Serbia

josifidis@gmail.com

Emilija Beker Pucar

Department of European Economics and Business,
Faculty of Economics Subotica,
University of Novi Sad,
Serbia

emilijabp@gmail.com

Slađana Srdić

Department of European Economics and Business,
Faculty of Economics Subotica,
University of Novi Sad,
Serbia

srdicsladja@gmail.com

Gabriela Ivan

Department of European Economics and Business,
Faculty of Economics Subotica,
University of Novi Sad,
Serbia

gabriela@ef.uns.ac.rs

The authors are grateful to two anonymous referees, as well as the participants of 10th International Conference "Developments in Economic Theory and Policy", for helpful and valuable comments and suggestions. Any error is responsibility of the authors.

Inflation Targeting in Advanced vs. Emerging Economies before and after the Crisis

Summary: Emerging economies have specificities which distance them compared to advanced economies in practicing inflation targeting (IT) monetary regime. One of the main differences in performing IT in advanced compared to emerging economies is "fear of floating" problem in emerging group. However, on the road from exchange rate (ER) as a nominal anchor to IT, differences between advanced and emerging economies concerning "fear of floating" have been more or less narrowed. In this paper we are concentrated to selected aspects of ER pass-through to prices and output, as well as (in)direct monetary policy reactions to ER shocks, trying to find out is significant difference observable between advanced and emerging IT countries in pre-crisis period and (post)crisis period. The comparison is made on the basis of forecast error variance decompositions from estimated Vector Autoregression (VAR) / Vector Error Correction (VEC) models. "Fear of floating" phenomenon should not be exclusively applied to emerging economies, especially in the crisis period burdened with external shocks. The role of ER in IT monetary framework is strengthened with higher internal vulnerability to ER shocks, despite the level of economic development. Advanced countries more use interest rate as an indirect way to withstand ER shocks, while emerging economies more use direct way via foreign exchange interventions to withstand the ER shocks.

Key words: Inflation targeting, Exchange rate shocks, Internal vulnerability, Monetary response, "Fear of floating", Advanced economies, Emerging economies.

JEL: E42, F41.

Emerging economies generally have specificities which distance them compared to advanced economies in practicing inflation targeting (IT) monetary regime. Emerging, including transition economies, pass-through abrupt structural changes on their development (and transition) road including raising vulnerability to external shocks as a consequence of trade and capital liberalization. While institutional aspects (above all, central bank independence, coordination of fiscal and monetary policy, transparency and responsibility of monetary authority, as well as development of financial markets) could also pose a threat to successful IT, other crucial and inherent vulnerabilities seriously aggravate the combination of flexible exchange rate (ER) arrangement and IT monetary framework in emerging economies.

Frederic S. Mishkin (2004, 2006) emphasizes main differences between emerging and advanced economies in conducting IT regimes: weak fiscal institu-

tions, weak financial institutions including monitoring and regulations by the government, low credibility of monetary institutions, "currency mismatching" problem, "sudden stop" problems, etc. Paul R. Masson, Miguel A. Savastano, and Sunil Sharma (1997), Roberto Golinelli and Riccardo Rovelli (2001), Jiri Jonas (2003), Jonas and Mishkin (2003), Mishkin (2004, 2007), Gill Hammond (2012) stress that successful IT assumes strong fiscal position, relatively low inflation, relatively predictable and understandable monetary transmission mechanism, developed financial system including developed financial market with non-monetary government financing and developed money market providing quick effects of monetary policy instruments, central bank independence and clear mandate towards price stability, central bank capacity to model and predict inflation, absence of another nominal anchor (mainly ER anchor) besides inflation target, as well as transparent and responsible monetary policy.

In order to highlight the difference between advanced IT and non-IT countries, Mishkin (2007) explores and compares their macroeconomic performances, concluding that IT regime has positive effects in reducing inflation in the long run, bringing weaker reaction of inflation to exchange rate and oil shocks, and strengthening independence and improvement of monetary policy effectiveness. However, benefits from IT practicing are higher if countries have already conducted disinflation with the possibility to set stationary inflation targets. Despite the benefits produced with IT regimes it couldn't be concluded that performances of IT countries are better than performances of advanced non-IT countries. Rather the performances are similar to the group of developed countries without explicit nominal anchor. Comparing performances of advanced non-IT countries and emerging IT countries, these are much better for advanced IT countries. Siok Kun Sek and Wai Mun Har (2012) evaluates the performance of IT regime in three emerging East-Asian economies which switched from rigid ER regime towards flexible ER with IT monetary framework after the financial crisis 1997-1998. The authors compare inflation and output growth/gap between pre- and post-IT periods via bivariate GARCH (1,1) model. Their findings reveal lower variability in inflation and output growth after IT implementation, as well as decline in inflation persistency. Gerald Epstein and Erinc Yeldan (2008) explored selected macroeconomic indicators of emerging IT economies as annual average five years before and after the adoption of IT monetary framework. While evidence from the growth performance of IT countries and adjustment patterns of the trade balance are mixed and diversed, the figures on unemployment indicate a significant increase in the post-IT era, while most currencies appreciated in the aftermath of IT adoption. Authors argued that orthodoxy of central banking, based on top priority of central banks to keep inflation in low single digit, is neither optimal nor desirable. Researching impacts and responses of Latin America to global economic crisis, Michael Cohen (2012) also argued that the crisis made clear that the focus of monetary authorities on inflation is suboptimal. The experience of Latin America, as well as other parts of the world, clearly shows that central banks should have multiple objectives. The experiences of LAE during the boom period 2004-2008 indicates that IT may actually limit central banks' action in the case if a rapid expansion of domestic demand is not reflected in growing inflation, mainly because

it is accompanied by exchange rate appreciation and consequently worsening of current account balances. The same doubt concerning the effectiveness of IT in emerging LAE could be found in Carlos A. Carrasco and Jesus Ferreiro (2011). The authors were concentrated to Mexico as inflation targeter, trying to reveal whether the implementation of IT (in 1999) and/or full-fledged IT (in 2001) have influenced inflation performance in Mexico. The results indicate that economic growth wasn't affected, although it was more stable than in the past. Albeit anchoring of inflation expectations to the inflation target represents the main contribution of IT as a monetary strategy, the improvements related with lower and more stable inflation in Mexico cannot be solely (or mainly) attributed to the adoption of IT. Nelson H. Barbosa-Filho (2008) analysed Brazilian experience with IT monetary strategy in the period 1999-2006 comparing the periods of ER targeting and IT targeting. The author revealed that IT was successful in reducing inflation after 1999 and 2002 currency crises mainly due to ER appreciation. Concerning the economic growth before and after IT adoption, the author stated that it was slow under IT compared to ER targeting, although with an upward trend and smaller volatility during IT phase.

One of the main differences in performing IT monetary regime in advanced compared to emerging economies is "fear of floating" problem. Emerging economies due to inherent vulnerabilities couldn't allow significant ER movements. "Fear of floating" is a complex problem as a combination of unofficial dollarization/euroization in these economies, relatively high exchange rate (ER) pass-through to inflation and real economy, as well as already expressed external imbalances. Due to these obstacles, ER cannot fluctuate dominantly freely according to foreign exchange market pressures. Nevertheless, there is a potential danger that ER transforms to a nominal anchor having in mind over excessive focus of monetary authorities to ER movements. The situation in which monetary authority *de facto* target ER and inflation rate points to dual anchor or two target coexistence. Dual targets and anchors complicate the performance of IT regime since, as is well known, IT assumes exclusively focus to inflation rate as a nominal anchor. This kind of hybrid regime (with two anchors and targets) could be viewed as a preparatory phase for full-fledged, strict IT or a kind of IT modality acceptable for emerging and transition economies. It could be considered that hybrid monetary concept, as a matter of fact, is a type of IT typical for emerging and transition economies in which macroeconomic circumstances don't allow strict IT framework. The nature of IT in emerging and transition economies was investiged by Joshua Aizenman, Michael Hutcchison, and Ilan Noy (2011). The authors estimated panel data for 16 emerging IT countries in the period 1989-2006. According to key findings, authors concluded that emerging IT countries doesn't follow "pure" IT strategy since external variables play an important role in the policy rule having in mind systematic response to the real ER. This kind of strategy, marked as "mixed strategy", focuses both variables inflation and real exchange rate. Although monetary response to real ER was more constrained in IT compared to non-IT countries, the authors found stronger response in those IT countries with high concentration in commodity exports.

The focus of this paper is the phase when selected emerging economies adopted IT monetary framework. IT period is split to the pre-crisis period (first sub-

period) and (post)crisis period (second sub-period) trying to shed some light to the differences between emerging (EEE and Latin American Economies (LAE) emerging groups) and advanced IT economies which pioneered with IT framework. The comparison is based on differences in ERPT to inflation and output variations, as well as monetary response to ER shocks according to revealed internal vulnerability.

The paper is structured in the following way. Section 1 explains specificities of IT in emerging economies with the special focus to the role of an ER in IT framework. Section 2 deals with methodology issues, namely, country sample, time series, sub-periods and empirical procedure. Section 3 presents the discussion of key findings, i.e. vulnerability of selected countries to ER shocks (ERPT to consumer prices and industrial production) and monetary policy response to ER shocks (the extent of "fear of floating"). Section 4 reveals concluding remarks.

1. Inflation Targeting in Emerging Economies: The Role of an Exchange Rate

The potential danger in practicing IT monetary strategy in emerging economies exists when ER depreciations must be limited due to macroeconomic fragility to external shocks (foreign demand fall, drop in export prices, sudden capital outflows, etc). In such situations, ER depreciations could threat inflation target, as a primary goal in IT framework, or financial stability having in mind burdened debt servicing in the case of unofficial financial dollarization/euroization. Therefore, the question is could monetary authorities in these circumstances allow relatively free ER fluctuations? If the answer is no, then the main argument in favor of flexible ER (ER as a shock absorber) has been lost. Crucial limits for relatively free ER fluctuations and narrowed maneuver space for monetary policy in emerging economies are stronger ERPT combined with more persistent inflationary expectations, unofficial financial dollarization/euroization, as well as external (mainly deficit) imbalances.

If ERPT to inflation is relatively stronger, the cost of inflation rise dominates over redistributive adjustment mechanism (competitiveness gain). Carrasco and Ferreiro (2013) analysed inflationary expectations in IT framework in the case of Mexico for the period 2004-2011 using unit root, normality and cointegration tests. The authors confirmed the dominant role of ER channel in monetary transmission mechanism in a small open economy with IT monetary framework. Daniel Daianu and Laurian Lungu (2007) investigate IT regime in transition economies concluding that despite different economic performances of Poland, Czech Republic, Slovakia and Hungary, common challenge for these countries is ER control within IT regime. Authors claim that ER channel is dominant in monetary transmission mechanism and that central banks are under specific pressure having in mind energy and agricultural prices (vulnerability to external shocks), as well as necessity for domestic structural and fiscal adjustments. Helena Horská (2004) investigates IT in Poland and Hungary, with the review of Czech case, claiming that ER channel dominates in the short run in monetary transmission mechanism. Besides, interest rate channel is secondary and initially weak, but gets stronger during time. The weakness of interest rate channel the author explains with inelasticity of credit demand to domestic interest rate and inefficient banking system. Stronger ER transmission to prices in the case of transi-

tion economies also confirm Fabrizio Coricelli, Boštjan Jazbec, and Igor Maston (2004), while Kosta Josifidis, Jean-Pierre Allegret, and Emilija Beker Pucar (2009) confirm dominance of ERPT over interest rate pass-through in monetary transmission mechanism of Poland, Czech Republic, Slovakia, Hungary and Serbia, especially at the beginning of transition process. The authors explored the road of selected Eastern European Economies (EEE) which pass through the three phases: macroeconomic stabilization phase or ER as a nominal anchor phase, intermediate (hybrid) ER regime and, finally, adoption of managed floating ER regime in the combination with preparatory (later full-fledged) IT monetary framework. At the third phase, some of key vulnerabilities have been decreased in the sense of lower exchange rate pass-through (ERPT) and less influence to ER. Sebastian Edwards (2006) finds that emerging countries which adopted IT experienced a decline in the pass-through from ER changes to inflation. Therefore, most emerging IT countries have previously prepared for managed floating ER regime in the combination with IT monetary framework. Mark Stone et al. (2009) confirm that non-IT emerging economies more manage the ER and that policy implementation tends to be based on foreign exchange intervention that is more *ad hoc* and less market-based. ER channels are stronger and more uncertain for the typical non-IT emerging economies. These countries are less financially developed, more dollarized, and with less overall credibility compared to IT emerging economies.

Inflationary expectations, nominal anchor and credibility of monetary policy are another source of vulnerability. Less developed economies have had very persistent and downward rigid inflationary expectations due to former inflationary episodes and insufficient credibility of monetary policy to restrain inflation. Consequently, traditional anchor in such economies is an exchange rate. However, there are opinions that IT implementation in combination with flexible ER during time contribute to a restrain of inflationary expectations, as well as wage and price indexation (Mishkin 2004; Mishkin and Klaus Schmidt-Hebbel 2007).

Unofficial financial dollarization/euroization is next problem connected with previous vulnerability indicators, mainly as a consequence of negative monetary past and lack of confidence in monetary authority, monetary regime and domestic currency. Under unofficial financial dollarization/euroization monetary authorities couldn't afford excessive ER fluctuations because stronger ER depreciation threaten balances of firms, residents and fiscal position, having in mind debt servicing in foreign currency. This problem is known as negative balance sheet effect, "currency mismatching", or "original sin". Jorge Desormeaux (2006) considers that combination of full or strict IT and flexible ER could help emerging economies in reducing of financial dollarization. As successful examples author mentions Chile and Peru stressing that successful de-dollarization assumes strong institutions and monetary policy, as well as strengthening of financial sector (promotion of domestic currency and hedging activities, stronger financial regulations and security measures) and adequate combination of ER and monetary regime. Regarding last condition of financial de-dollarization, it is highlighted that IT contribute to monetary policy credibility, low and stable inflation ambient, while flexible ER overcomes "fear of floating" problem. In order to reduce the level of financial dollarization/euroization time is relevant fac-

tor in order to strengthen credibility of monetary authorities, to gain credibility to monetary policy regime and to perform *de facto* switch towards a new anchor.

Similar specificities in IT practicing, related with the role of ER in emerging economies, are underlined in Stone et al. (2009). Authors claim that the enhanced role of the ER in IT emerging economies reflects strong, uncertain, and heterogeneous ER channels. First, pass-through from the ER to inflation is especially important for emerging economies, in part reflecting lower policy credibility. Second, many emerging economies manage the ER to mitigate the impact on output of relatively short-term currency movements. A third, longstanding motivation for active management of the ER is to promote financial stability, particularly against the impact of a potential depreciation on balance sheets with currency mismatches. Fourth, ER management can also help avoid or mitigate the adverse consequences for external stability of a "sudden stop" in capital inflows. Fifth, underdeveloped domestic financial markets reduce the scope for ER flexibility by amplifying ER shocks and constraining policy implementation. Finally, a high degree of overall policy credibility frees up the ER to float and enhances policy implementation and thus is necessary for the adoption of a full-fledged IT nominal anchor.

Christopher P. Ball and Javier Reyes (2004) based on the Guillermo A. Calvo and Carmen M. Reinhart (2002) tried to identify the difference between "fear of floating", IT and ER targeting. Their research is concentrated on the distinction between *de jure* and *de facto* adopted ER and monetary regimes. Countries with *de jure* IT as a monetary framework could *de facto* target an ER or express so called "fear of floating". The authors examine variability of ER, nominal and real interest rate, and foreign exchange reserves, in order to find the difference between strict IT and ER targeting. Crucial difference between "fear of floating" and strict IT lies in monetary policy reactions to nominal ER changes. In IT regime interest rate should react to nominal exchange rate (NER) depreciations only if inflation target is threatened, not in the case of all ER depreciation episodes. Besides, credible and strict IT is compatible with managed and free floating ER regimes, while "fear of floating" is closer to ER targeting. In most examined cases, *de jure* and *de facto* IT coincides, except five countries with *de jure* IT and *de facto* "fear of floating" (the cases of Brazil, Colombia, Peru, South Africa and Poland).

"Fear of floating phenomenon is, indeed, widespread and cuts across regions and levels of development. Fear of floating - or more generally, fear of large currency swings - is pervasive for a variety of reasons, particularly among emerging market countries. In sum, economic theory provides us with well-defined distinctions between fixed and flexible ER regimes, but we are not aware of any criteria that allow us to discriminate as to when a managed float starts to look like a soft peg. Indeed, it is often quite difficult to distinguish between the two. On the basis of the empirical evidence, perhaps, all that we can say is that, when it comes to exchange rate policy, discretion rules the day" (Calvo and Reinhart 2002, pp. 404-405).

Schmidt-Hebbel and Alejandro Werner (2002) explores the experiences of IT Latin American economies (LAE), namely Brazil, Chile and Mexico, with the comparison to a control group of other countries. Authors concluded that the three inflation targeters exhibit "fear of floating" considering frequency and intensity of steri-

lized exchange interventions in comparison to other inflation targeters that float more freely. From the side of relatively large ER volatility and moderate international reserve holdings, as well as declining inflation-to-devaluation pass-through coefficients with little evidence for monetary policy reaction to ER shocks, explored LAE didn't exhibit "fear of floating" in IT monetary framework. Carlos A. Ibarra (2008) investigated "fear of floating" in the case of three LAE inflation targeters, namely Chile, Colombia and Mexico. The author showed that "fear of floating" is becoming weaker as the period of floating lengthens in investigated LAE. Exchange rate volatility has risen since adoption of floating ER regime, although this is rather gradual process than discrete adjustment. Decreasing "fear of floating" phenomenon may be the result of a circular mechanism, i.e. rising ER volatility is connected with decreasing effects on output and inflation, and when these transmission effects weaken monetary authorities won't limit ER fluctuations significantly.

Taking into account crucial obstacles to successful IT in emerging economies, some authors investigated different types or sub-regimes within IT framework. Thus, Lucjan T. Orlowski (2000, 2005) suggests "light" IT sub-regime or dynamic approach to IT for transition economies confronted with already mentioned problems in performing full-fledged IT. Alina Carare and Stone (2006) identify three IT sub-regimes: full-fledged IT, eclectic IT, and light IT. Although IT proves to be successful in less and middle developed economies, United States of America (USA), European Monetary Union (EMU) and Japan never officially adopted IT. Restraint from explicit acceptance of pure IT regime is connected with the attempt to avoid over excessive focus to inflation target by violating goals of real economy, not to forget the fact that strong economies doesn't need firm and transparent anchor at all. Hans Genberg (2002) distinguish between strict and flexible IT stressing that strict IT assumes exclusive focus to inflation target, while flexible IT offers some weight to the other economic policy goals (if they are not confronted with the primary price stability goal). Lars E. O. Svensson (2007) highlight that even in the case if these advanced economies adopt IT, it will be rather in the form of flexible IT, not in the form of rigid, strict or pure IT regime.

2. Methodology Issues

Advanced IT economies used in our analysis are Australia, Canada, Norway, New Zealand, United Kingdom (UK), Iceland, and Sweden. Emerging IT economies include Brazil, Chile, Colombia, Mexico, Peru (LAE), Czech Republic, Hungary, and Poland (EEE). Selected countries with the years of IT adoption, along with other important informations for econometric analysis are presented in Table 1 in Appendix. Detailed review of IT contries could be found in Hammond (2012) and Peter Warburton and Joanna Davies (2013), while classification of monetary policy frameworks for all member countries could be found in International Monetary Fund - IMF (2012).

The evolution of nominal ER (national currency per base currency, US dollars, end of period, yearly data) in explored advanced and emerging IT economies in the period since IT adoption until 2013 is shown in Figure 1 in Appendix. Common pattern of nominal ER evolution in advanced, as well as emerging economies, is apprec-

iation tendency in the years prior the crisis. All countries in 2008-2009 crisis years experienced depreciation pressures in more or less extent. National currencies of LAE recovered relatively quickly after the crisis years, while in the case of EEE the appreciation path restored with a longer delay compared to LAE. Currencies of advanced IT economies also recovered relatively quickly, as in the case of LAE, with the continuation of appreciation trend. The exception in the group of advanced IT economies is Iceland which has been severely hit with the crisis and experienced strong and persistent currency weakening.

In order to reveal the difference between advanced and emerging economies in vulnerability to ER shocks and accompanying monetary response to ER shocks, forecast error variance decomposition results are derived from estimated Vector Autoregression (VAR) / Vector Error Correction (VEC) models. Vulnerability to ER shocks is tracked as nominal ER (impulse) transmission to consumer price index (response) and industrial production (response). Monetary policy response to ER shocks is observed via nominal ER transmission (impulse) to interest rate (response) and foreign exchange reserves (response). These main relations, namely ER pass-through to inflation, industrial production, interest rate and foreign reserves, are analyzed during 24 months since ER shock (impulse) occurrence.

All time series of monthly frequency are obtained through IMF International Financial Statistics[1] including: Industrial production - IP (manufacturing, seasonally adjusted), Consumer prices - CPI (Index 2005=100), Interest rate - IR (money market rate), Nominal effective exchange rate - NEER (consumer price index), Official Reserve Assets - FR (Foreign Currency Reserves in Convertible Foreign Currencies, US Dollar). The exact time series and time sub-periods used in the case of selected countries are presented in Table 1 in Appendix.

Research period starts with the year when selected countries adopted IT until global economic crisis (August 2007), named as first sub-period or pre-crisis period. The second sub-period starts with August 2007 until data are available (depends from the database, but generally until January 2013), named (post)crisis period.

Time series were primarily transformed in log values (with the exemption of an interest rate), followed with stationarity testing via Augmented Dickey-Fuller (ADF), Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and Dickey-Fuller test statistic using a generalized least squares GLS (DF-GLS). The results of stationarity testing in the level and in the first differences are presented in Table 2 in Appendix.

If both series are non-stationary Johansen's cointegration test is performed. If the cointegration is confirmed, VEC model is estimated. If cointegration isn't confirmed, VAR model is estimated in the first differences. Results of cointegration testing are presented in Table 3 in Appendix. If one series is stationary, but another one is non-stationary, VAR model is estimated with previously differencing of series with unit root. If both series are stationary they enter in VAR model in the level. Finally, after estimation of VAR or VEC model, depending from stationarity and cointegration tests, forecast error variance decomposition results are derived with nominal ER as an impulse from one side, and prices, industrial production, interest rate and

[1] **International Monetary Fund - IMF.** 2013. "Data and Statistics - International Financial Statistics." http://elibrary-data.imf.org/.

foreign reserves as responses from the other side. Forecast error variance decomposition results are further analyzed and presented with Figures 2-5.

3. The Discussion of Results

If ERPT to consumer prices and industrial production is higher, then ER movements destabilize internal balance in the sense of potential inflationary pressures or contractionary pressures of real economy. If this is the case, it is expected that monetary response, indirectly via interest rate or directly via foreign exchange interventions, to ER shocks is stronger. Conventional thought is that advanced economies less limit ER fluctuations due to their less vulnerability (less transmission of ER shocks to the inflation and output), while emerging economies more care about ER fluctuations since these movements are transmitted to their internal and external imbalance. Empirical findings reveal are there such striking differences in performing IT in the case of advanced vs. emerging economies having in mind ERPT to inflation and real economy and, accordingly, is there any significant difference in monetary reactions to ER shocks.

Since global economic crisis brought strong external trade and financial shocks (significant drop in export demand and export prices from one side, and abrupt sudden stop problem or even capital outflows from the other side), the results reveal if something changed in (post)crisis sub-period having in mind the role of ER in IT monetary regime on relation advanced vs. emerging economies. Under external shocks monetary authorities in IT regime balance between allowing market-oriented ER depreciation from one side, and limiting ER movements to prevent stronger transmission to internal inflationary and real balance from the other side. We expect higher vulnerability to ER shocks in explored countries and higher managing of ER fluctuations in the (post)crisis period. Concerning the way of managing ER movements, it could be expected that advanced economies use more interest rate as an indirect way, while for emerging economies is expected to use more direct way or foreign exchange interventions to limit excessive depreciations.

3.1 Vulnerability of Selected Countries to Exchange Rate Shocks: Exchange Rate Pass-Through to Consumer Prices and Industrial Production

Observing ER transmission to consumer prices there is no clear line or striking difference between advanced and emerging economies (Figure 2a and 2b).

ERPT in EEE didn't pass 12% of CPI variations in both periods. In the group of LAE, ERPT in Mexico was raised from minor transmission in pre-crisis period to around 25% of consumer prices variations. Most striking difference between subperiods is in the case of Peru which ERPT vary from very low in the pre-crisis period to almost 80% in the (post)crisis period.

In the group of advanced economies, there is no change concerning ERPT in the cases of Canada, Norway, UK, Sweden, and Iceland. However, Swedish ERPT (60% in the second sub-period) and Iceland ERPT (above 30% in the second subperiod) remained relatively high (the highest from all explored countries) in both periods.

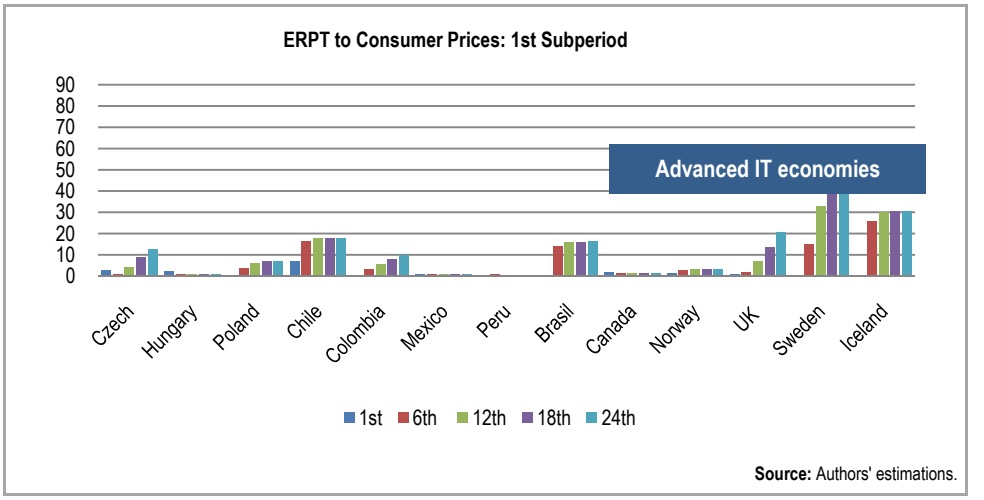


Figure 2a ERPT to Consumer Prices in the Pre-Crisis Period in Advanced and Emerging IT Countries

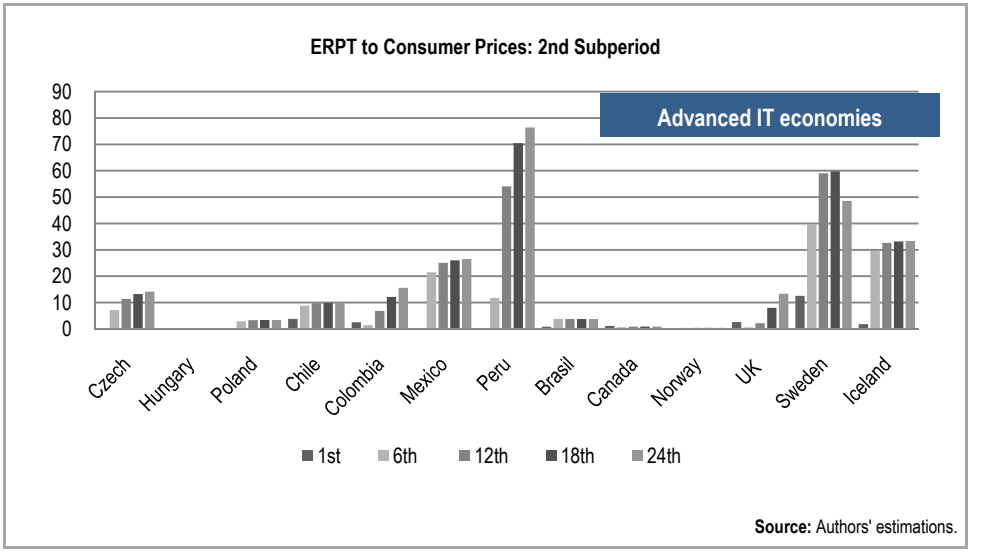


Figure 2b ERPT to Consumer Prices in the (Post)Crisis Period in Advanced and Emerging IT Countries

From the other side, ERTP to the real economy indicator, namely industrial production variations, points to higher vulnerability in the second sub-period in most countries (Figure 3a and 3b). In the first sub-period results don't point to relevant difference between emerging and advanced economies. In EEE group, Polish vulnerability was the highest (around 7%), in the group of LAE Peru expressed relatively highest vulnerability (below 5%), and Iceland in the group of advanced IT countries with 8% of industrial production variations.

In the second sub-period rise in real vulnerability is obvious in the cases of LAE at the first place, as well as some advanced countries. For the case of Brazil this

difference is 3% in the first sub-period to almost 40% in the second sub-period; Chile from around 1% to 12%; Mexico from around 1% to 5%; Peru from 5% to 8%. In the group of EEE real economy variations due to ER shock increased in the case of Czech Republic (from below 1% to around 7%); Hungary (below 1% to around 3%); while Poland[2] is the exemption with reduced real vulnerability in crisis period (decrease from around 6% to below 1%).

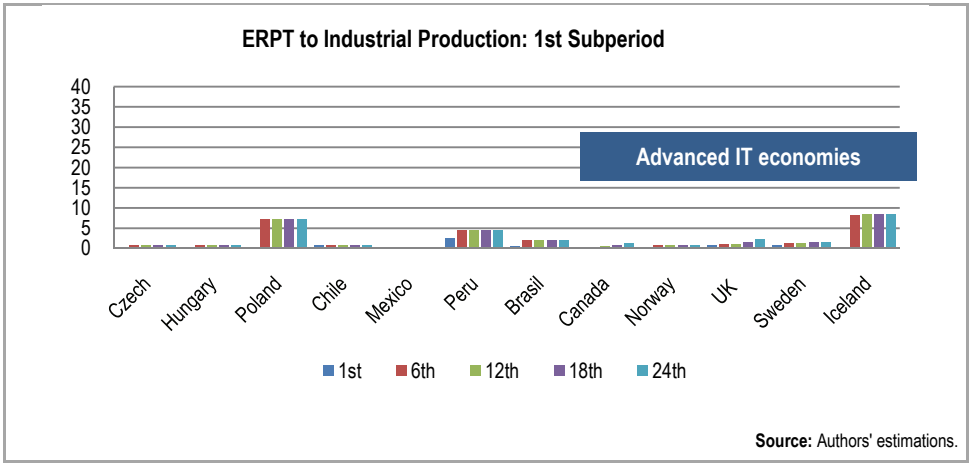


Figure 3a ERPT to Industrial Production in the Pre-Crisis Period in Advanced and Emerging IT Countries

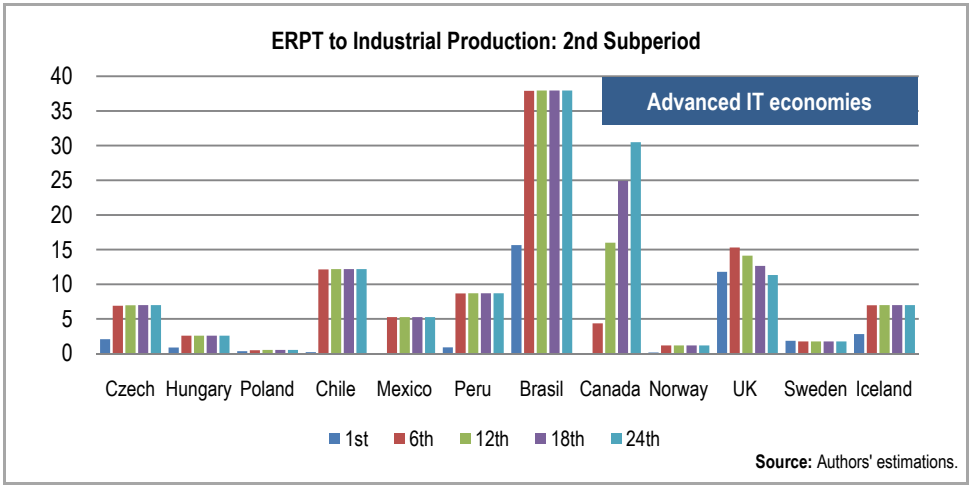


Figure 3b ERPT to Industrial Production in the (Post)Crisis Period in Advanced and Emerging IT Countries

[2] Poland was the only country between Emerging European Economies, which didn't experience GDP fall in 2008 and 2009. It serves as an example how ER depreciations is a useful tool in a fight against external shocks in crisis period. For more details see Josifidis, Allegret, and Beker Pucar (2013).

While emerging economies generally increased its real vulnerability to ER shock, especially LAE, most advanced economies (with the exemption of Norway and Sweden) also experienced higher ERPT to industrial production variations. That especially holds for Canada which industrial production variations explained with ER shock increased from around 1% to 30% in the second sub-period. UK also increased vulnerability of industrial production to ER variations from around 1% to around 15%. Iceland kept its real vulnerability at the same level as in the first sub-period.

Overall, we cannot highlight crucial difference between emerging and advanced economies, although LA IT economies did express most significant rise of real vulnerability. Higher vulnerability of LAE, as well as some advanced economies, could be connected with financial and economic interconnections with the USA economy, where is placed origin of the crisis. For instance, countries that in post-crisis period showed a greater response of industrial production to the ER are those with a greater trade links with the USA. Cohen (2012) emphasized heterogeneous patterns of vulnerability and response of LAE outlining three transmission channels from USA: financial channels, trade channels and remittances. In this crisis episode, financial channels of transmission were weaker compared to previous crisis episode, due to pre-crisis boom which allowed countries in Latin America to make major improvements in balance sheets with more policy space for countercyclical measures during the crisis. Contrary to the financial channels, trade channels were strongly affected, especially for manufacturing and service export sectors. The same conclusion is stated in Osvaldo Kacef and Rafael Lopez-Monti (2010) who stressed that repercussions of the crisis for LAE were manifested through real sector and negatively affected economic performance with significant drop in trade flows and export activities.

Nevertheless, more detailed analysis should be based on specific country cases, having in mind different results between country groups (advanced vs. emerging) and within the same group. For instance, Poland decreased its real vulnerability, while Norway and Sweden escape higher real vulnerability in crisis period, opposite to other countries in the group.

3.2 Monetary Policy Response to Exchange Rate Shocks: The Extent of "Fear of Floating"

Monetary policy response is expected to be connected with previously findings concerning higher vulnerability of inflationary and real variables to ER shock. Generally, we expect that advanced economies more use interest rate as a market and indirect way of influence to ER variations. From the other side is our expectation that emerging economies more used foreign exchange reserves as a direct and faster way to limit ER fluctuations, notably depreciations. These expectations are confirmed with variance decomposition results (Figures 4-5).

Advanced economies relatively weakly used interest rate as a response to ER shock in the pre-crisis period which points to relatively high level of monetary independence characteristic for flexible ER (interest rate response to ER shocks in both periods is presented within Figure 4a and 4b). However, in the second (post)crisis period under trade and capital external shocks, advanced economies raised the role of interest rate in order to limit excessive fluctuations. The extent of strengthened interest rate role varies between advanced economies. Accordingly, Norwegian interest

rate variations as a response to ER shock increased from around 5% to almost 80%; Australian interest rate variations increased from around 5% to about 65%; in the case of New Zealand the increase in interest rate variations explained with ER movements is from around 2% to almost 40%; for Iceland from around 1% to almost 50%; for Canada from 2% to 35%; for Sweden from 10% to 45%; and for UK from 3% to 10%. Therefore, advanced economies used, in more or less extent, interest rate as an indirect way to limit ER excessive fluctuations.

Figure 5a and 5b shows monetary policy response via foreign reserves to ER shock in pre-crisis and (post)crisis period. Foreign exchange reserves weren't used by monetary authorities of advanced economies as a way to limit fluctuations in the pre-crisis period with slightly increase of usage in the (post)crisis period (case of New Zealand, Canada, Norway, UK, Sweden, while Australia and Iceland didn't use this monetary instrument as a response to ER shock).

Emerging economies more used direct influence to ER fluctuations via foreign exchange reserves (see Figure 5a and 5b). However, the group of emerging economies is divergent. LAE expressed higher growth in foreign reserves variations explained with ER shock that especially holds for Peru (growth from 30% from above 60%), Brazil (from around 3% to almost 30%), and Mexico (from around 5% to almost 20%). Chile and Colombia didn't increase the role of foreign exchange reserves as a response to excessive ER fluctuations. The results are in line with higher vulnerability of these countries to ER transmission to inflation and industrial production. Peru is LAE most exposed to ERPT to consumer prices in (post)crisis period and it used direct and faster way to limit ER depreciation to keep the primary goal under targeted range. Brazil expressed higher exposure of real economy to ER shocks and, accordingly, increased the role of foreign exchange reserves to prevent real economy destabilization under external shocks. Mexico increased vulnerability from both aspects (inflationary and real, but not as striking as Peru and Brazil) and, accordingly, it moderately increased the role of foreign exchange reserves.

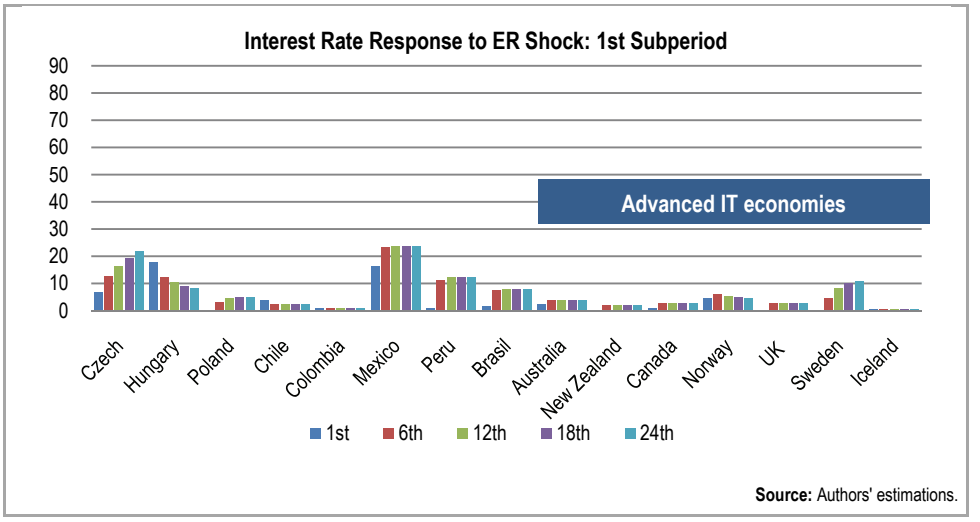


Figure 4a Monetary Response via Interest Rate to ER Shocks in the Pre-Crisis Period in Advanced and Emerging IT Countries

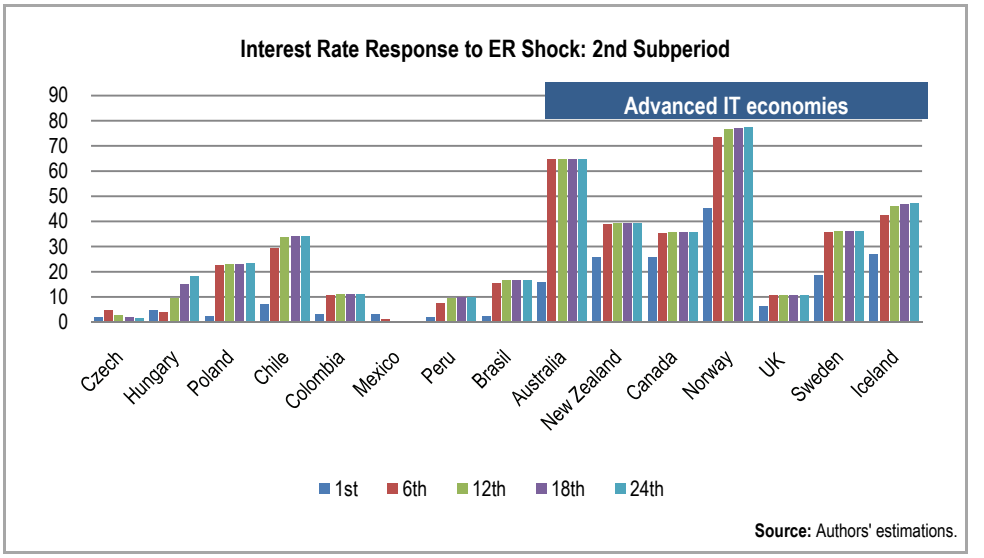


Figure 4b Monetary Response via Interest Rate to ER Shocks in the (Post)Crisis Period in Advanced and Emerging IT Countries

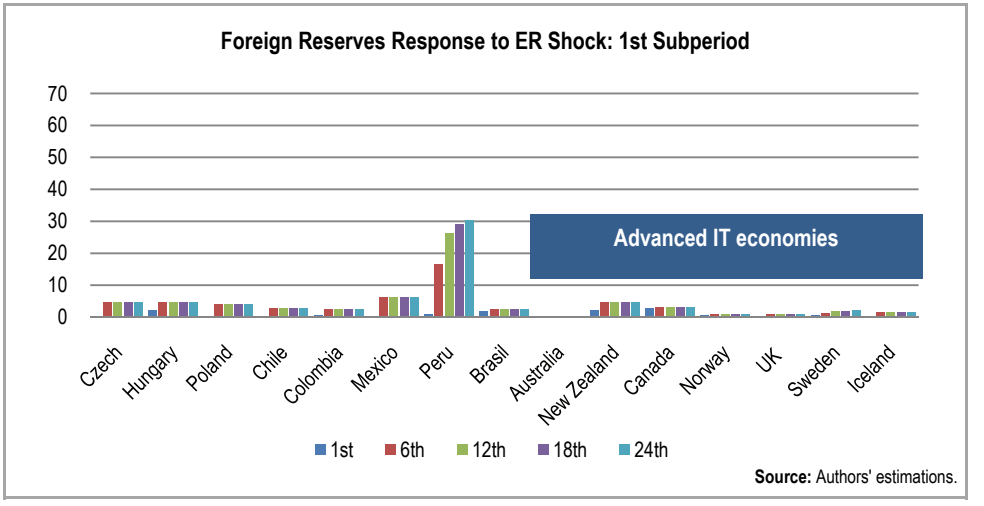


Figure 5a Monetary Response via Foreign Reserves to ER Shocks in the Pre-Crisis Period in Advanced and Emerging IT Countries

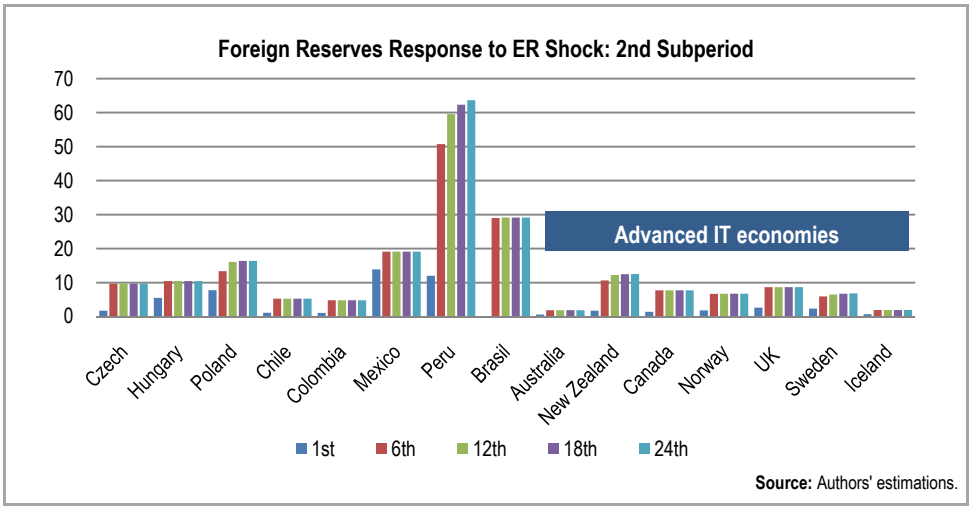


Figure 5b Monetary Response via Foreign Reserves to ER Shocks in the (Post)Crisis Period in Advanced and Emerging IT Countries

Our results indicate that EEE didn't increase inflationary and real vulnerability to ER shocks so strongly compared to LAE. Accordingly, EEE didn't use indirect and direct manner to withstand the ER shocks. This finding could be interpreted in the way that EEE mostly benefited from the role of ER as a shock absorber. ER depreciations under external shocks in the second sub-period weren't significantly limited and the industrial production variations weren't strongly increased as in the case of some LAE or even advanced economies. Contrary to EEE which successfully combine IT monetary framework with the role of ER as a shock absorber, another group of EEE with ER as a nominal anchor monetary strategy experienced the opposite in the crisis period. Josifidis, Allegret, and Beker Pucar (2013) explored EEE with flexible ER as a shock absorber from one side (Poland, Czech Republic, Hungary, Romania, Serbia), and EEE with ER as a nominal anchor (Estonia, Lithuania, Latvia, Bulgaria, and Croatia) on the other side, in the pre-crisis and the crisis period. Authors conclude that countries with flexible ER experienced ER depreciations, but avoid painful adjustment mechanism with less output and employment drop. Contrary, countries with rigid ER arrangement suffer more in the terms of internal adjustment with huge output and employment losses. Hence, in the crisis period accompanied with external shocks, ER is proved to be efficient shocks absorber in the case of EEE.

"Fear of floating" was more expressed in LAE. These countries used direct way to limit ER fluctuations. Stronger role of foreign exchange interventions in the case of LAE could be connected with the boom in commodity prices in the pre-crisis period. Most of the growth phase 2003-2008 or the boom period in Latin America prior the crisis, was characterized with an increase in inflationary expectations as a result of the steady expansion in activity and rising commodity prices, especially for food and energy. After initial stage of sharp real effective exchange rate depreciation, LAE experienced quickening real appreciation (mainly due to dollar depreciation

against other currencies, improving terms of trade, rising demand for some of the region's export products and growing inflows of emigrant workers' remittances), which led many of the region's central banks to perform foreign exchange interventions, building up large international reserves. Increased reserves have given to LAE a stronger tool in reserve management to protect against external shocks (World Bank 2009). Post-crisis period brought depreciation tendencies following three years of appreciation and, accordingly, loss of foreign exchange reserves. For details concerning macroeconomic policy challenges in Latin America from the boom to crisis, see Kacef and Lopez-Monti (2010) and Cohen (2012). The role of foreign exchange interventions in coping with external shocks during the crisis in LAE was also emphasized in Reinhart (2013).

Although "fear of floating" is phenomenon used mainly in the case of emerging economies with *de jure* floating ER regime, but with *de facto* high extent of managing ER fluctuations, the results indicate that under external shocks in (post)crisis period advanced IT economies also limit ER fluctuations (although indirectly via interest rate) and express some form of "fear of floating". This isn't the case in the pre-crisis period where minor response of interest rate and foreign exchange reserves to ER shock was found in advanced IT countries.

4. Conclusion

Emerging economies in the phase of IT adoption decreased ERPT to consumer prices. IT monetary framework is not macroeconomic stabilization program and, accordingly, it is usually implemented after achieved macroeconomic stability and anchored inflationary expectations. Emerging countries at the macroeconomic stabilization phase on their development (and transition) process accepted ER as a nominal anchor moving gradually towards another, more flexible ER and monetary arrangement. Our results indicate that there is no striking difference in ERPT between emerging and advanced economies in the pre-crisis period.

In the (post)crisis period ERPT to prices increased mainly in LAE, especially in Peru. Contrary, EEE didn't increase inflation vulnerability to ER shocks, while in the group of advanced economies no specific changes are observable (Sweden and Iceland have kept relatively higher ERPT to prices compared to other advanced countries). ERPT to prices stagnated or kept its former levels due to weaker aggregate demand in crisis period. Weaker aggregate demand is connected with lower import (as well as export) activities and accordingly lower ERPT to consumer prices via direct and indirect channels.

Similar to ERPT to consumer prices in pre-crisis period, striking difference in output vulnerability to ER shock between advanced and emerging economies is not observable. The situation changes in the (post)crisis period. While EEE didn't change this indicator substantially (Czech and Hungary slightly increased real vulnerability to ER shocks, Poland even decreased vulnerability to ER shocks), LAE and some advanced economies increased real vulnerability to ER shocks. Namely, abrupt vulnerability rise is evident in the case of Brazil, follows Chile, Peru and Mexico in the group of emerging countries. Concerning advanced countries real vulnerability rise is evident in Canada, UK, while Iceland, Sweden and Norway didn't express

important change. Obviously, we cannot highlight striking difference neither to this type of vulnerability.

Since EEE seems to be the least vulnerable to ER shock, these economies allowed more ER fluctuations. This claim is based on result of monetary reaction via interest rate and foreign exchange reserves to ER shocks in both sub-periods. This finding has another standpoint. Namely, EEE with the relatively least monetary response compared to other explored IT economies, allowed more absorbing role of ER and consequently experienced less output variations (especially Polish case which serves as an example of rare European economy without GDP drop in 2008 and 2009 due to mainly ER depreciations and shock absorbing role). Having in mind more vulnerable position of LAE concerning ERPT to industrial production, these economies more respond to ER shocks. In order to limit ER depreciations to avoid stronger contractionary effects of ER shock, LAE mainly used direct, faster and less market-friendly way to limit ER depreciations – foreign exchange reserves. This finding is expected since emerging economies use more direct way of influence via foreign exchange interventions, contrary to advanced economies.

As previous results implicate, some advanced economies experienced rise in output variability due to ER shocks and these economies (unlike emerging countries) significantly increased the role of interest rate to withstand the excessive ER fluctuations. Therefore, "fear of floating" shouldn't be connected exclusively to emerging economies. Although all advanced economies weren't analyzed (because some of them didn't accept officially IT monetary framework), our sample of advanced economies indicate that the difference in internal vulnerability to ER shocks were shrinking between emerging and advanced IT countries. These differences were more apparent in the preparatory phase for full adoption of IT regime, but after official acceptance monetary authorities in emerging economies worked on preparation for successful IT, including decreasing role of ER in monetary transmission mechanism.

However, this conclusion is general since in the group of advanced economies some countries experienced relatively higher, some relatively lower ERPT to prices and output. But all explored advanced IT countries increased the indirect influence or response to ER shock via interest rate (post)crisis period. "Fear of floating" is thus present in the case of higher vulnerability to ER shocks, where more vulnerable countries seek to stabilize ER directly or indirectly. Crisis period brought trade and financial shocks and all hit countries had to respond irrespective the relation advanced vs. emerging economies. The role of ER is raised in IT framework in advanced and some (mainly LAE) emerging economies under crisis impact, although the way of ER restraining differs.

References

Aizenman, Joshua, Michael Hutchison, and Ilan Noy. 2011. "Inflation Targeting and Real Exchange Rates in Emerging Markets." *World Development*, 39(5): 712-724.

Ball, Christopher P., and Javier Reyes. 2004. "Inflation Targeting or Fear of Floating in Disguise? A Broader Perspective?" http://comp.uark.edu/~reyes/Files/IT%20or%20FF%20in%20Disguise%20FINAL%20JMacro.pdf.

Barbosa-Filho, Nelson H. 2008. "Inflation Targeting in Brazil: 1999-2006." *International Review of Applied Economics*, 22(2): 187-200.

Calvo, Guillermo A., and Carmen M. Reinhart. 2002. "Fear of Floating." *The Quarterly Journal of Economics,* 117(2): 379-408.

Carare, Alina, and Mark R. Stone. 2006. "Inflation Targeting Regimes." *European Economic Review,* 50(5): 1297-1315.

Carrasco, Carlos A., and Jesus Ferreiro. 2011. "Inflation Targeting and Economic Performance: The Case of Mexico." *Panoeconomicus,* 58(5): 675-692.

Carrasco, Carlos A., and Jesus Ferreiro. 2013. "Inflation Targeting and Inflation Expectations in Mexico." *Applied Economics*, 45(23): 3295-3304.

Cohen, Michael. 2012. *The Global Economic Crisis in Latin America: Impacts and Responses*. London and New York: Routledge.

Coricelli, Fabrizio, Boštjan Jazbec, and Igor Masten. 2004. "Exchange Rate Pass-Through in Acceding Countries: The Role of Exchange Rate Regimes." http://www.hnb.hr/dub-konf/10-konferencija-radovi/coricelli-jazbec-masten.pdf.

Daianu, Daniel, and Laurian Lungu. 2007. "Inflation Targeting, between Rhetoric and Reality. The Case of Transition Economies." *The European Journal of Comparative Economics,* 4(1): 39-64.

Desormeaux, Jorge. 2006. "Strategies for Dedollarization: Financial Sector Development and Inflation Targeting." The paper presented at International Conference Dedollarization: Consequences and Policy Options, Istanbul.

Edwards, Sebastian. 2006. "The Relationship between Exchange Rates and Inflation Targeting Revisited." National Bureau of Economic Research Working Paper 12163.

Epstein, Gerald, and Enriç Yeldan. 2008. "Inflation Targeting, Employment Creation and Economic Development: Assessing the Impacts and Policy Alternatives." *International Review of Applied Economics*, 22(2): 131-144.

Genberg, Hans. 2002. "Inflation Targeting - The Holy Grail of Monetary Policy." Hong Kong Institute for Monetary Research Working Paper 2/2002.

Golinelli, Roberto, and Riccardo Rovelli. 2001. "Interest Rate Rules and Inflation Targeting in Three Transition Economies." http://www2.dse.unibo.it/wp/429.pdf.

Hammond, Gill. 2012. "State of the Art of Inflation Targeting - 2012." Centre for Central Bank Studies Handbook 29.

Horská, Helena. 2004. "Inflation Targeting in Central and Eastern European Countries." PhD thesis. University of Economics Prague, Faculty of Economics and Public Administration.

Ibarra, Carlos A. 2008. "Disinflation and Real Currency Appreciation in Chile and Mexico: The Role of Monetary Policy." *Investigación Económica*, 67(266): 67-94.

International Monetary Fund - IMF. 2012. *Annual Report on Exchange Arrangements and Exchange Restrictions.* Washington, DC: IMF.

Jonas, Jiri. 2003. *Inflation Targeting in Transition Economies: Some Issues and Experience*. Prague: Czech National Bank.

Jonas, Jiri, and Frederic S. Mishkin. 2003. "Inflation Targeting in Transition Countries: Experience and Prospects." National Bureau of Economic Research Working Paper 9667.

Josifidis, Kosta, Jean-Pierre Allegret, and Emilija Beker Pucar. 2009. "Monetary and Exchange Rate Regimes Changes: The Cases of Poland, Czech Republic, Slovakia and Republic of Serbia." *Panoeconomicus*, 56(2): 199-226.

Josifidis, Kosta, Jean-Pierre Allegret, and Emilija Beker Pucar. 2013. "Adjustment Mechanisms and Exchange Rate Regimes in 2004 New EU Members during the Financial Crisis." *Post-Communist Economies*, 25(1): 1-17.

Kacef, Osvaldo, and Rafael López-Monti. 2010. "Latin America, from Boom to Crisis: Macroeconomic Policy Challenges." *CEPAL Review*, 100: 41-67.

Masson, Paul R., Miguel A. Savastano, and Sunil Sharma. 1997. "The Scope for Inflation Targeting in Developing Countries." International Monetary Fund Working Paper 130.

Mishkin, Frederic S., and Klaus Schmidt-Hebbel. 2001. "One Decade of Inflation Targeting in the World: What Do We Know and What Do We Need to Know?" National Bureau of Economic Research Working Paper 8397.

Mishkin, Frederic S. 2004. "Can Inflation Targeting Work in Emerging Market Countries." National Bureau of Economic Research Working Paper 10646.

Mishkin, Frederic S. 2007. *Monetary Policy Strategy*. Cambridge, MA: MIT Press.

Mishkin, Frederic S., and Klaus Schmidt-Hebbel. 2007. "Does Inflation Targeting Make a Difference?" National Bureau of Economic Research Working Paper 12876.

Orlowski, Lucjan T. 2000. "A Dynamic Approach to Inflation Targeting in Transition Economies." Center for European Integration Studies Working Paper 11-2000.

Orlowski, Lucjan T. 2005. "Monetary Policy Adjustments on the Final Passage towards the Euro." Center for Social and Economic Research, Studies and Analysis 294.

Reinhart, Carmen. 2013. "Goodbuy Inflation Targeting, Hello Fear of Floating? Latin America after the Global Financial Crisis." Munich Personal RePEc Archive Paper 51282.

Schmidt-Hebbel, Klaus, and Alejandro Werner. 2002. "Inflation Targeting in Brazil, Chile, and Mexico: Performance, Credibility, and the Exchange Rate." Central Bank of Chile Working Paper 171.

Sek, Siok Kun, and Wai Mun Har. 2012. "Does Inflation Targeting Work in Emerging East-Asian Economies?" *Panoeconomicus,* 59(5): 599-608.

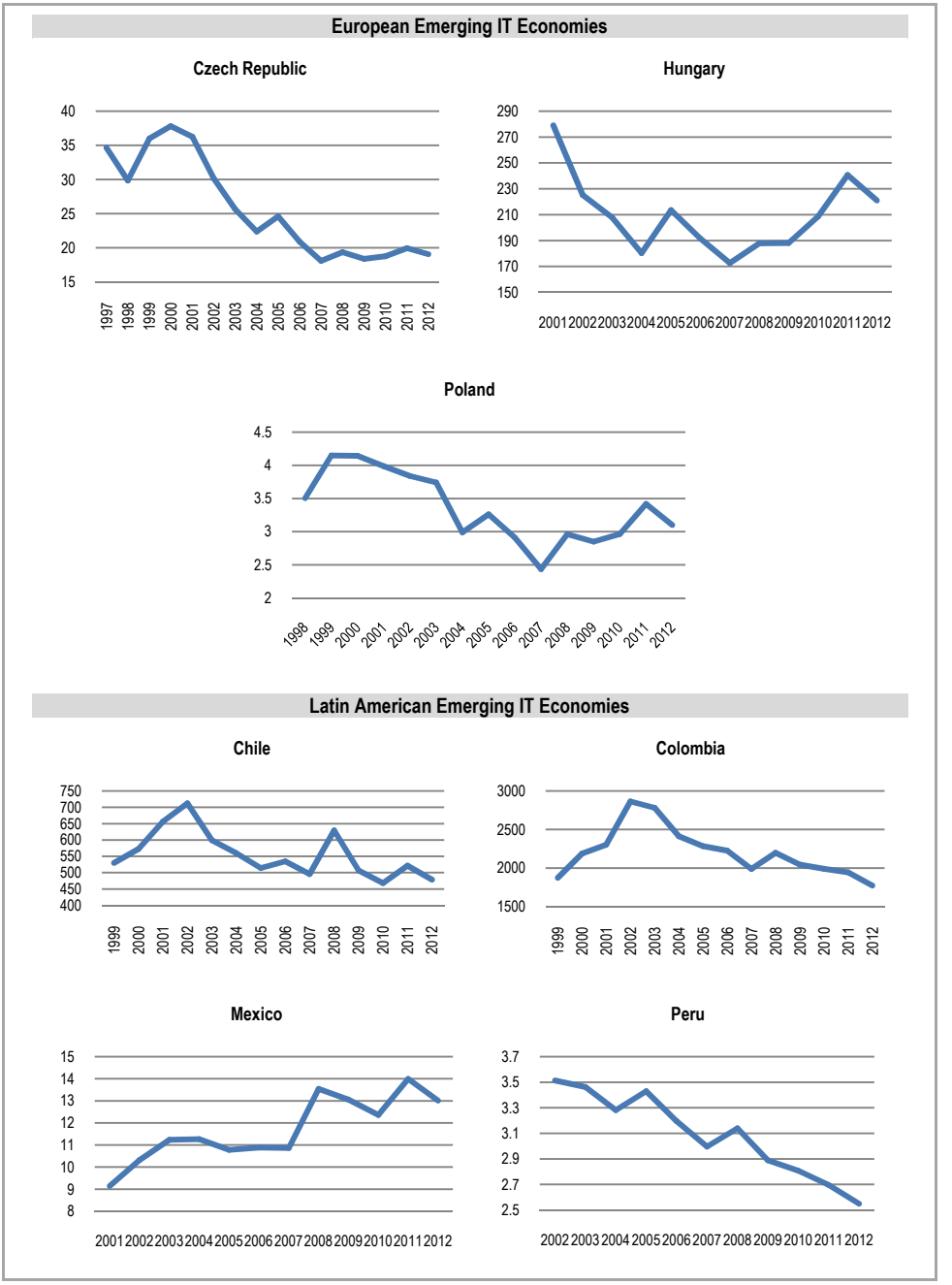
Stone, Mark, Scott Roger, Seiichi Shimizu, Anna Nordstrom, Turgut Kisinbay, and Jorge Restrepo. 2009. "The Role of the Exchange Rate in Inflation-Targeting Emerging Economies." International Monetary Fund Ocassional Paper 267.

Svensson, Lars E. O. 2007. "Inflation Targeting." http://www.princeton.edu/svensson/papers/PalgraveIT.pdf.

Warburton, Peter, and Joanna Davies. 2013. "Inflation Targeting - A Child of Its Time." http://www.centralbanking.com/central-banking-journal/feature/2153972/inflation-targeting-child.

World Bank. 2009. "The Global Financial and Economic Storm: How Bad Is the Weather in Latin America and Caribbean." Briefing Note Prepared by the LAC Chief Economist Office for the 2009 Spring Meetings, Washington.

Appendix


European Emerging IT Economies
Czech Republic
40
35
30
25
20
15
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Hungary
290
270
250
230
210
190
170
150
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Poland
4.5
4
3.5
3
2.5
2
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Latin American Emerging IT Economies
Chile
750
700
650
600
550
500
450
400
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Colombia
3000
2500
2000
1500
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Mexico
15
14
13
12
11
10
9
8
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Peru
3.7
3.5
3.3
3.1
2.9
2.7
2.5
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

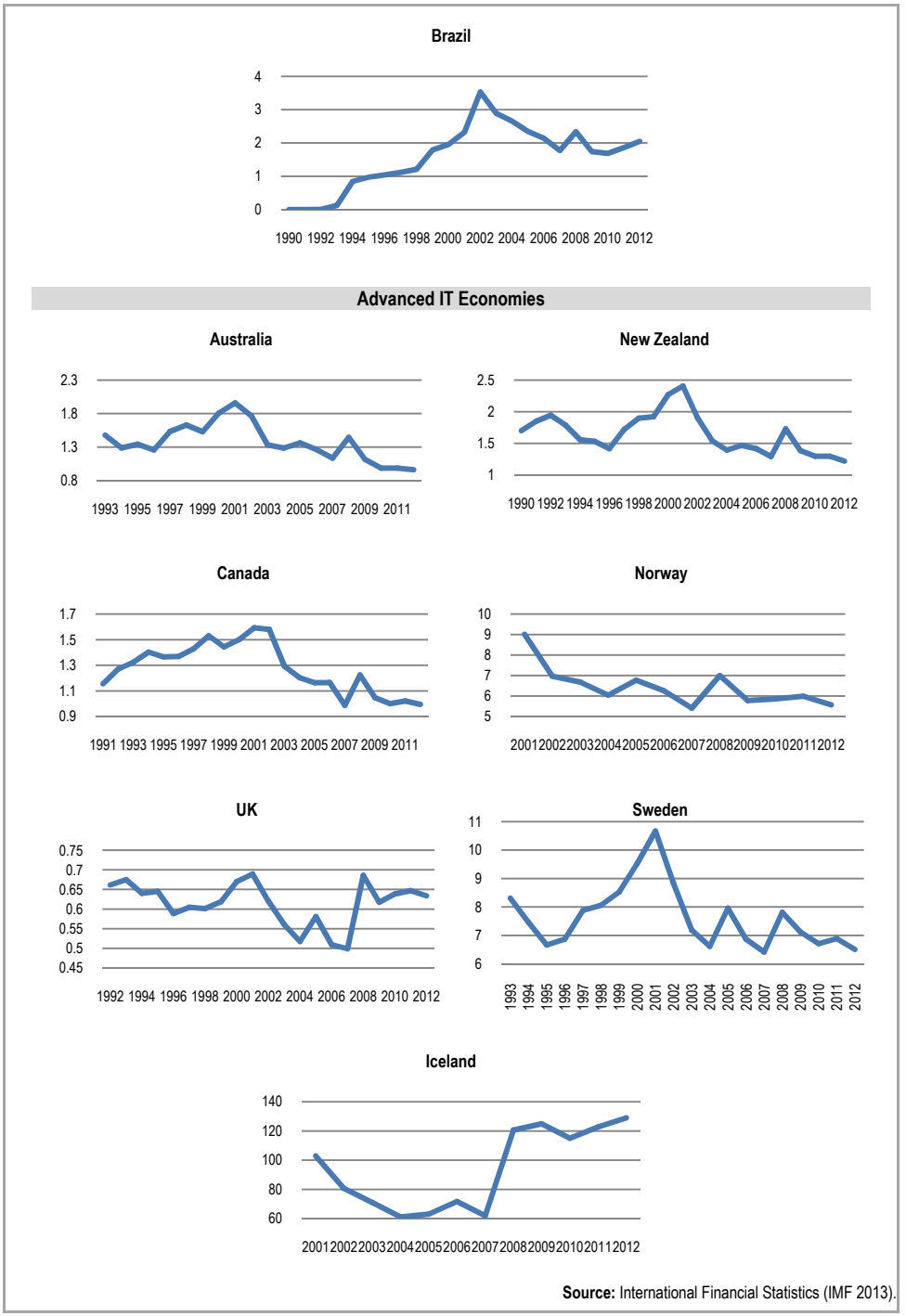


Figure 1 Nominal Exchange Rate in Selected Emerging and Advanced Economies since IT Adoption until 2013 (National Curency per Based Currency, End of Period, US dollars)

Table 1 Countries, Time Series and Sub-Periods of Empirical Research

Countries	Sub-periods: pre-crisis and (post)crisis period	Time series (from International Financial Statistics, IMF)
Advanced IT economies		
Australia	1st sub-period: 1993:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 1993:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
New Zealand	1st sub-period: 1991:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 1991:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Canada	1st sub-period: 1991:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 1995:01-2007:07 2nd sub-period: 2007:08-2012:11	NEER(impulse)-IP(response)
	1st sub-period: 1991:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 1991:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Norway	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IP(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2009:07	NEER(impulse)-IR(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
UK	1st sub-period: 1992:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 1992:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IP(response)
	1st sub-period: 1992:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 1992:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Sweden	1st sub-period: 1993:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 1997:01-2007:07 2nd sub-period: 2007:08-2012:12	NEER(impulse)-IP(response)
	1st sub-period: 1993:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 1993:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Iceland	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2012:02	NEER(impulse)-IP(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Emerging IT economies		
Czech Republic	1st sub-period: 1997:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 1997:01-2007:07 2nd sub-period: 2007:08-2012:12	NEER(impulse)-IP(response)
	1st sub-period: 1997:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 2000:03-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Hungary	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IP(response)

	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR (response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Poland	1st sub-period: 1998:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 1998:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IP(response)
	1st sub-period: 1998:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 2000:07-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Chile	1st sub-period: 1999:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 1999:01-2007:07 2nd sub-period: 2007:08-2011:12	NEER(impulse)-IP(response)
	1st sub-period: 1999:12-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 2000:08-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Colombia	1st sub-period: 1999:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 1999:01-2005:03	NEER(impulse)-IP(response)
	1st sub-period: 1999:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 2000:05-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Mexico	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IP(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 2001:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)
Peru	1st sub-period: 2002:01-2007:07 2nd sub-period: 2007:08-2013:01	NER(impulse)-CPI(response)
	1st sub-period: 2002:01-2007:07 2nd sub-period: 2007:08-2012:10	NER(impulse)-IP(response)
	1st sub-period: 2002:01-2007:07 2nd sub-period: 2007:08-2013:01	NER(impulse)-IR(response)
	1st sub-period: 2002:01-2007:07 2nd sub-period: 2007:08-2012:12	NER(impulse)-FR(response)
Brazil	1st sub-period: 1999:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-CPI(response)
	1st sub-period: 1999:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IP(response)
	1st sub-period: 1999:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-IR(response)
	1st sub-period: 1999:01-2007:07 2nd sub-period: 2007:08-2013:01	NEER(impulse)-FR(response)

Note: According to the available data, we made several changes regarding the types of time series that we used for our analysis: (1) Hungary: Interest rate (IR)-Discount rate; (2) Chile: Consumer price index (CPI)-Percent change over corresponding period of previous year; (3) Peru: NER-Nominal exchange rate; (4) Chile, Colombia, Peru: Industrial production (IP)-Manufacturing.

Source: Authors' estimations.

Table 2 Results of Stationary Testing (Level)

Time series	Period	ADF	KPSS	DF-GLS	Lag	Conclusion
Australia 1993:01-2013:01						
NEER-τ_μ	1993:01-2013:01	-1.052682 (-11.15902)	-0.017824 (-5.705641)	1.262185 (0.067357)	4	I(1)
IR-τ_τ	1993:01-2013:02	-2.718141 (-5.813875)	-2.524099 (-5.823783)	0.438049 (0.061522)	4	I(1)
FR-τ_τ	1993:01-2012:12	-1.590237 (-14.49529)	-0.267228 (-6.356941)	1.663535 (0.074734)	4	I(1)
New Zealand 1990:01-2013:01						
NEER-τ_μ	1991:01-2013:01	-1.789084 (-12.37970)	-1.252708 (-12.30126)	0.622838 (0.064927)	4	I(1)
IR-τ_τ	1991:01-2013:01	-2.257303 (-14.05875)	0.123819 (-14.03228)	0.924579 (0.068026)	4	I(1)
FR-τ_τ	1991:01-2013:02	-2.456014 (-14.21112)	-1.605073 (-16.49915)	0.357867 (0.045100)	4	I(1)
Canada 1991:01-2013:01						
NEER-τ_μ	1991:01-2013:01	-0.557205 (-13.33411)	-0.356877 (-11.75862)	1.454336 (0.178703)	4	I(1)
CPI-τ_τ	1991:01-2013:01	-2.448245	0.715851	0.088729	4	I(0)
IP-τ_μ (seasonally adj.)	1995:01-2012:11	-0.965350 (-14.50451)	0.421733 (-14.56254)	0.462342 (0.030128)	4	I(1)
IR-τ_τ	1991:01-2013:01	-2.566938 (-12.17393)	0.286508 (-0.185669)	1.555320 (0.191714)	4	I(1)
FR-τ_τ	1991:01-2013:02	-0.070725 (-10.89279)	0.555479 (-0.758264)	1.879236 (0.110221)	4	I(1)
Norway 2001:01-2013:01						
NEER-τ_μ	2001:01-2013:01	-3.045299 (-9.300783)	-0.976935 (-9.191241)	0.700074 (0.045857)	4	I(1)
CPI-τ_τ	2001:01-2013:02	-3.613330	-2.193363	0.169444	4	I(0)
IP-τ_μ (seasonally adj.)	2001:01-2013:01	-1.341420 (-13.46821)	-0.400879 (-0.735883)	1.365626 (0.382288)	4	I(1)
IR-τ_τ	2001:01-2009:07	-1.327237 (-5.867421)	-0.322876 (-5.857654)	0.394814 (0.133077)	4	I(1)
FR-τ_τ	2001:01-2013:01	-1.674714 (-14.57938)	-0.336907 (-2.790301)	0.912568 (0.172059)	4	I(1)
UK 1992:01-2013:01						
NEER-τ_μ (seasonally adj.)	1992:01-2013:01	-1.405383 (-12.48028)	-1.095685 (-12.48474)	0.415806 (0.124321)	4	I(1)
CPI-τ_τ	1992:01-2013:02	-3.206952 (-16.41517)	-1.007537 (-16.44741)	0.543372 (0.170844)	4	I(1)
IP-τ_μ (seasonally adj.)	1992:01-2013:01	-1.341937 (-5.098317)	-0.814090 (-1.107159)	0.464031 (0.369000)	4	I(1)
IR-τ_τ	1992:01-2013:02	-2.242944 (-23.70657)	0.555998 (-1.874170)	1.434027 (0.081042)	4	I(1)
FR-τ_τ	1992:01-2013:02	-0.364543 (-13.84692)	-0.624546 (-13.81415)	0.752675 (0.364195)	4	I(1)
Sweden 1993:01-2013:01						
NEER-τ_μ (seasonally adj.)	1993:01-2013:01	-2.841773	-2.030287	0.189750	4	I(0)
CPI-τ_τ	1993:01-2013:02	-1.935225	1.520455	0.143763	4	I(0)
IP-τ_μ (seasonally adj.)	1997:01-2012:12	-2.685148 (-2.969059)	-1.055963 (-2.426597)	0.824738 (0.100503)	4	I(1)
IR-τ_τ	1993:01-2013:02	-2.197551 (-7.537762)	0.296013 (-1.330621)	1.541195 (0.157584)	4	I(1)

FR-τ_τ	1993:01-2013:02	-0.447717 (-17.79550)	-0.653078 (0.006607)	1.237201 (0.450808)	4	I(1)
Iceland 2001:01-2013:01						
NEER-τ_μ	2001:01-2013:01	-0.646262 (-7.758208)	-0.060777 (-7.781115)	1.057688 (0.166974)	4	I(1)
CPI-τ_τ	2001:01-2013:02	-2.431587	-2.188288	0.283022	4	I(0)
IP-τ_μ (seasonally adj.)	2001:01-2012:02	0.539907 (-7.804372)	2.323324 (-7.629513)	1.404240 (0.197623)	4	I(1)
IR-τ_τ	2001:01-2013:02	-1.944916	-1.512022	0.295140	4	I(0)
FR-τ_τ	2001:01-2013:02	-1.046698 (-11.85785)	0.432128 (-11.56526)	1.371236 (0.120966)	4	I(1)
Czech R. 1997:01-2013:01						
NEER-τ_μ	1997:01-2013:01	-0.543349 (-11.62349)	1.627371 (0.096090)	0.233193 (-5.994246)	4	I(1)
CPI-τ_τ	1997:01-2013:01	-2.638805 (-4.467487)	0.156508 (0.151500)	-1.470687 (-3.484197)	4	I(1)
IP-τ_μ (seasonally adj.)	1997:01-2012:12	-1.238258 (-8.372588)	1.549010 (0.220243)	-0.027430 (-1.295496)	4	I(1)
IR-τ_μ	1997:01-2013:01	-2.170390 (-3.107321)	1.074160 (0.177735)	0.062413 (-3.080047)	4	I(1)
FR-τ_τ	2000:03-2013:01	-1.413055 (-14.67474)	0.311207 (0.056217)	-0.944810 (-14.54198)	4	I(1)
Hungary 2001:01-2013:01						
NEER-τ_μ	2001:01-2013:01	-2.726568 (-9.004553)	0.585592 (0.117945)	-2.112051 (-8.630705)	4	I(1)
CPI-τ_τ	2001:01-2013:01	-3.465501	0.097170	-3.174489	4	I(0)
IP-τ_μ (seasonally adj.)	2001:01-2013:01	-1.487072 (-19.80010)	0.978391 (0.083809)	-0.455483 (-1.478427)	4	I(1)
IR-τ_μ	2001:01-2013:01	-1.738101 (-9.993212)	0.748073 (0.039178)	-0.620190 (-10.01661)	4	I(1)
FR-τ_τ	2001:01-2013:01	-2.656918 (-12.49181)	0.128891 (0.072163)	-2.412774 (-9.715176)	4	I(1)
Poland 1998:01-2013:01						
NEER-τ_μ	1998:01-2013:01	-3.052781	0.251231	-3.046096	4	I(0)
CPI-τ_τ	1998:01-2013:01	-2.534990 (-8.987458)	0.195925 (0.224877)	-0.803975 (-1.602216)	4	I(1)
IP-τ_μ (seasonally adj.)	1998:01-2013:01	-1.615727 (-3.242074)	1.715892 (0.110062)	0.468541 (-1.989523)	4	I(1)
IR-τ_τ	1998:01-2013:01	-2.545207 (-5.692569)	0.304830 (0.062061)	-1.111690 (-1.343745)	4	I(1)
FR-τ_τ	2000:07-2013:01	-3.243293 (-14.33863)	0.147233 (0.063712)	-2.232192 (-13.87957)	4	I(1)
Chile 1999:01-2013:01						
NEER-τ_μ	1999:01-2013:01	-2.701618 (-9.789686)	0.306374 (0.148266)	-1.784491 (-9.537728)	4	I(1)
CPI-τ_μ	1999:01-2013:01	-3.267826	0.076915	-3.356949	4	I(0)
IP-τ_μ (seasonally adj.)	1999:01-2011m12	-1.556637 (-14.51579)	1.342784 (0.325191)	0.616380 (-5.605768)	4	I(1)
IR-τ_μ	1999:12-2013:01	-2.639811 (-11.23255)	0.289314 (0.141769)	-1.751336 (-2.247957)	4	I(0)
FR-τ_τ	2000:08-2013:01	-2.011945 (-13.96038)	0.318372 (0.035890)	-1.483311 (-13.44261)	4	I(1)
Colombia 1999:01-2013:01						
NEER-τ_μ	1999:01-2013:01	-1.508560 (-14.00314)	0.861770 (0.309358)	-1.277444 (-14.00314)	4	I(1)

CPI-τ_τ	1999:01-2013:01	-1.172040 (-7.695764)	0.377065 (0.023000)	-1.110400 (-1.923805)	4	I(1)
IP-τ_μ (seasonally adj.)	1999:01-2005:03	-2.235639 (-11.72272)	1.074907 (0.208262)	0.957571 (0.038785)	2	I(1)
IR-τ_μ	1999:01-2013:01	-0.971374 (-8.646995)	0.891855 (0.466845)	0.495098 (0.368877)	4	I(1)
FR-τ_τ	2000:05-2013:01	-1.970904 (-11.30705)	0.137559 (0.049287)	-1.940377 (-10.95647)	4	I(1)
Mexico 2001:01-2013:01						
NEER-τ_μ	2001:01-2013:01	-1.583933 (-8.577697)	1.220145 (0.064408)	-0.538277 (-7.915955)	4	I(1)
CPI-τ_τ	2001:01-2013:01	-4.557831	0.094122	-2.568998	4	I(0)
IP-τ_μ (seasonally adj.)	2001:01-2013:01	-0.411406 (-13.75207)	1.056542 (0.091452)	0.221305 (-3.962636)	4	I(1)
IR-τ_μ	2001:01-2013:01	-4.760108 (-8.816399)	0.923655 (0.290724)	0.067607 (-1.709391)	4	I(0)
FR-τ_τ	2001:01-2013:01	-2.017663 (-11.40325)	0.132024 (0.061241)	-2.050692 (-10.91555)	4	I(1)
Peru 2002:01-2013:01						
NER-τ_μ	2002:01-2013:01	-0.244410 (-11.53993)	1.375167 (0.066048)	0.861259 (-11.56069)	4	I(1)
CPI-τ_τ	2002:01-2013:01	-2.292459 (-8.071228)	0.134969 (0.051953)	-2.231579 (-7.643807)	4	I(1)
IP-τ_τ (seasonally adj.)	2002:01-2012:10	-2.601585 (-16.28207)	0.152344 (0.040159)	-2.302735 (-16.30947)	4	I(1)
IR-τ_μ	2002:01-2013:01	-2.637790	0.148339	-2.190985	4	I(0)
FR-τ_τ	2002:01-2012:12	-1.844294 (-10.53462)	0.104667 (0.074325)	-1.395035 (-4.265794)	4	I(1)
Brazil 1999:01-2013:01						
NEER-τ_μ	1999:01-2013:01	-12.14454 (-12.14454)	-1.036158 (-1.036158)	0.163389 (0.163389)	4	I(1)
CPI-τ_τ	1999:01-2013:02	-3.094870	-0.849183	0.313064	4	I(0)
IP-τ_τ (seasonally adj.)	1999:01-2013:01	-1.362575 (-11.61528)	0.440620 (-4.734707)	1.540818 (0.040896)	4	I(1)
IR-τ_τ (seasonally adj.)	1999:01-2013:02	-6.370763 (-8.412272)	-1.156911 (-1.006341)	1.333402 (0.066196)	4	I(1)
FR-τ_τ	1999:01-2013:02	-1.969163 (-13.69262)	-1.265143 (-13.70569)	0.282928 (0.105727)	4	I(1)

Note: In the model which includes both deterministic components, the critical values are: -3.43, 0.146, -2.95 for the ADF, KPSS and DF-GLS tests respectively, while the determination of stationarity about nonzero mean values is calculated by using the following values: -2.88, 0.46 and -1.94. Label τ_t refers to the model which includes both deterministic components, while τ_μ refers to the model which contains only constant. Values in brackets refer to the first difference of the observed time series.

Source: Authors' estimations.

Table 3 Results of Johansen's Cointegration Test

Combination of I(1) time series	Lag	Trace statistics	Conclusion
Australia 1993:01-2013:01			
NEER and IR	1_4	11.65846 0.083759	No cointegration at the 5% significance level.
NEER and FR	1_4	6.750278 1.941848	No cointegration at the 5% significance level.
New Zealand 1990:01-2013:01			
NEER and IR	1_4	10.69148 2.052492	No cointegration at the 5% significance level.
NEER and FR	1_4	7.016600 0.031280	No cointegration at the 5% significance level.
Canada 1991:01-2013:01			
NEER and CPI	The presence of cointegration is not tested, since the CPI is I(0).		
NEER and IP	1_4	37.40364 6.367794	2 cointegration equations at the 5% significance level.
NEER and IR	1_4	13.52676 0.476860	No cointegration at the 5% significance level.
NEER and FR	1_4	3.952226 0.064014	No cointegration at the 5% significance level.
Norway 2001:01-2013:01			
NEER and CPI	The presence of cointegration is not tested, since the CPI is I(0).		
NEER and IP	1_4	12.68778 0.241325	No cointegration at the 5% significance level.
NEER and IR	1_4	15.98129 5.709205	2 cointegration equations at the 5% significance level.
NEER and FR	1_4	12.45605 2.883785	No cointegration at the 5% significance level.
UK 1992:01-2013:01			
NEER and CPI	1_4	22.33134 2.492182	1 cointegration equation at the 5% significance level.
NEER and IP	1_4	22.06677 1.086072	1 cointegration equation at the 5% significance level.
NEER and IR	1_4	8.458180 3.006600	No cointegration at the 5% significance level.
NEER and FR	1_4	9.650116 0.048307	No cointegration at the 5% significance level.
Sweden 1993:01-2013:01			
NEER and CPI	The presence of cointegration is not tested, since NEER is I(0).		
NEER and IP			
NEER and IR			
NEER and FR			
Iceland 2001:01-2013:01			
NEER and CPI	The presence of cointegration is not tested, since the CPI is I(0).		
NEER and IP	1_4	6.493190 0.023096	No cointegration at the 5% significance level.
NEER and IR	The presence of cointegration is not tested, since the IR is I(0).		
NEER and FR	1_4	6.751589 0.895284	No cointegration at the 5% significance level.
Czech Republic 1997:01-2013:01			
NEER and CPI	1_4	25.43239 3.575973	1 cointegration equation at the 5% significance level.
NEER and IP	1_4	15.16425 1.739095	No cointegration at the 5% significance level.
NEER and IR	1_4	19.15630	1 cointegration equation at the 5% significance level.

		2.997019	
NEER and FR	1_4	7.488550 1.984964	No cointegration at the 5% significance level.
Hungary **2001:01-2013:01**			
NEER and CPI	The presence of cointegration is not tested, since the CPI is I(0).		
NEER amd IP	1_4	9.569235 2.300343	No cointegration at the 5% significance level.
NEER and IR	1_4	16.03913 1.901012	1 cointegration equation at the 5% significance level.
NEER and FR	1_4	14.12293 0.892264	No cointegration at the 5% significance level.
Poland **1998:01-2013:01**			
NEER and CPI NEER and IP NEER and IR NEER and FR	The presence of cointegration is not tested, since the NEER is I(0).		
Chile **1999:01-2013:01**			
NEER and CPI	The presence of cointegration is not tested, since the CPI is I(0).		
NEER i IP	1_4	13.93831 2.578451	No cointegration at the 5% significance level.
NEER and IR	The presence of cointegration is not tested, since the IR is I(0).		
NEER and FR	1_4	12.96894 2.297561	No cointegration at the 5% significance level.
Colombia **1999:01-2013:01**			
NEER and CPI	1_4	25.67451 5.582269	2 cointegration equations at the 5% significance level.
NEER and IP	1_4	20.45786 6.810302	2 cointegration equations at the 5% significance level.
NEER and IR	1_4	14.61343 0.453975	No cointegration at the 5% significance level.
NEER and FR	1_4	10.76679 0.017925	No cointegration at the 5% significance level.
Mexico **2001:01-2013:01**			
NEER and CPI	The presence of cointegration is not tested, since the CPI is I(0).		
NEER and IP	1_4	9.515414 1.464347	No cointegration at the 5% significance level.
NEER and IR	The presence of cointegration is not tested, since the IR is I(0).		
NEER and FR	1_4	10.31600 0.157080	No cointegration at the 5% significance level.
Peru **2002:01-2013:01**			
NER and CPI	1_4	24.52606 0.378043	1 cointegration equation at the 5% significance level.
NER and IP	1_4	14.39222 0.604961	No cointegration at the 5% significance level.
NER and IR	The presence of cointegration is not tested, since the IR is I(0).		
NER and FR	1_4	18.34047 0.003002	1 cointegration equation at the 5% significance level.
Brazil **1990:01-2013:01**			
NEER and CPI	The presence of cointegration is not tested, since the CPI is I(0).		
NEER and IP	1_4	9.927886 2.382813	No cointegration at the 5% significance level.
NEER and IR	1_4	8.658493 1.241022	No cointegration at the 5% significance level.
NEER and FR	1_4	8.824298 0.249641	No cointegration at the 5% significance level.

Note: Critical values for the 5% level of statistical significance are 15.49471 and 3.841466.

Source: Authors' estimations.