Macroprudential Regulations as Counter-cyclical Tools: The Case of Turkey

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Abstract

This paper analyzes the effectiveness of macroprudential regulations adopted by the Central Bank of Turkey in the aftermath of the global financial crisis. In particular, we examine the effects of the domestic policy rate and the reserve requirements on the volume and composition of capital flows, the interest rate differentials, the real exchange rate, and the private bank credit growth. Our findings indicate that the reduction in the policy rate declined the short-term capital inflows, and this direct effect was complemented by the indirect effect of the reserve requirements; however, the estimated effects were temporary. The use of reserve requirements also allowed for higher interest rate differentials, providing the central bank more policy autonomy in the short run, and it had a slight effect on the real exchange rate. Finally, the reserve requirements – particularly those on foreign currency liabilities – were effective in reducing rapid private credit growth and ensuring financial stability. However, the rising share of short-term debt, and the heavy reliance on external financing for economic growth continue to pose challenges for the sustainability of the macroeconomic stability in Turkey.

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I. Introduction

In the aftermath of the global financial crisis, the strong recovery of capital inflows to emerging market economies (EMEs) driven partly by monetary expansion in advanced countries and partly by a two-speed recovery process in which EMEs sustained higher growth rates generated concerns for both macroeconomic and financial stability. On the macroeconomic front, the recipient countries faced intense pressure on their currencies to appreciate, reducing competitiveness, widening current account deficits, and giving rise to Dutch disease. On the financial-stability side, the capital inflow surges tended to increase the money supply and liquidity, creating inflationary pressures, overheating of the economy, and generating bubbles in real estate and stock markets. The response of policymakers to these challenges took diverse forms with an emphasis on macroprudential regulations, active reserve management, and capital account policies (Ostry et al. 2011, 2012; Magud et al., 2011; Erten and Ocampo, 2013), and was endorsed by the IMF's new institutional view (Gezici, 2013; Gallagher and Ocampo, 2013).

Supporters of using capital account policies, or capital flow management techniques, only after all other macroeconomic and financial policy tools are exhausted have argued that emerging countries could follow policies similar to Turkey by lowering policy interest rate to reduce large short-term inflows while controlling for the rapid credit expansion by raising reserve requirement ratios and implementing other contractionary macroprudential measures (IMF, 2011). However, this new "policy mix" that Turkey adopted in December 2010 was also criticized for negatively affecting the primary objective of the Central Bank of the Republic of Turkey (CBRT), inflation and inflationary expectations (IMF, 2012). It was pointed out that the announcement of a lower policy rate to reduce attracting capital inflows broke down the expectations channel of monetary policy as the expected inflation rate remained significantly above the target rate and the core inflation measures began to accelerate. In spite of the increasing recognition of such challenges in macroprudential policy coordination, there has been very limited empirical work on them. More specifically, to date there has not been any comprehensive attempt to assess the different aspects of Turkey's recent experience with macroprudential regulations.

The purpose of this paper is to provide a detailed quantitative assessment of Turkey's experience with the "policy mix" by focusing on the effects of two key complementary policy instruments – the policy interest rate and the differential reserve requirement ratios – on the double goals of financial and price stability. In particular, we assess whether these instruments were effective in delivering some of the outcomes that motivated their adoption in the first place by evaluating empirically (i) whether the implicit tax associated with reserve requirements (RRs) and the reductions in the policy rate reduced the inflow of short-term capital to Turkey, and thereby lengthening the maturity of the financing of current account deficit, (ii) whether these measures helped avoid appreciation of the real exchange rate, and (iii) whether the rise in implicit tax related to RRs reduced the domestic credit growth, countervailing the expansionary effects of lower policy rates. In an attempt to produce robust results we employ a number of empirical

methods, including instrumental variables – 2SLS techniques and the vector autoregression (VAR) estimations.

Our contributions to the existing literature are twofold. First, our findings on the experience of Turkey with macroprudential regulations contribute to the broader literature on individual country studies of various macroprudential policies, and particularly to the studies focused on the reserve requirement policies designed for domestic financial stability. We develop two indices to measure the tax equivalent cost of reserve requirements, and use them to test their effectiveness on macroeconomic outcomes. Second, we contribute to growing literature on the capital flow management measures by analyzing the effects of the policy mix on the volume and composition of capital flows to Turkey. Most studies focus on countries that use direct measures of capital controls, and our study is the first one to evaluate the effects of indirect measures – reductions in the policy rate and RR-implied tax burden – adopted in Turkey to lengthen the financing maturity of the current account deficit.

The rest of the paper is organized as follows. Section 2 reviews the related literature on the effectiveness of macroprudential regulations in EMEs. Section 3 presents an overview of the macroprudential policies recently implemented in Turkey and the policy objectives they were designed to attain. Section 4 discusses and quantifies the tax equivalent cost of the differentiated RRs. Section 5 presents empirical results on the effectiveness of the implicit tax associated with RRs and the policy rate on the volume and composition of capital flows, on interest rates, and on the real exchange rate. Section 6 presents evidence on the effect of the implicit tax related to RRs on the private bank credit growth. Finally, Section 7 concludes and discusses policy implications.

2. Related Literature on Macroprudential Regulations

The importance of macroprudential regulations to ensure financial stability has been emphasized in post-Keynesian approaches built on Minsky's ground-breaking work on financial instability (Esen and Ogus Binatli, 2013). Having pointed at inherent instability and crisis prone tendencies in capitalist economies, Minsky underlined the role of a unified supervisory agency to favor stability-enhancing, and discourage instability-augmenting institutions and practices. Unified nature of such supervision was crucial to Minsky's vision, given that he advocated the integration of FDIC and other financial regulatory institutions with the central bank in order to pursue financial stability as a coherent policy objective (Minsky, 2008).

The macroprudential policies are generally designed to reduce systemic risk that might emerge from a disruption in the financial system, but carries the potential to have serious negative consequences for the real economy. Recent advances in analytical modeling offer a simple conceptual framework for analyzing macroprudential policies in interaction with conventional monetary policy tools. In these models, monetary policy controls the risk-free interest rate and macroprudential policy targets the risk premium, or the spread between lending rates and the risk-free rate (Unsal, 2011; Cechetti and Kohler, 2012). A major conclusion of this theoretical

work is that the coordination of two policy instruments to achieve both price and financial stability enhances welfare. This gains particular importance under fairly open capital accounts since the use of only one instrument to achieve both objectives may not be feasible. For example, raising the policy interest rate to reduce excessive credit expansion driven by large capital inflows is likely to be ineffective since it will end up attracting more capital inflows.

In practice countries use a variety of macroprudential policy tools, including credit-related, liquidity-related, and capital-related measures such as counter-cyclical capital requirements, reserve requirement ratios, limits on foreign exchange (FX) lending/borrowing, caps on debt-to-income (DTI), loan-to-value (LTV) or leverage ratios (Lim et. al., 2011). While the choice of particular tools varies significantly across countries, our focus here is on the transmission of reserve requirement (RR) policies to real economic outcomes.

A key objective of the central banks in using the RRs as a policy tool is to counter-cyclically adjust the broader credit conditions (Gray, 2011). In Turkey the central bank considers the interest rate as the main instrument for price stability, with a secondary role for financial stability, and RRs as the main instrument for financial stability, with a secondary role for price stability (Basci, 2010). When RRs are remunerated below the policy rate or are unremunerated, a variation in the level of the requirement imposes a tax on banks' liabilities. This tax is expected to increase the spread between lending and deposit rates as banks pass on increased costs to their customers (Gray, 2011; Tovar et al., 2012; Glocker and Towbin, 2012a). Depending on the change in spread, the tax will lead to a fall in deposit supply, or a contraction of loan demand, or both, generating a contraction in the credit growth. Inflation-targeting central banks, as the CBRT, will typically offset the impact of a change in RRs on the banking system liquidity and interbank interest rates through open market operations. Even though the monetary effect of changes in RRs is sterilized in this way, there would be a macroprudential effect, reflected by an increase in the spread between lending and deposit rates that avoids excessive credit growth and the vulnerabilities associated with it.

Raising RRs for such macroprudential purposes may have unintended side effects. When RRs squeeze profitability of banks, this might create incentives for banks to take more risk in an effort to restore return on equity. In Turkey, for instance, relatively drastic increases in RRs in early 2011 may have further spurred banks' riskier consumer lending, which was ultimately addressed by increases in regulatory risk weights on such lending. Moreover, in small open economies, increases in RRs may deter capital inflows and ease the currency appreciation pressure or result in depreciation since they tend to decrease returns on domestic and FX deposits (Glocker and Towbin, 2012a).

This theoretical work is supported by empirical studies that generally find evidence for a significant effect of changes in RRs on credit growth. Vargas et al. (2011) study the experience of Colombia and find that RRs have a strong and lasting effect on lending rates charged on business loans. Focusing on five Latin American countries, Tovar et al. (2012) find that the use

of RRs as a countercyclical tool has modest and short-lived effects on credit growth.

The evidence on side effects, such as exchange rate and capital flows, is more mixed. For Brazil, Glocker and Towbin (2012b) find that an increase in the reserves requirement by 1 percentage point leads to a 2 percent depreciation of the domestic currency. Evidence presented in Tovar et al. (2012) confirms the effects of RRs on exchange rates, even if their results point to a more transitory depreciation. On the other hand, Clements and Kamil (2009) find no significant impact of the changes in unremunerated RRs on the exchange rate in Colombia. Consistently, they also find no significant impact of the changes in RRs on the total volume of capital flows. Baba and Kokenyne's (2011) results suggest otherwise as they find that unremunerated RRs in Colombia has reduced the volume of capital inflows, affected short-term flows negatively and thus helped lengthen the maturity structure of inflows. Baba and Kokenyne (2011) find a similar effect of unremunerated RRs in the case of Thailand, but the effect materializes through increased capital outflows.

With their potential impact on capital flows, RRs provide the monetary authorities an instrument to curb excessively strong credit growth without attracting net capital inflows and appreciating the exchange rate. When increases in RRs dampen capital inflows, this can give greater room for maneuver for monetary policy to increase interest rates, as has been the experience in Peru (Tovar et al., 2012).

3. Overview of the Macroprudential Policies in Turkey

Explicit macroprudential policy framework, including active use of RRs, was adopted in the Turkish economy as a response to the global financial crisis of 2008. In this section we present an overview of pre-crisis and post-crisis monetary and financial policies in Turkey.

3.1. Pre-crisis monetary and financial policy framework:

Since Turkey's financial crisis in 2001, the CBRT has followed an inflation-targeting program, which achieved its target of reducing the inflation rate to single-digits by mid-2000s. The recovery of capital inflows in 2002 continued uninterrupted until 2007 (Figure 1), allowing for a prolonged economic growth for 24 quarters in a row. During this period before the global financial crisis, the CBRT used the overnight interest rates as the main monetary policy tool to achieve the primary objective of price stability[1].

The period of inflation targeting also coincided with the adoption of a series of prudential regulations for the Turkish banking industry. These reforms, implemented by the Banking Regulation and Supervision Agency (BRSA), focused on restructuring public banks and, strengthening the capital structure of private banks, while improving the supervisory and regulatory framework. As these reforms targeted financial stability of individual institutions,

[1] For a detailed examination of the inflation-targeting regime in Turkey, see Telli et al. (2008), Ersel and Özatay (2008), Civcir and Akçağlayan (2010).

rather than having an explicit concern for systemic risk, they should be considered more microprudential in design. The restructuring process coupled with significant consolidation of the banking sector paved the way for the expansion of domestic credit: the credit-to-deposit ratio, which stood at only 30.5 percent at the end of 2001, rose to 80 percent at the end of 2007, and the real private credit growth rose up to 50% yearly growth rate by 2005 (Figure 2). This rapid credit growth was largely driven by favorable global financial conditions allowing banks to have low-cost access to funds from abroad, the decline in borrowing needs of the Treasury, and the corresponding decline in lending rates overall (Kenc et al., 2011).

3.2. Policy response to the crisis: liquidity support and the "policy mix"

Once the global financial crisis hit, the CBRT responded quickly to the sharp contraction in Turkish economy by lowering the interest rate from 16.75% in November 2008 to 6.50% in November 2009. The Bank also adopted measures to provide ample liquidity to the financial sector and prevent excessive volatility in short-term interest rates. Among these tools was the use of RRs: the RR ratio on FX liabilities was lowered from 11% to 9% as early as December 2008, and the RR ratio on TL liabilities was reduced from 6% to 5% in October 2009. As shown in Figure 3 and 4, this was the first time that the RRs were used as an active tool of monetary policy over the last decade.

In late 2009-early 2010, the central bank authorities became increasingly concerned about the push factors behind the strong recovery of capital inflows to Turkey, including the large-scale monetary expansion by the major advanced country central banks, the so-called C-5. The return of capital inflows in large volumes and with mostly short-term maturity generated vulnerabilities for the Turkish economy (Figure 1). Resulting rapid currency appreciation as seen in Figure 5 further stimulated a widening of current account deficit and excessive credit growth. Overall, the Bank was concerned about how to manage the exposure to the risk of an unanticipated outflow of short-term capital that could trigger a currency crisis with devastating consequences for the real economy.

The macroprudential regulations were introduced by the CBRT to reduce such financial stability risks arising from large and volatile capital inflows. In April 2010, the CBRT designed an "exit stategy" to remove excess liquidity provided during the crisis. This strategy was implemented with a "policy mix" that combined the use of interest rates with an active RR management to complement the objective of price stability with financial stability. The policy mix was shaped around two goals: (1) channeling capital inflows towards long-term investments and preventing the over-appreciation of the Turkish lira was targeted; (2) a more controlled growth in domestic loans and domestic demand while rebalancing domestic and external demand (Basci, 2012). In line with the first goal, an interest rate corridor – the spread between overnight lending and borrowing rates – was introduced.

The establishment of an interest rate corridor in April 2010 aimed to create a policy-induced uncertainty by allowing overnight interest rates to occasionally fall below the policy rate to discourage short-term speculative capital inflows. Table 1 provides a list of additional policy measures adopted by the central bank, CBRT. In November 2010, CBRT widened this corridor by decreasing overnight borrowing rate from 5.75% to 1.75% while keeping the lending rate at 8.75% and policy rate at 7.00%. In December 2010, the interest rate corridor was widened further. To attain the second goal of controlling domestic credit growth, the RR ratios for TL denominated liabilities were raised in November 2010 and those for FX denominated liabilities were increased in June 2010. In September 2010, the remuneration of RRs was halted, turning them effectively into unremunerated RRs, or URRs. Finally, the CBRT began to differentiate the RR ratios by maturity in February 2011 for TL denominated liabilities, and in June 2011 for FX denominated liabilities such that the liabilities with shortest maturities had to keep the highest ratios for RRs.[2]

These central bank policy measures were complemented by other macroprudential measures adopted by the BRSA to safeguard the domestic financial sector. Table 1 shows various types of macroprudential policies introduced after 2008: capital-related measures such as limitations on banks' dividend payouts, credit-related measures such as caps on loan-to-value ratios and FX lending, and liquidity-related measures such as the use of a new interest rate risk assessment tool to gauge maturity mismatch were introduced. While some of these policies were implemented with a delay, measures on consumer loans and the credit growth cap are likely to have contributed to the sharp slowdown in credit growth in the second half of 2011 (Figure 2), acting as complements to the RR policies implemented by the central bank.

3.3. Macroeconomic trends and the "policy mix"

Overall, the macroprudential policies including the active use of RR ratios aimed to have an immediate impact on the domestic credit growth, with possible indirect effects on capital inflows and the exchange rate. Following the implementation of active RR policy, Figure 2 indicates that there has been a reduction in the growth rate of domestic credit in the second half of 2011. In the meantime, Figure 1 shows that there has been a reduction in inflows of both short and long term capital, and Figure 5 shows that the Turkish lira depreciated in real terms, declining well below the trend. All of these trends indicate that the macroprudential measures had the intended macroeconomic outcomes approximately for the first six to eight months.

However, these immediate desired outcomes were short-lived. By the beginning of 2012 the currency appreciation returned and the domestic credit growth began to rise. While the long-term capital inflows kept declining, short-term inflows were on the rise, indicating a reversal in key policy indicators targeted by the RR policies. Indeed, Table 2 shows that the share of short-term external debt in total debt increased drastically from 18.2% in 2009 to 30% in 2012, a period

[2] In order to offset the monetary effects of the rise in RRs, the Bank authorities injected liquidity by open market operations that kept market interest rates close to the policy rate.

during which active reserve requirement policy was used in combination with macroprudential measures. While the overall indebtedness of the Turkish economy is still relatively low, this sudden increase in short term external debt raises questions about the overall effectiveness of policy. In order to disentangle various factors that influence the targeted macroeconomic variables, and evaluate the effectiveness of policy measures, we first construct indices to measure the tax equivalent cost of RRs, and use them in our econometric analysis in the following sections.

4. Tax Equivalent Cost of Reserve Requirements

The use of required reserves as a monetary policy instrument implies costs for the financial institutions if the remuneration of required reserves is at a rate below the returns on alternative investments, which is typically the case (Borio, 1997; Montoro and Moreno, 2011; Ma et al., 2011). By acting as a distortionary tax on financial intermediation, the reserve requirements may be particularly costly for depository institutions, which often have to pass these costs onto borrowers as high-cost of credit and/or to depositors as lower returns than would be otherwise.[3] Moreover, heavy reliance on RRs could have the unintended consequence of regulatory arbitrage, which has been an increasing concern for countries that use high RRs extensively, including China.

The particular form of the RRs changes with goal of the policy. In the conventional use of the RRs, the goal is to influence the loanable funds of the banking system and domestic money supply. Within this framework, central banks try to control credit conditions and/or inflation by imposing RRs on selected liabilities of the domestic banking system, regardless of the currency denomination. Reserves held for these RRs are often remunerated by the central bank at rates below opportunity cost. The RR system in Turkey typically falls under this category. However the remuneration of reserves was halted as a part of the policy response to external market conditions in 2011.

An unconventional and relatively recent use of RRs, especially in EMEs such as Colombia and Thailand, functions similar to capital controls as they distinguish between foreign and domestic capital. In this framework, a certain share of capital inflows are subject to the RRs to be held as deposits at the central bank according to the maturity of the investments (De Gregorio et al, 2000; Baba and Kokenyne, 2011). The goal of this use is to slow down inflows and prevent instability that might emerge from sudden outflows. In this use, reserves are often unremunerated. While the use of RRs used by the CBRT in Turkey is more conventional by design and serves as a domestic prudential tool in counter-cyclical adjustment, the RRs also are imposed on FX deposits, and they place a burden on domestic banking system by taxing their liabilities. Thus, they also share commonalities with the unconventional RRs that are used as

[3] Alternatively, the cost of RRs could be absorbed as lower profit margins by the depository institutions. The particular response depends on the market power of individual banks: the higher the market power, the more likely they are to pass the cost on the customers.

capital account regulations. Subsection 4.2 provides an international comparison of the tax equivalent cost of RRs.

4.1. Measuring the tax equivalent cost of reserve requirements

There are two factors that determine the magnitude of the tax equivalent cost of RRs, or the implicit tax associated with RRs. The first one is the opportunity cost of holding required reserves, which is the difference between the return on alternative "risk-free" return on investment and the remuneration on required reserves. This difference measures the implicit average "tax rate" associated with RRs, and the "risk-free" return can be captured by domestic government bond yields (Ma et al., 2011). The banks and other depository institutions face an implicit tax burden when the opportunity cost of holding required reserves is greater than zero, which would be the case when required reserves are remunerated at rates that are lower than the risk-free return on alternative investment, or when they are unremunerated.

The second factor that determines the tax equivalent cost of RRs is the level of the required reserve ratio, assuming that all deposits are under coverage of required reserves. Higher required reserve ratios increase the portion of deposits that must be held as required reserves, thereby increasing the tax equivalent cost of RRs. The implicit tax associated with RRs, or their tax equivalent cost (τ) is the product of the (weighted) required reserve ratio (RRR_w) and the tax rate, which is the difference between domestic government bond yield (i) and the (weighted) remuneration rate for required reserves, or the interest paid for reserves (i_w^{RR}):

$$\tau = RRR_w(i - i_w^{RR})$$

Until 2011 required reserve ratios imposed on the liabilities of the Turkish system was only differentiated based on their currency denomination, with FX liabilities being subject to higher rates than TL liabilities. In 2011 required reserve ratios were differentiated not only based on currency denominations but also for different maturities of liabilities. Shorter-term liabilities became subject to higher required reserve ratios to create incentives for lengthening the maturity structure of liabilities.

We construct two implicit tax indices depending on the currency denomination of liabilities:

(i) Implicit tax 1, τ_1, is measured by using a weighted RRR for FX and TL denominated liabilities (weighted by both maturity and the currency denomination) and a weighted rate of remuneration (weighted by currency denomination), and

(ii) Implicit tax 2, τ_2, is measured by using a weighted RRR for only FX denominated liabilities (weighted by the maturity) and its rate of remuneration.

The key distinction between the two indices is that the first one reflects the tax burden on all deposits regardless of differences in which currencies they are held, while the second one is a

measure of tax burden on FX denominated deposits only, which might be more influential as a policy instrument in controlling credit expansion since credit booms are largely driven by capital inflows from abroad, which we will consider in more detail in Section 6.

For both indices, the risk-free return on alternative investment is the monthly average cost of domestic borrowing reported by the Undersecretariat of Treasury, Turkey.[4] This measure is the average interest paid on domestic debt securities issued by the Treasury, and it is by definition the minimum return on risk-free investment on a monthly basis.

Figures 6 and 7 show the evolution of τ_1 and τ_2.Since the tax equivalent cost of RRs depends as much on the opportunity of holding required reserves, the implied tax burden is fairly high the earlier part of the sample during which the cost of government borrowing was relatively high and the remuneration rates were much lower. Once the inflation rate declined to single-digit level in mid-2000s, the risk-free interest rates also came down, and so did the opportunity cost of holding RRs. In order to eliminate the effects of these large declines in levels of both τ_1 and τ_2, we used the differenced series in our empirical analysis (shown in right hand scale in Figures 6 and 7), which allows us to focus on changes in the implied tax rates.[5] Finally, Figure 6 clearly shows the rise in the implicit tax burden in September 2010 when the RRs became unremunerated, and in November 2010 when the RRR on TL denominated liabilities rose significantly. There was a parallel rise in the RRR for FX liabilities in June 2010, but this is not observed partly because the changes were small and partly because of the offsetting changes in the opportunity cost.

4.2. Reserve requirement and its tax equivalent cost: an international comparison

This section complements the evolution of implicit tax rates with an international comparison of their burden as a share of GDP and credit to private sector as shown in Table 3. Several interesting points emerge from this comparison. First, Turkey's RRR on local currency liabilities appears to be much lower than those in China and Colombia, slightly lower than those in India and Korea, and significantly higher than those in Malaysia and Russia based on August 2010 figures. With the recent changes, Turkey's differentiated RRR range from 5 to 11.25% in 2013, which has become much closer to Colombia's range. For foreign currency liabilities, Turkey has the highest RRR among the selected countries, and the current differentiated RRR ranges from 6 to 11% based on maturities of liabilities.

Second, Turkey's required reserves as a share of GDP appears to be quite modest at 1.72%, which is much lower than most countries in the sample, and only higher than Malaysia and

[4] The Treasury calculates the monthly average cost of domestic borrowing as follows: The total net sales amount of the Domestic Debt Securities issued via auction in the current month are weighted with the annual average compound interest rate emerged from the auction. After that, the weighted amounts are aggregated. The aggregated amount is divided by the total net amount of Domestic Debt Securities issued via auction in the current month.

[5] Baba and Kokenyne (2011) and De Gregorio et al. (2000) also use the changes in the tax equivalent cost of RRs instead of its level form. Our empirical results are robust to changes in the sample period. For example, we obtain the same results when the earlier volatile part of the sample is omitted until 2004.

Russia (Table 3). As a share of credit to private sector, Turkey's required reserves stands higher at 4.79%, positioning Turkey in the middle of selected countries. Third, in terms of opportunity cost of holding RRs, Turkey has fairly similar costs to Malaysia, both of which have lower opportunity costs than other countries except China. Finally, the RRR-implied tax burden in Turkey is lower than most countries in the international comparison. As a share of GDP, the implicit tax in Turkey is the same as that in Russia ranging 4-6%, and as a share of credit to private sector, it is slightly larger than Russia with a range of 12-18%. However, overall Turkey has a much lower implicit tax rate than most countries, especially as a share of GDP.

5. The Policy Rate, Reserve Requirements, and Capital Flows

Proponents of the new policy mix in Turkey have argued that, by discouraging short-term capital inflows, this policy reduces the vulnerability of the economy to external shocks (Akcelik et al., 2013). In this section we examine formally whether the reduction in the policy rate and the rise in differentiated RRs– that effectively turned into unremunerated RRs, or URRs, after September 2010 – affected the volume and/or composition of capital inflows to Turkey.

5.1. The composition and volume of capital flows in Turkey

For assessing the effects of the policy rate and the URR on capital inflows we pursue two alternative methods. First, we use instrumental variables–2SLS method to estimate reduced-form capital flow equations. We present the results from these estimations together with the OLS estimates in this subsection. Second, we use vector autoregression (VAR) estimations to explore the links between interest rate differentials, the RR-implied tax, volume and composition of capital flows, and the real exchange rate. The results from these VARs are reported in Subsection 5.2.

A key issue that arises in the estimation of the effects of the policy rate and the RR-implied tax on capital flows is the endogeneity bias: new measures are put in place during episodes of large capital inflows. To control for this potential source of bias, we use instrumental variables and VAR estimations both of which are useful methods of overcoming the bias on estimated coefficients towards zero. As shown below, we get stronger results in the instrumental variables–2SLS estimation relative to the OLS case, which shows that the former estimation helped reduce the potential endogeneity bias that tends to push coefficients downward.

Our analysis uses monthly data that covers the period December 2002 to December 2012. We exclude the period before 2002 to exclude the 2001 financial crisis period, and the data on the composition of deposits is not available before the month of December in 2002. Most variables used in the analysis are taken from the website of CBRT, and the list of description and sources of data is provided in Appendix 1.

The CBRT classifies capital flows into three categories: direct investments, portfolio investments, and other investments. Among other investments, it distinguishes between short-

term capital inflows and long-term capital inflows listed on the liabilities side, but it does not have the same distinction for the capital outflows data listed on the assets side of the balance sheet. Therefore, for the analysis of this section, we use the net portfolio flows as indicator of short-term net capital flows. However, we constructed a short-term capital inflows variable that includes other short-term inflows in addition to portfolio inflows. In addition, we use the total volume of net capital flows and capital inflows as a percent of GDP as aggregate measures of total capital flows. In both cases, we leave out public sector flows composed of monetary authority and general government in portfolio investment assets, but include government sector's portfolio investment liabilities since it includes the investment of nonresident private investors in local public sector securities that makes up a significant share of private capital flows (Baba and Kokenyne, 2011).

Our estimation rests on a reduced-form equation for capital flows. In the presence of imperfect capital mobility, capital flows would hinge on interest rate differentials, business cycles, external "push" factors, and country-specific factors including indicators of risk. Following De Gregorio et al. (2000), we assume that there is a portfolio allocation problem that provides the following linear solution for capital flows in period *t*, Kf_t:

$$Kf_t = \beta_0 + \beta_1(i_t - i_t^* - \hat{e}_t^e - \tau_t) + \beta_3 Z_t + u_t \quad (1)$$

where $\hat{e}^e$ is the expected depreciation, τ is the implicit tax rate of the RRs (or the tax equivalent cost of RRs) and Z is a set of other macroeconomic variables (De Gregorio et al., 2000; and Taylor and Sarno, 1997). The coefficient β_1 shows how capital flows respond to the expected return on international investments.

In order to evaluate the effects of the policy rate and the RR-implied tax rate on capital flows separately, we estimate the following equation:

$$Kf_t = \beta_0 + \beta_1 i_t + \beta_2 i_t^* + \beta_3 \hat{e}_t^e + \beta_4 \tau_t + \beta_5 Z_t + v_t \quad (2)$$

As defined above, we use two measures of Kf_t: short-term flows as a proportion of GDP and total flows as a proportion of GDP. The domestic interest rate, i_t, is measured by the overnight borrowing rate, which has been the policy rate until May 2010 and is tightly linked to the current policy rate, the weekly repo rate.[6] The foreign interest rate, i_t^*, is measured by the monthly Euro libor rate, which is the interbank lending rate for the Eurozone countries, and also the key rate that determines the tightness of external financial conditions for Turkey.[7] The expected change in the exchange rate, $\hat{e}_t^e$, is measured by the effective rate of depreciation (De Gregorio et al.

[6] Since the data on weekly repo rate does not exist for the period before May 2010, it is not possible to use it in the analysis.

[7] We also tried using the monthly Federal Funds rate as an alternative indicator of foreign interest rates, and our results did not change.

2000)[8]. The implicit tax rate of the RRs, τ_t, is measured as described in Section 4.[9] A higher policy rate, a lower foreign interest rate, and a lower implicit tax are expected to increase capital flows, especially short-term capital flows.

The other macroeconomic variables, Z_t, include domestic and foreign business cycles, country-specific investment risk, and current account balance. The domestic business cycles are measured by a cyclical component of the logarithm of an index of industrial production of Turkey by applying the Hodrick-Prescott (HP) filter.[10] For the foreign business cycles, we use the cyclical component of the logarithm of Eurozone industrial production index by applying the HP filter.[11] Positive deviations from the long-term trend in domestic business cycles indicate a domestic boom, which are likely to attract larger volumes of capital inflows. The opposite would be expected for the effects of foreign business cycles. The country-specific investment risk is captured by the JPMorgan's EMBI+ Turkey government bond spread, which shows the difference between returns on dollar-denominated sovereign debt instruments in Turkey and U.S. Treasury notes that are assessed to be risk-free. Given that a lower EMBI spread is related to a lower investment risk, it is expected to attract capital flows into the country. Finally, the current account balance is included as an additional macroeconomic variable. Since a larger current account deficit reflects an increased expenditure over savings that needs to be financed by additional capital flows, we expect a negative relationship between current account balance and capital flows. In order to address the potential endogeneity bias between the policy measures and capital flows, we estimate Eq. (2) using 2SLS with lagged variables as instruments.

The unit root tests in Appendix 2 indicated the stationarity of most variables used in analysis. First-difference series are used for the implicit tax rate of RRs because it displays cumulative changes, and by first-differencing the index, we show the impact of changes in the implicit tax rate on capital flows (Baba and Kokenyne, 2011).

The two panels of Table 4 report the results for total and short-term flows, both in net and inflow terms, as percentage of GDP. The first four regressions in each panel are for total flows; the next four are for short-term flows. In the regressions with instrumental variables – 2SLS estimation, J-statistics do not reject the validity of the instruments used.

The results presented in Table 4 show that in all specifications the coefficient for the policy rate has the correct positive sign and is highly significant in explaining both short-term and total capital inflows, as well as total net capital flows. A 1% reduction in the policy rate is associated with a 0.07 (0.08) percentage point decline in short-term inflows to GDP ratio (total inflows to

[8] In addition to the effective depreciation rate, De Gregorio et al. (2000) also use a one-step-ahead forecast obtained from a rolling ARMA model, and we have constructed such a variable to use as an alternative indicator of expected depreciation, however, it was insignificant in all regression results, and therefore is left out.
[9] The estimation results with τ_2 were very similar to those with τ_1, and are therefore omitted here.
[10] The smoothing factor for the HP filter is 14,400 given the monthly data used.
[11] This is similar to the definition of business cycles in Baba and Kokenyne (2011) while they use an extrapolated real GDP index instead of an industrial production index that we used to extract cyclical components.

GDP ratio). Moreover, the implicit tax rate of RRs has large and significant effects in all of the equations estimated with instrumental variables – 2SLS. The estimated effect of the implicit tax is between 7 to 8 times larger than the effect of the Euro libor rate, and 70 to 80 times larger than the effect of the policy rate.[12] The effect of the RRs in both short-term and total inflows and net flows seems quite important economically, since the results indicate that the presence of RRs implied that monthly short-term (total) inflows were on average 5.1 (7.8) percentage points of GDP lower than what they would have been in their absence. In case of net flows, the results show that the RRs were associated with a 4.1 and 4.7 percentage point decline in the short-term and total net flows as a share of GDP respectively. When the results for the policy rate and the RRs are taken together, the conclusion is that both the policy rate and the RRs had a statistically significant impact on both the composition of capital flows and their overall volume, and the effect of RRs as an implicit tax were larger and more economically meaningful than that of policy rate for the sample period December 2002 – December 2012.

However, it is important to note that one reason for the small coefficient of the policy rate could be that the earlier part of the sample includes data values for the policy rate that has double digits due to domestic inflation. Another point of caution is that the changes in the implicit tax are either due to the changes in the RRR or the opportunity cost of reserves held, and it is the RRR and its remuneration that policymakers control. Due to its significant effects on domestic credit, policymakers tend to make very small changes in RRR, which would have a small impact on the RR-implied tax rate. Therefore, the resulting changes in the implied tax rate tend to be smaller than the changes in the policy rate, indicating that the policy rate may be a more direct and effective policy instrument for altering the composition and total volume of capital flows in general.

The results for remaining variables from Table 4 are as follows. The Euro libor rate is negatively associated with capital flows, but only significantly with the short-term inflows and net flows, and the total net flows. Effective depreciation is negatively related to capital flows in almost all specifications; however, it is only significant for the case of short-term flows in OLS regressions. The domestic business cycle was in most of the specifications positively associated with capital flows, and significantly in case of total capital inflows. The foreign business cycle was insignificant in all specifications and had the incorrect sign in all cases except one. Finally, the EMBI spread and the current account deficit have significant coefficients with the correct negative sign.

5.2. VAR Analysis of the Effectiveness of the Policy Rate and Reserve Requirements

This section examines whether the changes in the policy rate and RRs in Turkey produced desirable effects on the interest rate differentials and the real exchange rate, in addition to their

[12] DeGregorio et al. (2012) find a similarly large effect for the URR in comparison to interest rate differentials. In our case, the reason for why the policy rate's coefficient is much smaller is because the earlier period of the sample contains data values for the policy rate that are in double digits, reflecting the domestic inflationary environment.

effects on the composition of capital flows. In particular, we use a VAR framework to assess: (a) whether the RRs led to higher interest rate differentials, generating room for higher monetary policy autonomy, (b) whether the RRs decreased the appreciation of the real exchange rate, and (c) whether the changes in the policy rate reduced the appreciation of the real exchange rate. The VAR estimation allows us to address the potential endogeneity problem by providing a dynamic response function for the policy measures based on previous values of macroeconomic variables. Assuming that the authorities do not react to shocks in other endogenous variables in the same month, the policy measures taken by the authorities will generate impulse responses from macroeconomic variables of interest (De Gregorio et al., 2000).

Drawing on the specification in De Gregorio et al. (2000) and Baba and Kokenyne (2011), we consider the following endogenous variables:

1. An indicator of the implicit tax rate of the RRs;

2. Interest rate differential (spread between the policy rate and the Euro libor rate);

3. Capital flows as a share of GDP; and

4. Real effective exchange rate.

The assumption underlying the Cholesky decomposition is that the authorities initially decide on the RRRs, which yield an implicit tax rate depending on the opportunity cost of investment. Given the changes in this implicit tax and the changes in the policy rate, an interest rate differential is obtained, which in turn affects the capital flows and the real exchange rate. We first look at the responses to a shock from the implicit tax rate assuming no shocks from the policy rate in the same period, and next we evaluate the responses to a shock from the policy rate , which we consider as a shock from the interest rate differentials.

Moreover, we consider the following exogenous variables in our specification:

1. Domestic business cycle;

2. Foreign business cycle;

3. EMBI+ Turkey government bond spread;

4. Lagged current account balance.

In the VAR estimations for the period December 2002 to December 2012 we include one lag, which is the number of lags recommended by the Schwarz information criterion. Figures 1 and 2 plot the impulse response functions of these VARs to a one standard deviation shock in the implicit tax from the RRs. The solid lines show the response of endogenous variables, and the dashed lines indicate the plus or minus two standard error bands, providing the 95 percent confidence intervals. Figure 8 includes total net capital flows, and Figure 9 has a decomposition

of flows into short-term inflows, short-term outflows, long-term inflows, and long-term outflows. The full results are reported for only Figure 8 to save space.

The impulse response functions in Figure 8 show that, in response to a one standard deviation shock to the implicit tax from the RRs, the interest rate differential increases in two months to a peak of 0.3% and stays at this peak level for 8 months after the shock, and dying out slowly 10 months after the shock. The magnitude of this peak at 0.3% is fairly large in comparison to similar effects for Brazil of 0.045% and for Thailand of 0.004% estimated by Baba and Kokenyne (2011), and twice as much as the effects of the URR in Chile on the domestic interest rate of about 0.1 to 0.15% estimated by De Gregorio et al. (2000). This implies, overall, that the RRs were significantly effective in keeping a fairly large differential in interest rates, helping the authorities to achieve a greater degree of monetary policy independence. On the other hand, it implies that the cost of capital in Turkey was raised as a result of the implicit tax imposed with higher RRs.

Figure 8 indicates that total net capital flows show a very small, and very marginally significant, decline during the first month after the implicit tax rate shock, which is reversed in the second month, and became no longer statistically significant different from zero after the third month. In turn, Figure 9 shows that short-term capital inflows decrease in the first month after the implicit tax rate shock by about 0.2 percent of GDP, but this decline is reversed in the second month after the shock. Long-term capital inflows, on the other hand, show a small increase of about 0.05 percent of GDP in the first month after the shock, which converges to zero starting with the second month. Regarding the effects on outflows, Figure 9 shows that both short-term and long-term outflows increase in response to an implicit tax rate shock in the first month, but the increase in short-term outflows is about 0.1 percent, while that in long-term outflows is less than 0.01 percent of GDP, both of which die out very quickly after the second month of the shock. Taken together, then, these results indicate that the RRs had a more significant effect in affecting the composition of the flows, reducing the share of short-term inflows and increasing short-term outflows, however, the effects are very temporary, mostly constrained to the first couple of months after the change in RRs.

Figure 8 also shows that the real exchange rate responds with a small and temporary depreciation to the RR-implied tax rate. The real exchange rate responds with a slight depreciation of 0.01 percent in the first month after the shock, which shows a persistent decline, reaching 0.005 percent after 5 months, and fading away 16 months after the shock. The magnitude of the response appears very small in comparison to similar effects as in case of Chile (De Gregorio et al., 2000), but is quite similar to slight effects as in case of Korea, Thailand, and Brazil (Baba and Kokenyne, 2011). Overall, the effect of the RRs on the real exchange rate is small and rather temporary, fading away after about 5 months after the changes in RRs.

6. The Reserve Requirements and the Credit Growth

The RRs have been a key component of the new policy mix when the policymakers aimed to reduce the inflows of short-term capital by lowering the policy rate and compensated for the expansionary effects of the lower policy rate on credit growth by increasing the RRs on both Turkish lira and foreign exchange denominated deposits. The reserve requirement ratios were differentiated, with short-term maturity deposits having higher ratios, in order to lengthen the average maturity of deposits. The authorities argued that higher RRs were effective in reducing the excessive credit growth in the private banking sector (Kenc, 2011; Akcelik et al., 2013). In this section we examine formally whether the rise in the implicit tax attached to the RRs was effective in reducing the private bank credit growth in Turkey.

6.1. Private bank credit growth in Turkey

In order to assess the effect of the RRs on credit growth we pursue two alternative methodologies. First, we use instrumental variables–2SLS method to estimate reduced-form credit growth equations. The results from these estimations are presented together with the OLS estimates in this subsection. Second, we use vector autoregression (VAR) estimations to investigate the relationships between the implicit tax rate associated with the RRs, the policy interest rate, the domestic business cycle, and the private bank credit growth. The results from these VARs are reported in the following subsection 5.2.

One of the concerns in the estimation of the impact of RRs on credit growth is the endogeneity bias: RRRs are increased during a period of rapid increase in the growth of credit. We control for this potential source of bias by using instrumental variables and VAR estimations. Our analysis uses monthly data from December 2002 to December 2012.[13]

Table 5 reports the results for the reduced-form regressions for private bank credit growth in Turkey. The columns (1) and (2) use the implicit tax rate 1 based on the weighted average of the RRs for domestic and foreign currency deposits, while the columns (3) and (4) use the implicit tax rate 2 based on the RRs for foreign currency deposits only. This distinction is crucial for explaining the credit growth dynamics in Turkey. Our results below support the view that the growth of private credit in Turkey is largely driven by external factors, including foreign inflows of capital, and therefore, it tends to be more sensitive to changes in the RRs for deposits denominated in foreign currency.

The results presented in Table 5 indicate that the coefficients for the implicit tax rates have the correct negative sign, however, only that of the implicit tax rate 2 is significant (at 5 percent level). The results in columns (3) and (4) show that a one percent increase in the implicit tax rate 2 is associated with a 5 to 8 percent decline in the credit growth rate, which is an sizable effect suggesting that the effect is also economically significant. Since the implicit tax rate 2 is measured based on the RRR and remuneration rate for FX denominated deposits, this result implies that the credit growth in Turkey is much more influenced by changes in the RRs for

[13] See Appendix 1 for data sources and descriptions.

foreign currency than domestic currency – which reflects the fact that credit booms in Turkey tend to be externally driven by surges in capital inflows (Akcelik et al, 2013; Rodrik, 2012). This is further supported by the significant and negative coefficient of the Euro libor rate, which indicates that tightening in external monetary conditions negatively affects credit growth in Turkey, and by the slightly significant and positive coefficient of the net portfolio flows, which implies that a rise in short-term capital flows tends to spur credit growth. Moreover, the EMBI spread is highly significantly and negatively related to credit growth, indicating that a rise in the spread – an indication of a rise in investment risk in Turkey – is associated with a decline in credit growth. Overall, these findings suggest that credit growth dynamics in Turkey depend largely on external factors; however, the RRs on foreign currency deposits are a key domestic policy tool that can be deployed to offset these factors in a countercyclical way.

The policy rate is positively associated with the credit growth, and this is also confirmed by other studies (Binici and Koksal, 2012). This finding is interpreted as the coincidence of high policy rates with credit booms, as the authorities raise the rates to counter surges in credit growth. The domestic business cycle is also positively associated with credit growth, supporting the expectation that an expansion of industrial output above trend would be associated with a higher transactions demand for money, and would be accompanied by higher credit growth. Finally, the real exchange rate is positively but not significantly (in the IV-2SLS regressions) related to credit growth. This suggests that an appreciation of the real exchange rate is associated with higher rates of credit growth, and it reflects the boom-bust cycles associated with capital flows.

6.2. VAR analysis of the effectiveness of reserve requirements on credit growth

This section examines whether the changes in RRs in Turkey produced a reduction in the private bank credit growth using a VAR framework. Assuming that the authorities do not react to shocks in other endogenous variables in the same month, the policy measures taken by the authorities will generate impulse responses from macroeconomic variables of interest.

Drawing on the specification in Tovar et al. (2012), we consider the following endogenous variables:

1. An indicator of the implicit tax rate of the RRs;

2. The policy interest rate;

3. The net portfolio capital flows;

4. The business cycle as an indicator of the level of economic activity;

5. The private bank credit growth in real terms.

The identification of shocks in the system is obtained by a Choleski decomposition in which the implicit tax rates associated with the RRs are assumed to be the most exogenous variables,

followed by the policy rate, the net portfolio capital flows, the business cycles, and lastly, bank credit growth to the private sector. We consider responses to two types of shocks: (i) the implicit tax rate 1 based on the weighted average of RRs for domestic and foreign currency deposits, and (ii) the implicit tax rate 2 based on the RRs for foreign currency deposits only.

In the VAR systems over the period December 2002 to December 2012 we include one lag, which is the number of lags recommended by the Schwarz information criterion. Figures 3 and 4 plot the impulse response functions of these VARs to a one standard deviation shock in the implicit tax rate 1 and 2 respectively. The solid lines show the response of endogenous variables, and the dashed lines indicate the plus or minus two standard error bands, providing the 95 percent confidence intervals. The responses from the net portfolio capital flows are left out to avoid repetition with the previous section.

The impulse response functions in Figure 10 show that, in response to a one standard deviation shock to the implicit tax rate 1 based on a weighted average of RRs on Turkish lira and FX denominated deposits, the private bank credit growth declines in first month by about 0.8%, which quickly erodes within six months and begins to increase thereafter. However, Figure 11 indicates that in response to a one standard deviation shock to the implicit tax 2 based on RRs on FX denominated deposits, the private bank credit growth declines in first month by 1.8% in first month, reaches a peak of 2% in second month, and begins to gradually fade away thereafter, although the negative effect persists until the twentieth month. These findings are in line with our finding in the previous subsection, and suggest that the implicit tax related to the RR-implied tax on FX deposits play a more important role in reducing credit growth during periods of credit boom.

Finally, Figures 10 and 11 indicate that, in response to a one standard deviation shock from implicit tax rate 1 and 2, the policy rate increases by 0.30 to 0.35% in the first month, reaches a peak of 0.40 to 0.45% in the second month, and the positive effect gradually declines to about 0.2% in the twentieth month. This suggests that there is a complementary role between policy rate increases and reserve requirement shocks, which implies that authorities tend to increase the policy rate following a rise in the reserve requirement ratios. Tovar et al. (2012) found a similar effect for a cross-country study of Latin American economies in the recent period.

7. Conclusion

This paper analyzes the macroeconomic effectiveness of the “policy mix” adopted by the Central Bank of Turkey in 2010 with the dual objectives of ensuring financial stability coupled with price stability. We consider two key policy instruments: the policy interest rate and the RRs on domestic liabilities of the banking system, and we develop two indices to measure the tax equivalent cost of RRs. Our empirical analysis focuses on the effects of these macroprudential policy measures on the volume and composition of capital flows, the interest rate differentials, the real exchange rate, and the private bank credit growth. While we find significant effects with

instrumental variables estimations, the results from VAR systems show that these effects tend to be temporary and small in magnitude.

Our findings indicate that the reduction in the policy rate declined the short-term capital inflows, and this direct effect was complemented by the indirect effect of the reserve requirements; however, these effects that are estimated to be fairly large and significant in instrumental variables framework appear weak and temporary when estimated with VARs. The RR-implied tax rate has the strongest effect on the interest-rate differentials, which suggests that it was useful for the central bank to have more policy autonomy in the short term. The policy measures also had a small and temporary effect in slowing down the appreciation of the real exchange rate. Finally, the RR-implied tax rate associated with FX liabilities had a significant effect in reducing the growth of the private bank credit, while the broader measure of RR-implied tax rate covering both TL and FX liabilities did not produce a significant effect. This provides support for the view that the credit booms in Turkey are predominantly financed by capital inflows from abroad, and raising RRs on FX liabilities is an effective macroprudential measure to offset excessive credit growth and avoid the bursting of credit bubbles.

This paper has not covered additional elements of the macroprudential policies introduced in the same period. For example, we have not examined the effects of other macroprudential measures, such as loan-to-value ceilings on housing and commercial real estate loans, adopted by the BRSA over 2008-11. There is descriptive and anecdotal evidence that these measures played a crucial role in getting the excessive credit growth under control[14]. This suggests that our estimates for the effects of RRs on credit growth should be interpreted with caution since part of the effect may be due to these uncontrolled other prudential measures. Finally, our paper has not dealt with the effect of policy-induced uncertainty generated by the widening of interest-rate corridor. However, given that the policy rate fluctuates within that corridor, we focus on the realized changes in the policy rate instead of expected changes based on the corridor.

Over the long run, the rising share of short-term debt and the heavy reliance on external financing for economic growth continue to pose challenges for the sustainability of the macroeconomic stability in Turkey. Such challenges can only be overcome through the design of strategic economic policies with an explicit focus on industrial policies for long-term development. The ongoing real appreciation of the exchange rate continues to undermine the competitiveness of Turkish industry, and there are no comprehensive policy packages to deal with this problem. Therefore, while the use of macroprudential policies as the ones in recent years are extremely valuable for short-term macroeconomic management, unless these policies are complemented with longer-term strategic policymaking, it will be quite difficult to sustain macroeconomic stability in the long run.

Finally, as the IMF's institutional view recently recognized, the use of direct capital flow measures should be part of the macroeconomic policy tool of EMEs that are subject to large and procyclical capital flows. The policymakers in Turkey have generally distanced themselves from

[14] See, for example, Akcelik et al, 2013 and IMF, 2012 for a discussion.

the use of such measures to have a friendly attitude towards foreign capital. However, this often comes at the expense of an excessive reliance on procyclical capital flows and the associated sudden-stops that are very difficult to manage without the use of direct measures. In fact, the optimum policy response to such flows would target the source of the disturbance, the capital flows. In that sense, capital flow measures are a first best policy response to isolate the economy from the amplification effects generated by procyclical capital flows. Therefore, the use of domestic prudential measures such as differential RRs should be seen as complements – instead of substitutes to – capital account regulations as countercyclical policy tools.

References:

Akcelik, Yasin, Erdem Basci, Ergun Ermisoglu, Arif Oduncu, 2013, "The Turkish Approach to Capital Flow Volatility", *CBRT Working Paper* No. 13/06, Central Bank of the Republic of Turkey.

Baba, Chikako and Annamaria Kokenyne, 2011, "Effectiveness of Capital Controls in Selected Emerging Markets in the 2000s," *IMF Working Paper* 11/281, Washington: International Monetary Fund.

Basci, Erdem, 2010, "Financial Stability and the Central Bank," Presentation at the Turkish Economic Association, Ankara.

Basci, Erdem, 2012, "Monetary Policy of Central Bank of the Republic of Turkey after Global Financial Crisis," *Insight Turkey*, Vol. 14(2).

Binici, Mahir and Bulent Koksal, 2012, "Determinants of Credit Booms in Turkey", MPRA Papers.

Borio, Claudio, 1997, "Monetary policy operating procedures in industrial countries", *BIS Working Papers*, No 40, Basel: Bank for International Settlements.

Cecchetti, Stephen, and Marion Kohler, 2012, "When Capital Adequacy and Interest Rate Policy are Substitutes (and When They are Not)," *BIS Working Paper* 379, Basel: Bank for International Settlements.

Civcir, Irfan and Anıl Akçağlayan, 2010, "Inflation targeting and the exchange rate: Does it matter in Turkey?", *Journal of Policy Modeling*, 32 (3): 339–354.

Clements, Benedict J. and Herman Kamil (2009), "Are Capital Controls Effective in the 21st Century? The Recent Experience of Colombia," *IMF Working Paper* No. 09/30.

De Gregorio, Jose, Sebastian Edwards, Rodrigo O. Valdes, 2000, "Controls on capital inflows: do they work?" *Journal of Development Economics* 63, 59–83.

Ersel, Hasan and Fatih Özatay, 2008, "Fiscal dominance and inflation targeting: lessons from Turkey", *Emerging Markets Finance and Trade*, 44 (6): 38-51.

Erten, Bilge and José Antonio Ocampo, 2013, "Capital Account Regulations, Foreign Exchange Pressure, and Crisis Resilience," Working Paper.

Esen, Oguz and Ayla Ogus Binatli, 2013, "The Minsky Perspective on Macroprudential Policy", *PERI Working Paper*, No. 308, January, Political Economy Research Institute, Amherst, MA.

Gallagher Kevin P. and José Antonio Ocampo, 2013, "IMF's New View on Capital Controls," *Economic and Political Weekly* XLVIII (12), March 23.

Gezici, Armagan, 2013, "Changing Role of the IMF? Evidence from the Current Global Crisis," Working Paper.

Glocker, Christian and Pascal Towbin, 2012a, "Reserves Requirements for Price and Financial Stability: When Are They Effective?" *International Journal of Central Banking*, 8 (1), 66–113.

_____, 2012b, "The Macroeconomic Effects of Reserve Requirements," Document de Travail 374 (Paris: Banque de France)

Gray, Simon, 2011, "Central Bank Balances and Reserves Requirements," *IMF Working Paper* 11/36 (Washington: International Monetary Fund)

International Monetary Fund (IMF), 2011, 'Recent Experiences in Managing Capital Inflows: Cross-Cutting Themes and Possible Policy Framework', *IMF Policy Paper*, 14 February.

International Monetary Fund (IMF), 2012, "The Interaction of Monetary and Macroprudential Policies—Background Paper", *IMF Policy Papers*, 27 December.

Kenc, Turalay, 2011, "The Turkish Experience", Presentation at the Brazilian Ministry of Finance and IMF Joint High-level Conference on Managing Capital Flows in Emerging Markets, Brazil.

Kenc, Turalay; Turhan, M. Ibrahim; Yildrim, Onur, 2011, "The experience with macro-prudential policies of the Central Bank of the Republic of Turkey in response to the global financial crisis," *World Bank Policy Research Working Paper* 5834, Washington, DC: World Bank, Europe and Central Asia Region, Office of the Chief Economist.

Lim C., F. Columba, A. Costa, P. Kongsamut, A. Otani, M. Saiyid, T. Wezel, and X. Wu , 2011, "Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences" *IMF Working Paper*, WP/11/238.

Ma, Guonan, Yan Xiandong and Liu Xi, 2011, "China's evolving reserve requirements" *BIS Working Paper*, No 360, Basel: Bank for International Settlements.

Magud, Nicolas E., Carmen M. Reinhart, and Kenneth S. Rogoff, 2011, "Capital Controls: Myth and Reality—A Portfolio Balance Approach," NBER Working Paper No. 16805.

Minsky, Hyman P. 2008, *Stabilizing the Unstable Economy*, Yale University Press, McGraw-Hill.

Montoro, Carlos and Ramon Moreno, 2011, "The use of reserve requirements as a policy instrument in Latin America", *BIS Quarterly Review*, March, 53-65.

Ostry, Jonathan D., Atish R. Ghosh, Karl Habermeier, Luc Laeven, Marcos Chamon, Mahvash S. Qureshi, Annamaria Kokenyne, (2011), "Managing Capital Inflows: What Tools to Use?" *IMF Staff Discussion Note* SDN/11/06, Washington: International Monetary Fund.

Ostry, Jonathan D., Atish R. Ghosh, Marcos Chamon, Mahvash S. Qureshi (2012), "Tools for Managing Financial-Stability Risks from Capital Inflows," *Journal of International Economics*, 88 (2): 407–421.

Rodrik, Dani, 2012 "The Turkish Economy after the Global Financial Crisis", *Ekonomi-tek*, 1 (1), January, 41-62.

Taylor, Mark P. and Sarno, Lucio, 1997, "Capital flows to developing countries: long and short-term determinants," *The World Bank Economic Review* 11 (3), 451–470.

Telli, Cagatay, Ebru Voyvoda and Erinc Yeldan, 2008. "Macroeconomics of twin-targeting in Turkey: analytics of a financial computable general equilibrium model," *International Review of Applied Economics*, 22 (2): 227-242.

Tovar, Camilo E, Mercedes Garcia-Escribano, and Mercedes Vera Martin, 2012, "Credit Growth and the Effectiveness of Reserves Requirements and Other Macroprudential Instruments in Latin America," *IMF Working Paper* 12/142 (Washington, DC: International Monetary Fund).

Unsal, Filiz, 2011, "Capital Flows and Financial Stability: Monetary Policy and Macroprudential Responses," *IMF Working Paper* 11/189 (Washington: International Monetary Fund).

Table 1: Macroprudential Measures adopted after 2008

Measures	Adoption Date
Introduced by BRSA	
Caps on dividend payouts distributed by banks	October 2008
Minimum 1 year maturity on certain FX lending by banks and banning consumers from taking out FX-linked loans	June 2009
Loan-to-value ceilings on housing and commercial real estate loans	December 2010
Providing 'guidance' to banks that credit growth in 2011 should not exceed 25 percent.	Spring 2011
High risk weights for consumer loans	June 2011
Increased provisions for consumer loans	June 2011
Increased minimum requirements for credit card payments	June 2011
Introduction of a new interest rate risk measure to discourage maturity mismatch in bank balance sheets	August 2011
Changes to minimum Capital Adequacy Requirements to include banks with foreign ownership	September 2011
Introduced by CBRT	
Introduction of an interest rate corridor for more room policy adjustment	April 2010
RR ratios for TL denominated liabilities were raised	November 2010
RR ratios for FX denominated liabilities were raised	June 2010
The remuneration of RRs stopped (beginning of unremunerated RRs)	September 2010
RR ratios for TL denominated liabilities differentiated by maturity	February 2011
RR ratios for F denominated liabilities differentiated by maturity	June 2011

Source: Author's compilation based on CBRT and IMF (2012).

Table 2: External Debt Indicators in Turkey

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Gross External Debt[1]	129.6	144.1	161.0	170.5	208.3	250.3	281.0	269.2	291.9	304.2	336.9
as a share of GDP (%)	55.7	47.6	41.1	35.3	39.2	38.7	38.5	43.8	39.9	39.3	42.4
Private/ Total (%)	33.2	33.9	39.7	49.7	58.1	64.3	67.1	64.0	65.4	65.8	67.1
Public/Total (%)	49.8	49.2	47.0	41.3	34.4	29.4	27.9	31.0	30.5	31.0	30.6
Short Term/Total (%)	12.7	16.0	20.0	22.8	20.6	17.2	18.7	18.2	26.5	27.0	30.0
Long Term/Total (%)	87.3	84.0	80.0	77.2	79.4	82.8	81.3	81.8	73.5	73.0	70.0

Source: CBRT based on Treasury Statistics.
Notes: [1] In billions of US dollars.

Table 3: Reserve requirement and implicit tax in selected economies in August 2010

	China	Colombia	India	Korea	Malaysia	Russia	Turkey
(1) Required reserves ratio (in per cent)							
On local currency	11 – 17	0 – 11	6	0 – 7	1	2.5	5
On foreign currency	5	–	5.5	1 – 7	–	2.5	10
(2) Required reserves as a percentage of							
GDP	25.42	2.77	4.18	2.98	0.94	0.87	1.72
Credit to private sector	19.92	8.52	8.59	2.93	0.83	2.08	4.79
(3) Opportunity cost (in basis point)							
Base on yield of 1-year government notes	47	353	651	313	290	471	255
Base on yield of 5-year government notes	102	683	768	400	337	681	373
(4) Implicit tax (in percent)							
Based on yield of 1-year government notes							
As a share of GDP	0.12	0.12	0.27	0.09	0.03	0.04	0.04
As a share of credit to private sector	0.09	0.30	0.56	0.09	0.02	0.10	0.12
Based on yield of 5-year government notes							
As a share of GDP	0.26	0.20	0.32	0.12	0.03	0.06	0.06
As a share of credit to private sector	0.20	0.58	0.66	0.12	0.03	0.14	0.18

Source: Authors' evaluation for Turkey based on CBRT data, and Ma et al. (2011) for other countries.
Notes: Figures are based on August 2010 data, except for the required reserve ratio for Colombia, which is for December 2010. Opportunity cost refers to the spread between government bond yield in specified maturity and required reserve remuneration. Implicit tax refers to the product of required reserves and opportunity cost: 4 = 2 * 3. The reserve requirement ratio for India refers to cash reserve ratio only, excluding the statutory liquidity ratio.

Table 4: The Effects of the Policy Rate and Implicit Tax Rate 1 on Capital Flows to Turkey

Dependent var.:	Total flows				Short-term flows			
	(net) OLS	(net) 2SLS	(inflow) OLS	(inflow) 2SLS	(net) OLS	(net) 2SLS	(inflow) OLS	(inflow) 2SLS
Policy rate	0.09**	0.07**	0.10***	0.08***	0.04	0.04*	0.08***	0.07**
	(2.53)	(2.06)	(3.23)	(0.03)	(1.94)	(1.69)	(2.95)	(0.03)
Euro libor rate	-0.44**	-0.31**	-0.16	-0.05	-0.43***	-0.43***	-0.73***	-0.69***
	(2.54)	(-2.00)	(-0.96)	(0.18)	(-3.71)	(-3.22)	(-5.22)	(0.16)
Effective	-0.05	-0.03	-0.05	-0.04	-0.10***	-0.07	-0.09***	-0.04
depreciation	(-1.26)	(-0.40)	(-1.37)	(0.04)	(-4.02)	(-1.43)	(-2.78)	(0.07)
Implicit tax rate 1	-1.34	-4.65**	-1.97*	-6.06**	-1.48*	-4.05**	-1.50*	-5.38**
	(-1.37)	(-2.25)	(-1.83)	(3.02)	(-1.77)	(-2.10)	(-1.86)	(2.55)
Business cycle	-0.12	0.37	5.39*	6.77**	0.95	-0.46	4.22**	3.63
	(-0.05)	(0.11)	(1.95)	(2.98)	(0.60)	(-0.20)	(2.27)	(3.09)
Foreign business	10.04*	5.28	0.88	-2.53	0.96	1.74	5.40	3.55
cycle	(1.66)	(0.79)	(0.15)	(6.03)	(0.23)	(0.31)	(1.16)	(6.35)
EMBI spread	-0.75***	-0.76***	-0.90***	-0.87***	-0.31***	-0.25**	-0.45***	-0.47***
	(-5.63)	(-4.73)	(-5.99)	(0.15)	(-3.27)	(-2.03)	(-3.64)	(0.12)
Current account	-0.60***	-0.87***	-0.71***	-0.90***	-0.15	-0.41**	-0.30**	-0.60***
	(-3.88)	(-3.55)	(-3.92)	(0.23)	(-1.25)	(-2.48)	(-2.20)	(0.22)
R-squared	0.37	0.43	0.44	0.43	0.33	0.31	0.43	0.38
Adjusted R-squared	0.32	0.38	0.40	0.38	0.28	0.26	0.39	0.34
Observations	120	116	120	119	120	116	120	117
J-statistic		18.53		12.19		20.72		8.91
[p-value]		[0.67]		[0.43]		[0.60]		[0.63]

Source: Authors' estimations.

Note: White's heteroscedasticity-consistent standard errors are reported in parentheses. ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent level, respectively. All regressions include a constant term. Capital flows and current account balance are represented as a percent of GDP. Interest rates, effective depreciation, implicit tax rate 1, and EMBI spread are expressed in percent. The period is 2002:M12 – 2012:M12.

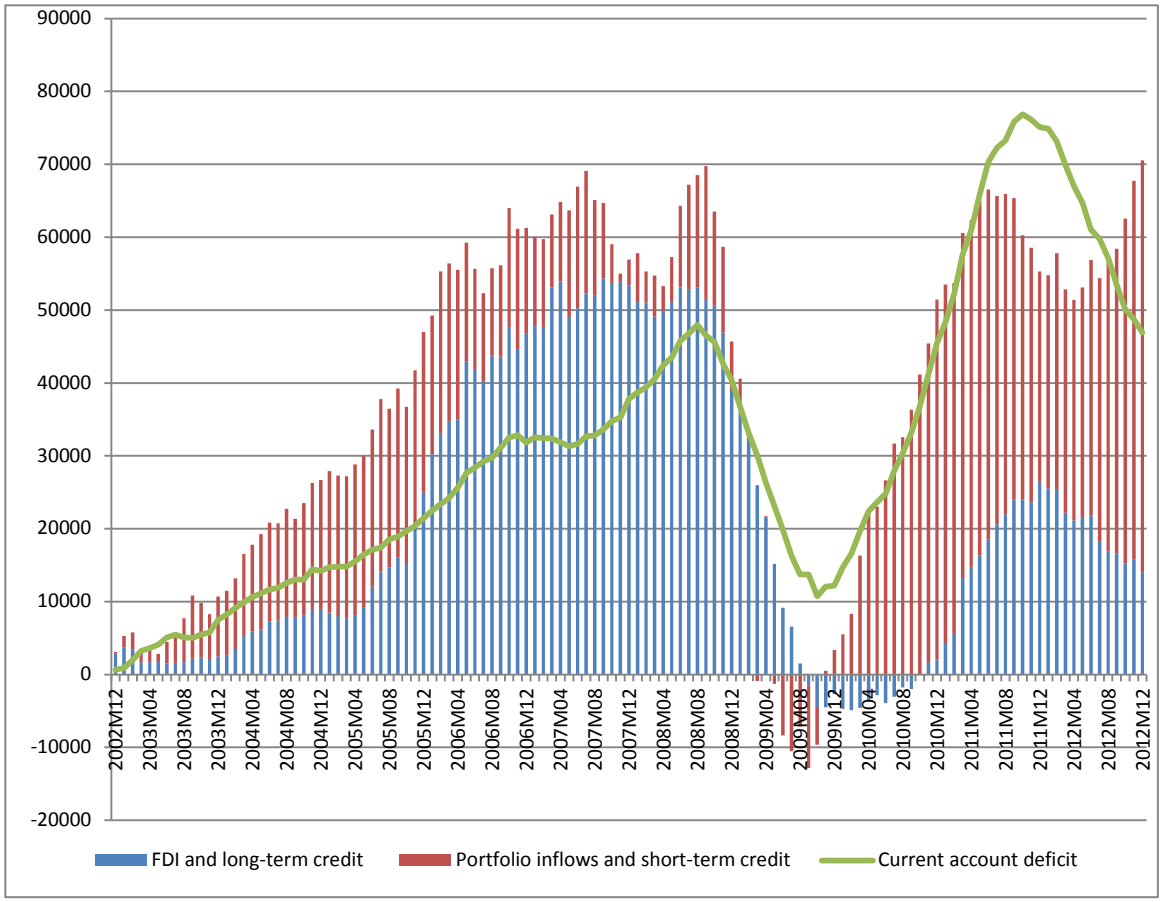
Table 5: The Effects of Implicit Tax Rates 1 and 2 on Private Bank Credit Growth in Turkey

Dependent var.:	Private bank credit growth (real, in percent)			
	OLS	2SLS	OLS	2SLS
Implicit tax 1	-1.38	-9.86		
	(3.91)	(9.03)		
Implicit tax 2			-4.93**	-8.53**
			(2.04)	(4.19)
Policy rate	0.75***	0.77***	0.69***	0.68***
	(0.14)	(0.18)	(0.13)	(0.16)
Euro libor rate	-2.36***	-2.27***	-2.19***	-2.07***
	(0.57)	(0.55)	(0.57)	(0.57)
Business cycle	11.95*	14.04*	13.19**	13.75**
	(6.11)	(7.21)	(5.95)	(6.41)
Portfolio net flows	1.13**	0.89*	0.99*	0.83*
	(0.52)	(0.50)	(0.52)	(0.49)
Real exchange rate	0.24**	0.19*	0.20**	0.16
	(0.10)	(0.11)	(0.10)	(0.10)
EMBI spread	-2.32***	-2.74**	-2.36***	-2.59***
	(0.86)	(1.20)	(0.85)	(1.16)
R-squared	0.95	0.95	0.95	0.95
Adjusted R-squared	0.95	0.94	0.95	0.94
Observations	119	118	119	118
J-statistic		15.60		14.28
[p-value]		[0.41]		[0.50]

Source: Authors' estimations.

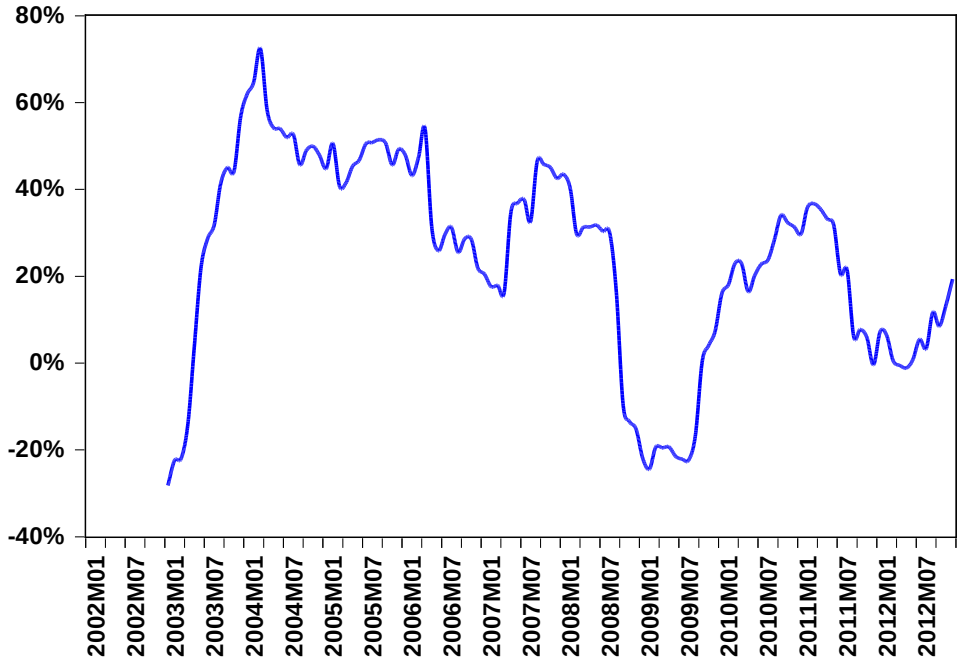
Note: White's heteroscedasticity-consistent standard errors are reported in parentheses. ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent level, respectively. All regressions include a constant term and lagged dependent variable. Portfolio net flows is represented as a percent of GDP. Interest rates, implicit tax rates (URR), the real exchange rate, and EMBI spread are expressed in percent. The period is 2002:M12 – 2012:M12.

Figure 1. Composition of Capital Inflows and Current Account Deficit (cumulative, in millions of US$)



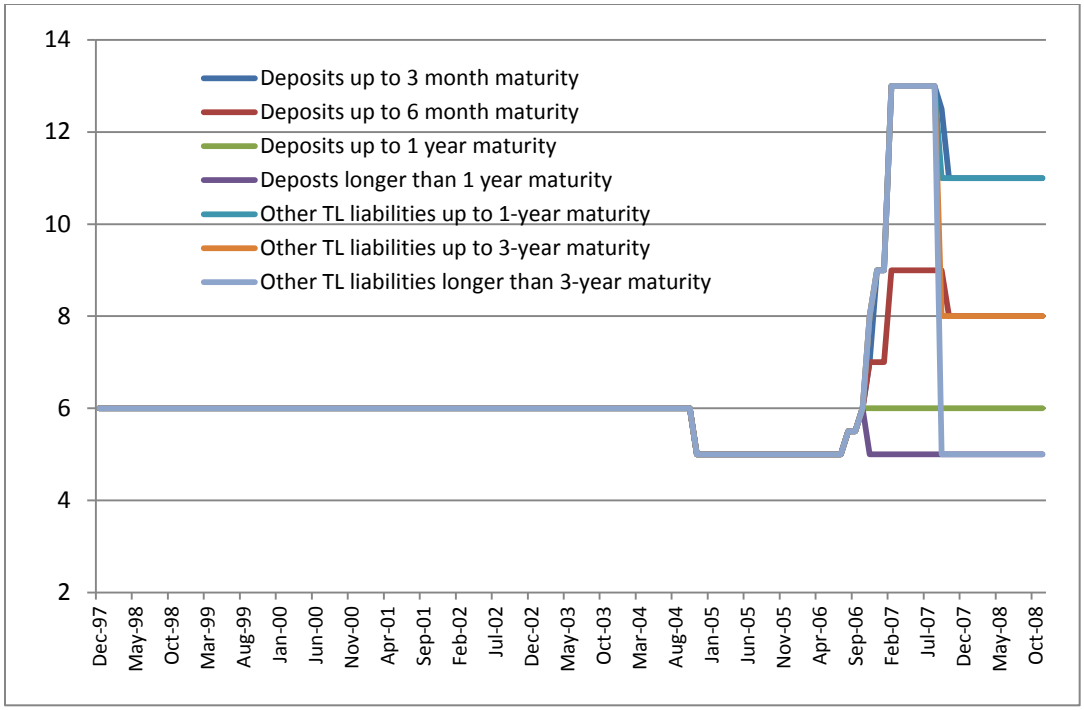
Source: Authors' evaluations from the CBRT.

Figure 2. Private Bank Credit Growth (deflated by CPI, in yearly % change)



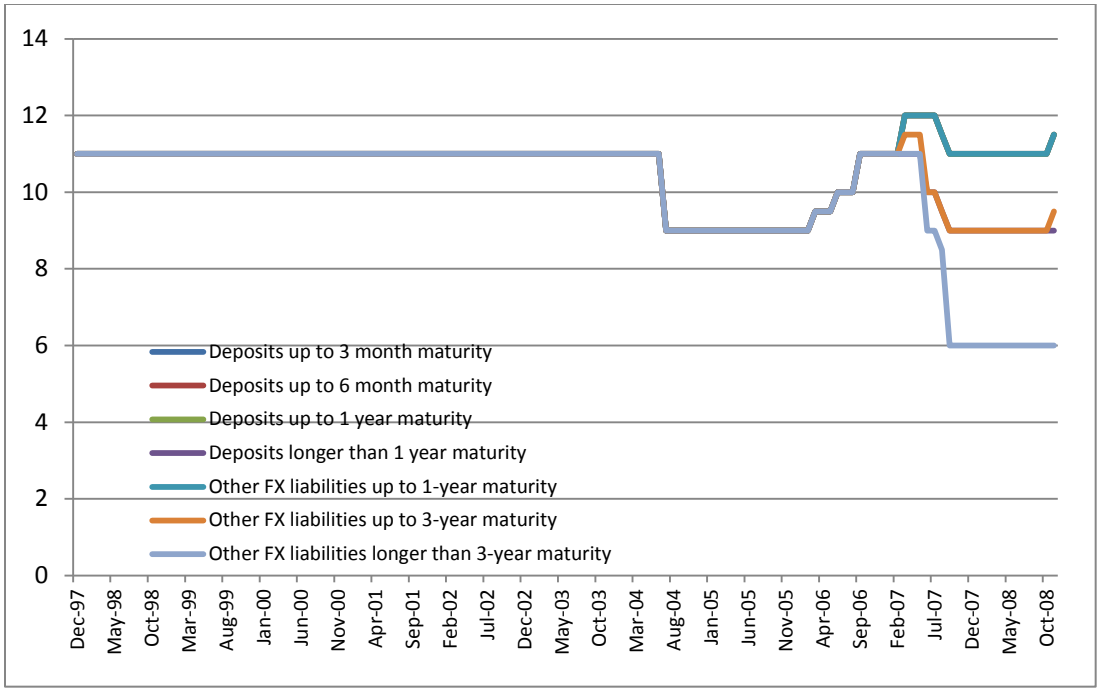
Source: Authors' evaluation from the CBRT.

Figure 3: Reserve Requirement Ratios for TL Denominated Liabilities of the Turkish Banking System



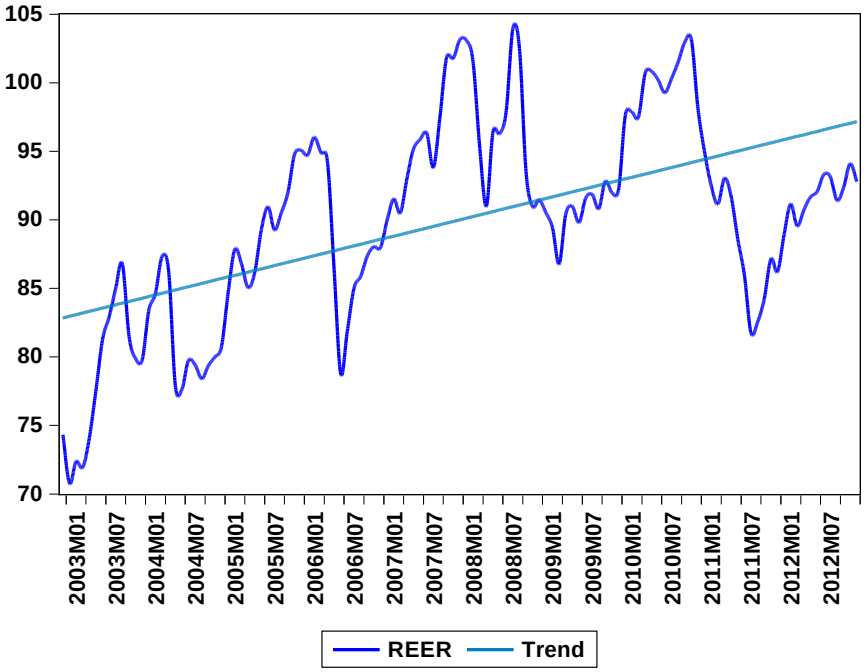
Source: CBRT Banking Statistics.

Figure 4: Reserve Requirement Ratios for FX Denominated Liabilities of the Turkish Banking System



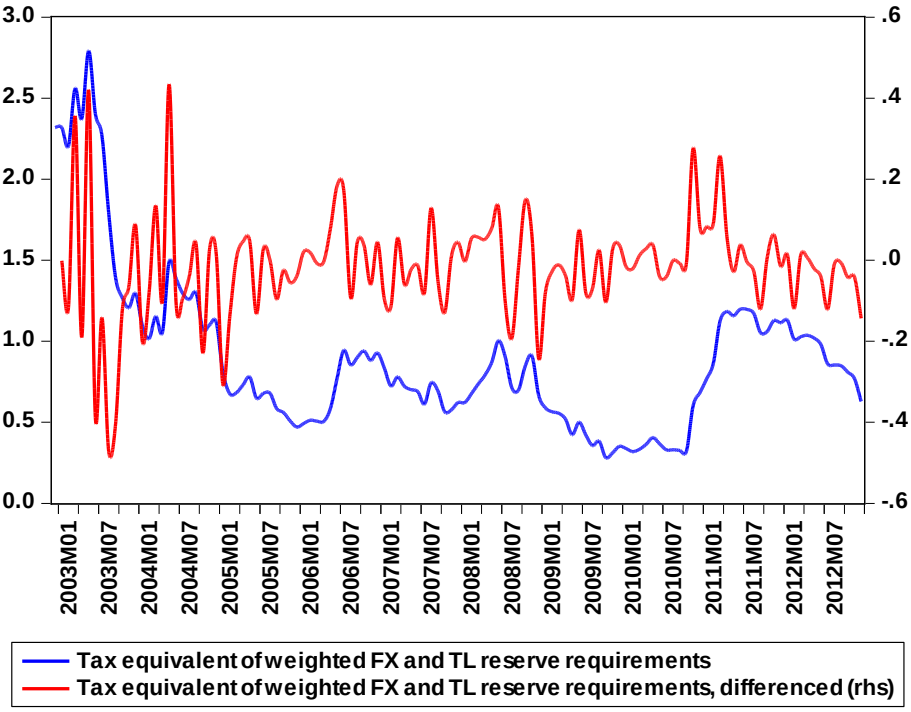
Source: CBRT Banking Statistics.

Figure 5: Turkish Lira - Real Effective Exchange Rate (CPI Based, June 2010=100)



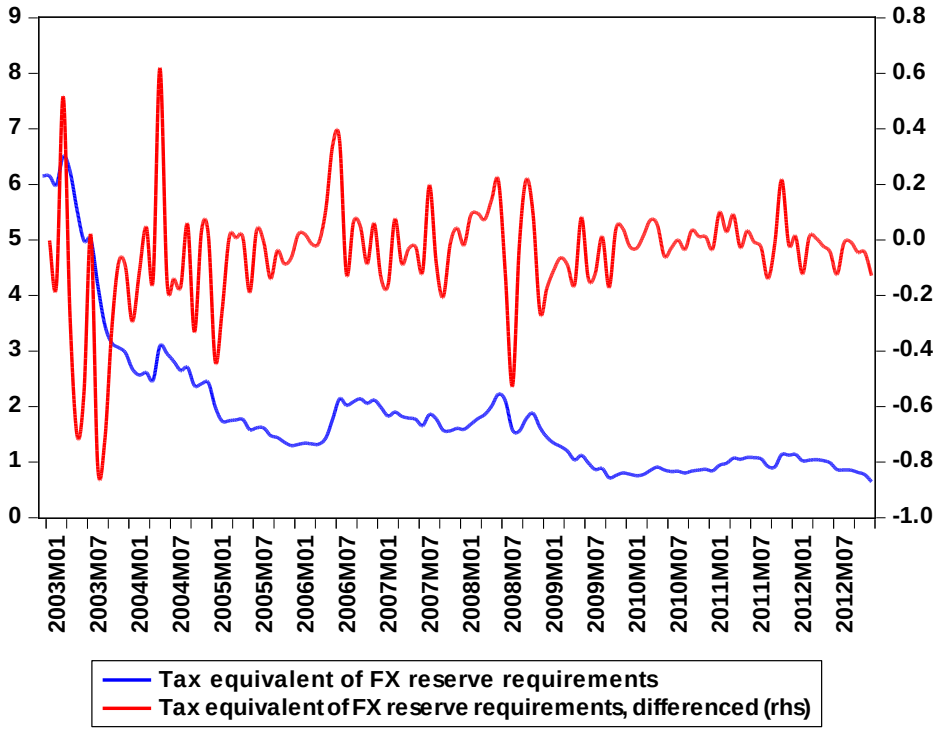
Source: Global Financial Data.

Figure 6. Tax equivalent cost of reserve requirements in TL and FX, weighted (τ_1)



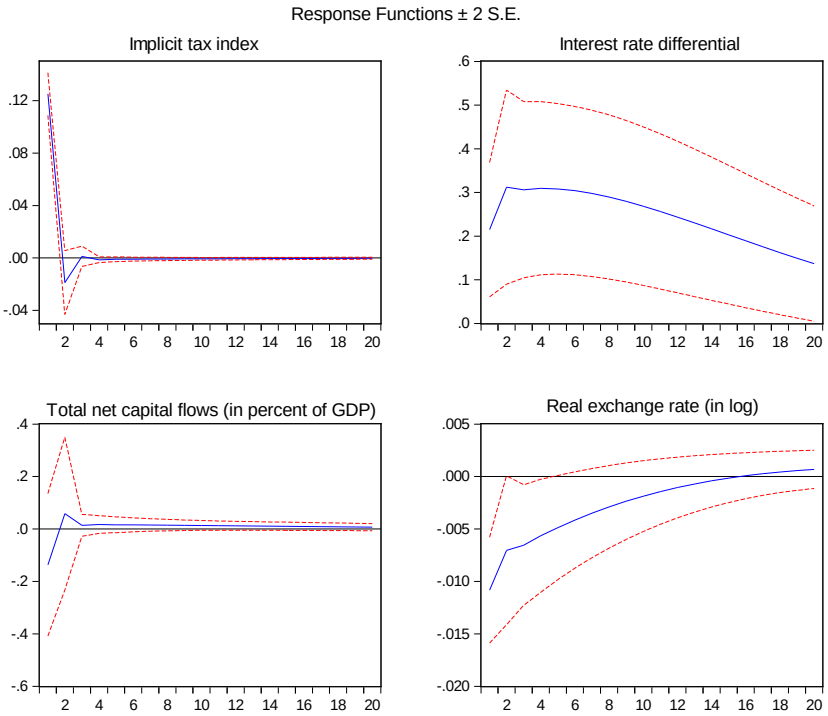
Source: Authors' estimation based on CBRT statistics database.

Figure 7: Tax equivalent cost of reserve requirements in FX, weighted (τ_2)



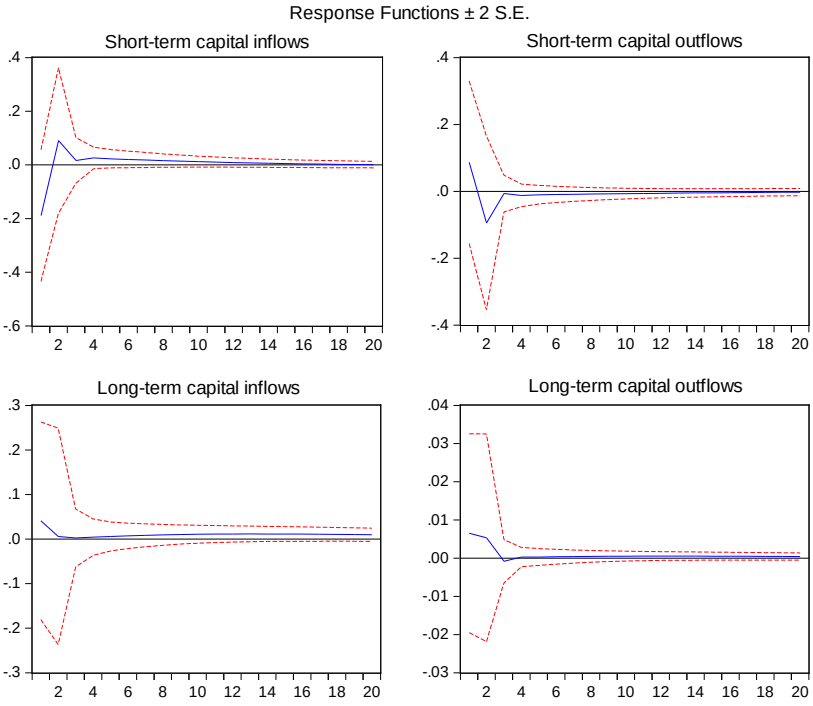
Source: Authors' estimation based on CBRT statistics database.

Figure 8. VAR response functions to a shock in the implicit tax rate 1



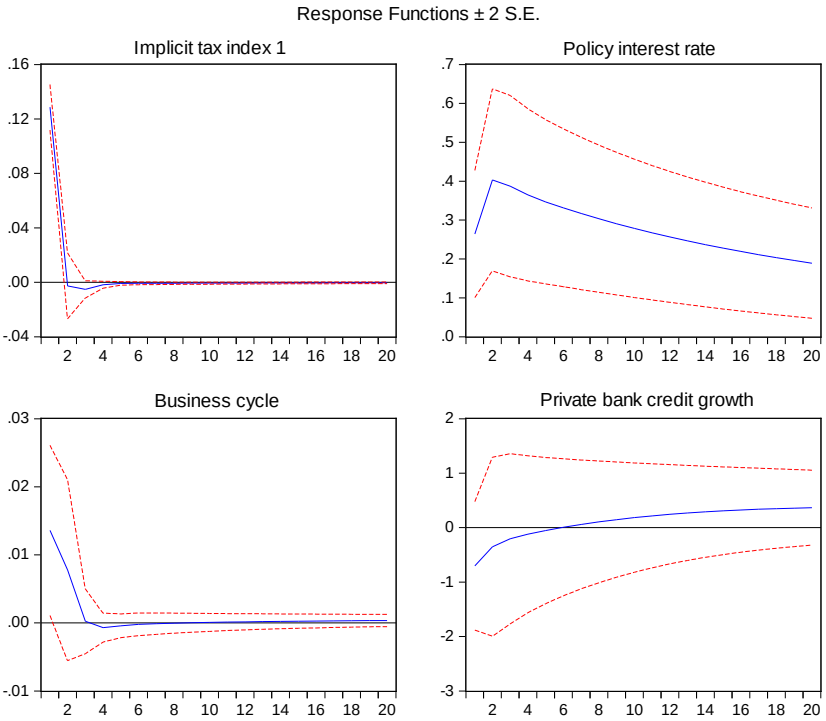
Source: Authors' estimations.

Figure 9. VAR response functions to a shock in the implicit tax rate 1; composition of the flows



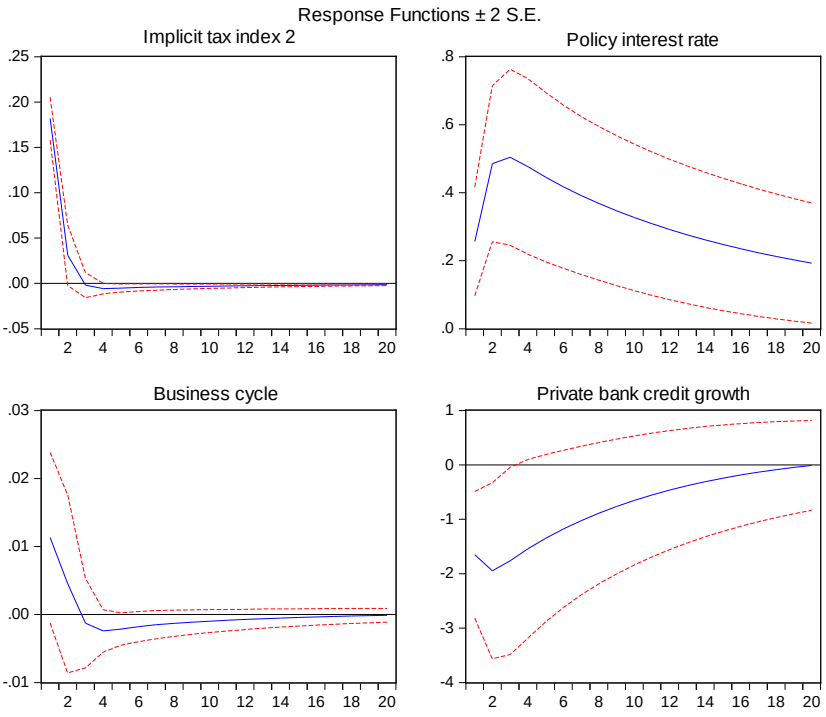
Source: Authors' estimations.

Figure 10. VAR response functions to a shock in the implicit tax rate 1; the private bank credit growth



Source: Authors' estimations.

Figure 11. VAR response functions to a shock in the implicit tax rate 2; the private bank credit growth



Source: Authors' estimations.

Appendix 1. Data Sources and Definitions

Variables	Source	Statistics	Definition
Private capital flows	CBRT	Balance of payments	Private capital flows are defined as capital flows that are excluding those general government and monetary authority.
Reserve requirement ratios	CBRT	Banking data	
Interest rates on FX and TL reserve requirements	CBRT	Banking data	End of period
Domestic government bond rate	Undersecretariat of Turkey		End of period
Industrial production, Turkey	CBRT and IMF, International Financial Statistics (IFS)	Industrial production index (2010=100)	Series from the CBRT and IFS are combined to cover the whole sample period.
Industrial production, Eurozone	Bloomberg	Industrial production index, Eurozone	
Nominal GDP	CBRT	GDP-Expenditure based	The monthly GDP series is obtained by extrapolating the growth rate of the industrial production index into the quarterly GDP series. The series is converted into USD before being used as a deflator for capital flows denominated in USD.
Exchange rates	CBRT		End of period
Policy rate	CBRT	Overnight borrowing rate	End of period
Euro libor rate	Bloomberg	Euro libor 1-month rate	End of period
EMBI spread	Global Financial Data (GFD)	JPMorgan EMBI+ Turkey government bond spread	End of period
Current account balance	CBRT	Balance of payments	
Real exchange rate	GFD	Turkey Lira Real Effective Exchange Rate	End of period
Private bank credit growth	CBRT		The growth rate of bank credit to private sector in real terms (deflated by CPI).

Note: The date is monthly from December 2002 to December 2012.

Appendix 2. Unit Root Tests

Variable	Transformation	Augmented Dickey-Fuller test	Phillips-Perron test
Implicit tax index 1	1st difference	-10.60***	-10.70***
Implicit tax index 2	1st difference	-8.30***	-8.64***
Net total flows	% GDP	-7.24***	-7.40***
Net short-term flows	% GDP	-8.63***	-8.86***
Net long-term flows	% GDP	-10.97***	-10.97***
Total inflows	% GDP	-7.26***	-7.51***
Total short-term inflows	% GDP	-9.21***	-9.38***
Total long-term inflows	% GDP	-1.86	-7.19***
Total short-term outflows	% GDP	-10.15***	-10.24***
Total long-term outflows	% GDP	-10.97***	-10.97***
Policy rate	Level	-4.19***	-4.10***
Euro libor rate	Level	-1.25	-1.08
Interest rate differential	Level	-4.86***	-4.14***
Spot exchange rate	% change	-9.91***	-9.90***
Real exchange rate	Log	-2.65*	-2.11
Domestic business cycle	HP filtered	-2.72*	-7.89***
Foreign business cycle	HP filtered	-3.84***	-2.56*
EMBI spread	Level	-2.32	-2.08
Current account balance	% GDP	-5.13***	-5.20***
Private bank credit growth	% change	-2.38	-2.81*

Notes: ***, **, * indicate the null hypothesis of a unit root is rejected at the 1%, 5%, and 10% level of significance respectively. The number of lags is chosen according to the Schwarz information criterion for the augmented Dickey-Fuller tests, and the bandwidth is chosen according to the Newey-West bandwidth selection for the Phillips-Perron tests. The sample period is 2002:M12 to 2012:M12. For the Euro libor rate, the EMBI spread, and private bank credit growth, the null hypothesis of a unit root is rejected at least at the 10% level if the sample period is extended to cover 2000:M1.