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## Political economic drivers of real exchange rate levels

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2022

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# Political Economic Drivers of Real Exchange Rate Levels\*

Esra Nur Uğurlu<sup>†</sup> and Arslan Razmi<sup>‡</sup>

## Abstract

Voluminous theoretical and empirical research shows that real exchange rate (RER) undervaluation could be conducive to economic development. Why do countries then often avoid the pursuit of policies that facilitate undervaluation or even intentionally pursue RER overvaluation? We address this question by investigating the economic/structural, institutional/political, and policy factors that explain the within-country variation in RER undervaluation in a baseline panel of 68 developing and 39 developed countries between 1988 and 2012 using OLS and GMM estimators. Our results indicate that the sectoral structure of the economy, functional distribution of income, the dependence of exports on imported inputs, the degree of central bank independence, balance sheet vulnerabilities, and technological sophistication are important determinants of RER levels. Our key results are robust to using alternative measures, estimation techniques, different samples, and additional control variables.

**Key Words:** Exchange Rate Policy, Real Exchange Rate Misalignment, Interest Groups, Import Dependence, Central Bank Independence

**JEL Codes:** O24, O11, E58

## 1 Introduction

A large body of theoretical and empirical research suggests that real exchange rate (RER) undervaluation is conducive to growth and economic development (Guzman *et al.*, 2018; Razmi *et al.*, 2012; Rodrik, 2008) while overvaluation has the opposite effects.<sup>1</sup> Despite their potential benefits, many developing countries

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<sup>1</sup>Henceforth, we use the terms undervalued exchange rate and competitive exchange rate interchangeably. The real exchange rate expresses the nominal exchange rate adjusted for relative prices between the countries under consideration. Another key definition from the structural transformation viewpoint represents RER as the price of tradable goods relative to nontradable ones. When a country's RER is at its equilibrium level according to purchasing power parity, the cost of a basket of domestic goods is the same as that of an identical basket of foreign goods. When a country's currency is undervalued (overvalued), its exports are more (less) competitive than foreign goods in international markets. Misalignment can be defined as the departure

either avoid implementing undervalued RER policies or intentionally pursue RER overvaluation (Steinberg, 2015). Why do many developing countries adopt RER policies that may impede their long-run development? In this paper, we address this question by examining the economic/structural, institutional/political, and policy factors that explain within-country variation in RER undervaluation in a two-way fixed-effects panel data set-up.

RER undervaluation can function as a form of protection that gives tradable industries an edge over their international competitors (Steinberg, 2016). Undervalued RER policies can diminish an economy’s dependence on foreign capital inflows by stimulating exports and reducing current account deficits. If the tradable sector is special in a development sense, say thanks to the greater presence of knowledge spillovers or learning by doing, then keeping the price of tradables high relative to nontradables can serve as instrument of development policy to encourage producers to shift resources into their production (Rodrik, 2008). Using RER as an incentive to redeploy resources into tradable activities can help low-income economies to reap immediate productivity gains and jump-start growth (Eichengreen, 2007). Others argue that an undervalued RER promotes growth by reducing real wages and thereby increasing investment (Levy-Yeyati & Sturzenegger, 2007). There is also evidence indicating that sustained episodes of investment surges are more likely in countries with competitive real exchange rates (Libman *et al.*, 2019). Although the literature has not sufficiently assessed the specific channels through which undervalued RER boost growth (Demir & Razmi, 2022) and whether this relationship is linear or subject to a change after a certain threshold, a growing body of empirical research shows that an undervalued RER is positively associated with high growth rates. These findings are robust to estimation techniques, samples, and data choices, particularly for developing countries (Razmi, 2021). While pursuing RER undervaluation may not be a sufficient condition for successful development in and of itself, a substantial body of evidence indicates that avoiding RER overvaluation is necessary and undervalued RER might be required for sustained economic growth (Eichengreen, 2007).

Assuming that policymakers and politicians are aware of the potential benefits of undervaluation and are well-intentioned, what prevents them from pursuing RER undervaluation? Despite being among the most contentious issues in developing countries as well as in the contemporary global political economy due to concerns about “currency wars,” this question has not received sufficient attention in the literature as the existing studies focus mainly on the question of exchange rate regime choice, international and national coordination, and issues pertaining to electoral cycles (Razmi, 2018). Investigations into this question are central to understanding how actual exchange rate policies are made and what obstacles stand in the way of targeting an exchange rate level compatible with industrial development. On the basis of this motivation, this paper aims to provide an in-depth investigation into economic/structural, institutional/political, and policy factors that help explain RER misalignment.

There are two strands of literature that address the political economy of real exchange rate policies. One strand focuses on the purely economic consequences of RER-induced changes in income distribution for macroeconomic outcomes such as GDP growth. For instance, the literature on ‘contractionary devaluations’ illustrates that devaluations could have contractionary effects on output and employment in the short-run due to their redistributive effects (Diaz-Alejandro, 1963; Krugman & Taylor, 1978). Although its

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of the RER from its equilibrium level (as defined below).

primary concern is to analyze the potential adverse effects of devaluations on output, this literature provides important insights on the political economy of exchange rate policies. From this literature, one would expect policymakers to be hesitant to pursue competitive RER policies due to possible short-run contractionary effects on output and income distribution. This possibility is acknowledged by Krugman and Taylor (1978, p. 454): “Devaluation not only reduces output and employment, but redistributes income from labor to capital as well. Thus devaluation is a costly cure, and a devaluation big enough to reduce the balance of payments deficit substantially in the short run may be unacceptable.” A related strand of literature highlights the upheavals that follow episodes of large devaluations. As Cooper (1971, p. 3) noted in a widely-cited study of large exchange rate changes in developing economies, devaluations are “one of the most dramatic, even traumatic, measures of economic policy that a government may undertake.” Steinberg and Malhotra (2014) estimate that, between 1973-2006, military dictators lost power during 17 percent of their 48 devaluation episodes and democratic leaders did so in 38 percent of their 79 devaluations.

The second body of work on the political economy aspects of RER policies originates from the international political economy literature and approaches the question from a different direction by analyzing how political and institutional characteristics shape exchange rate policies. This literature underscores the role of domestic interest groups clustered around sectoral characteristics (Frieden, 1991), political regimes (Quinn & Weymouth, 2017; Steinberg & Shih, 2012), and labor and financial market institutions (Steinberg, 2015) in shaping exchange rate preferences and policies.

While the contributions from the international political economy literature have enriched the analysis of exchange rate policies, the literature remains underdeveloped. We aim to contribute to this literature by providing a thorough empirical analysis that incorporates both inter-sectoral (tradable and non-tradable) and inter-class (labor and capital) conflicts of interest that shape exchange rate preferences. In addition, we investigate how these preferences interact with political and economic institutional structures in influencing RER levels. Finally, we recognize and explore the role of economic factors such as (revealed) comparative advantage, balance sheet considerations, and technological sophistication that guide and possibly constrain how inter-sectoral and intra-class preferences are shaped and expressed in practice.

Echoing Walter (2008) and Steinberg and Shih (2012), we argue that Frieden’s influential “interest-group theory of exchange rate preferences,” which analyzes RER preferences along sectoral lines, provides a useful but somewhat simplistic account of RER preferences. To better account for complexities in sectoral exchange rate preferences, we investigate how import intensity of production and exposure to foreign currency liabilities shape preferences over the exchange rate level. After examining the economic/structural determinants of RER undervaluation, we turn our attention to institutional factors. We investigate whether the proliferation of independent central banks and the presence of democratic institutions has influenced the preference for RER levels.

Regarding our methodological contributions, we attempt to address potential endogeneity and reverse causality problems that beset existing literature by employing lagged regressors and using Generalized Method of Moments (GMM) estimators. In addition, we use 3-year averaged lagged values of our variables in robustness checks to further weaken the possibility of reverse causation.

Our results indicate that a higher share of non-tradable sector output, a larger labor share of income, and a

larger financial sector are linked with less undervalued RERs. These findings are consistent with the view that undervalued RER policies are unpopular among workers and the non-tradable industries. Our results further indicate that independent central banks and democratic institutions are linked with more overvalued RERs. We also find some evidence that the dependence of domestic producers on imported inputs and reliance on quality-based rather than price-based competition lowers the likelihood of RER undervaluation. However, we do not find a negative link between balance sheet vulnerabilities and RER undervaluation. In contrast, our findings suggest that foreign debt burden might encourage governments to pursue RER undervaluation as a way to boost their international competitiveness and generate foreign exchange revenues. The key results are robust to using alternative proxies, data sources, regression specifications, and additional control variables.

The rest of the paper is organized as follows. The second section provides a conceptual discussion on the political economic determinants of RER policies. This section also summarizes the relevant literature and explains how our study contributes to it. Section 3 presents the data while section 4 discusses our empirical strategy. Section 5 presents the results. This section also contains a number of robustness checks and extensions. The last section concludes.

## 2 Conceptual Background

### 2.1 Policy Tools

Before analyzing the determinants of RER undervaluation, it can be helpful to discuss whether RER is a policy variable and what tools governments can use to influence it in the desired direction<sup>2</sup>. Given that the real exchange rate is a relative price, governments cannot completely control its movements. Nevertheless, they can employ various direct and indirect policy instruments to affect its level. The empirical evidence shows that the RER closely tracks the nominal exchange rate in short- to medium-run (Demir & Razmi, 2022). Therefore, policymakers can influence the former by controlling the latter. Central banks can change the interest rate or intervene in currency markets by buying and selling foreign currency to affect the nominal exchange rate<sup>3</sup>. Even under flexible exchange rate systems, many central banks, especially developing country ones, use these tools due to “fear of floating” (Calvo & Reinhart, 2002). Capital controls and forcing banks to purchase sterilization bonds at interest rates lower than the market interest rate – a tool that China extensively used in recent decades – are other tools countries can utilize to affect the RER (Montecino, 2018; Steinberg, 2015). Furthermore, governments can use fiscal policy to affect the RER by shifting the internal terms of trade. Given that government expenditures are typically biased towards nontradable goods, governments can target an undervalued (overvalued) RER by tightening (expanding) their expenditures. Our empirical analysis will control for the extent to which these policy choices affect RER misalignment.

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<sup>2</sup>See Frenkel (2008) and Demir and Razmi (2022) for a more in-depth treatment of this question.

<sup>3</sup>Governments’ ability to control the RER level is somewhat asymmetric in this regard. In general, it is easier for governments to maintain an undervalued RER given that the amount of foreign currency governments can purchase is effectively limitless, whereas the possibility of running out of foreign currency can limit the ability to keep the exchange rate at overvalued levels.

## 2.2 Economic/Structural Explanations

As with most economic policy choices, competitive RER policies create winners and losers (Razmi, 2018). On the one hand, undervalued exchange rate policies pit the working class against the capitalist class by altering the functional income distribution in favor of the latter. In the presence of nominal wage rigidities, exchange rate depreciations lower real wages and redistribute income away from the working class towards the capitalist class (Diaz-Alejandro, 1963; Krugman & Taylor, 1978). Furthermore, given that tradables make up a substantial proportion of workers' consumption baskets, devaluations lower real wages on impact (Demir & Razmi, 2022). As a result, workers typically express discontent with RER devaluations<sup>4</sup>. For this reason, in countries where politicians are under electoral pressure from a large working class base, an undervalued RER policy may be an unpopular recipe for economic development. This view is supported by empirical studies demonstrating that governments tend to defend the value of their domestic currency before elections and delay depreciations until after the election (e.g., Cermeño *et al.*, 2010 and references therein).

Apart from generating distributional conflicts between workers and capitalists, RER policies create intra-sector conflict by setting tradable industries, such as manufacturing, against the nontradable ones, such as finance, services, and construction. The importance of the sectoral structure, particularly the distinction between the tradable and nontradable sectors, lies at the heart of Frieden (1991)'s seminal "interest group theory of exchange rate preferences." Accordingly, undervalued RER policies make domestically produced tradables more competitive against their foreign-produced substitutes in international and domestic markets and more profitable relative to nontradables in the domestic market. As a result, the tradable sector is typically expected to benefit from and support RER undervaluation. On the other hand, the competitive advantages RER undervaluation delivers to the tradable sector are not available to the nontradable sector as the latter does not participate in international trade by definition. For these reasons, undervalued RER policies are expected to face opposition from the nontradable sector.

Among the nontradable industries, the financial sector's exchange rate preferences are worthy of special consideration. The financial sector typically prefers policies that keep inflation under control, given their role as creditors and motivation to protect the real value of their interest, dividend, and rent income. For instance, the financial sector typically favors tight monetary policies, inflation-targeting, and independent central banking regimes due to their functionality in taming inflationary pressures (Epstein, 1996). By the same token, one can expect the financial sector to promote policies that keep the value of domestic currency strong as a way of keeping inflation under control. Secondly, the financial sector benefits from access to assets in international markets at lower prices. Therefore, international investors interested in making gains off overseas assets can be expected to favor a strong currency (Frieden, 1991). Finally, financial firms may be averse to undervalued RER policies if they have accumulated large amounts of foreign currency-denominated liabilities on their balance sheet. In fact, even when they are not subject to currency mismatches, financial

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<sup>4</sup>Although undervalued RER policies are detrimental to the working class in the short run from the perspective of reduced purchasing power and deteriorating income distribution, they can be beneficial in terms of expanded employment opportunities, given that an undervalued RER can increase the supply of tradable sector jobs. However, the employment aspect is likely to be ineffective in increasing the popularity of undervalued RER policies among workers, given that this effect is too indirect, uncertain, and realized over the medium to long run (Steinberg, 2015). The survey evidence, based on Argentina, Serbia, and the UK, presented by Aklin *et al.* (2021), supports this view. This study shows that "for mass publics – whose daily lives center more on economic consumption than on production – concerns over high inflation than often resonate more deeply than their sector of employment, and that those preferences translate into attitudes about currency politics." (p. 2).

institutions, particularly lending institutions, can still be harmed by exchange rate depreciation if their customers are subject to currency mismatches (Walter, 2008).

The existing empirical evidence on Frieden's 'interest group theory' is inconclusive. On the one hand, the evidence presented by Broz *et al.* (2008), which relies on firm-level survey data from the World Bank's World Business Environment Survey, confirms Frieden's hypothesis by showing that tradable sector firms, particularly manufacturers and export producers, are more likely to be dissatisfied following an appreciation than are nontradable sector firms. However, according to some other survey research, respondents frequently report preferences different than those predicted by Frieden (Walter, 2008 and the references therein). Numerous historical examples similarly indicate that manufacturing firms can be among the most vehement opponents of RER undervaluation. For example, Mexican manufacturing firms lobbied for an overvalued RER during the early 1990s due to their heavy reliance on imported inputs and foreign currency borrowing (Kessler, 1998). According to Steinberg (2015), while the Mexican manufacturers recognized that an overvalued exchange rate could curtail their competitiveness, they maintained that devaluation would create bigger problems than it would solve. For similar reasons, between 2002 and 2013, the largest manufacturing companies in Turkey shaped the country's exchange rate policy in favor of an overvalued currency (Uğurlu, 2021). The lack of empirical and historical consensus suggests that Frieden's framework needs to be developed further to better capture the complexities of exchange rate preferences, particularly of the manufacturing sector.

The literature puts forward two main explanations regarding why tradable industries might oppose (support) RER undervaluation (overvaluation). The first relates to the reliance of domestic production on imported goods. Production in most tradable industries, particularly in manufacturing, relies on imported intermediate inputs, such as energy and raw materials, and capital goods, such as machinery and equipment (Campa & Goldberg, 2005). Domestic producers may be reluctant to pass through their imported input costs to their customers in the form of higher prices due to fears of losing market share. In the event of low pass-through into export prices and large pass-through into wages, export revenues facilitated by RER depreciation might be insufficient to compensate for the rise in imported input costs in domestic currency, resulting in the squeezing of manufacturing firms' profits. Therefore, the extent to which domestic producers rely on imported inputs shape their exchange rate preferences insofar as it determines whether they are harmed or helped by depreciation. The empirical evidence presented by Egan (2017), based on a panel of firms, supports the view that firms with a high dependence on imported inputs are dissatisfied with real depreciation. While the fear of losing market share might force companies to internalize the costs of depreciation, the extent to which this concern is relevant depends on the degree to which firms are competing on price or non-price terms. One would expect manufacturing industries that can produce sophisticated goods and compete on the basis of the quality of their products to be less favorable to RER undervaluation.

Balance sheet vulnerability is another source of complexity in the tradable sector's RER preferences. Many manufacturing firms in the developing world rely on foreign currency borrowing to finance their expenditures (Woodruff, 2005). The presence of foreign currency denominated debt and associated debt service payments make firms' balance sheets vulnerable to depreciation (Kohler, 2017), leading to a preference against undervalued RER policies.



Given that imported input and foreign borrowing costs that arise from depreciations impair firms' profitability, particularly for firms that compete mostly on the basis of price, RER preferences of tradable industries are not always clear. Therefore, gauging the determinants of RER preferences requires taking both the positive and negative effects of undervalued RER policies on firms' profitability into consideration. Some studies, including ours, capture the role of foreign currency exposure on the level of RER. However, the empirical literature overlooks the role of import intensity of domestic production and the extent to which the tradable industry competes on the basis of price vs. quality in shaping RER policies<sup>5</sup>. Our study addresses these gaps by including a measure of import intensity of production and an index measuring the complexity of production in our regression specifications.

On the subject of how economic structure shapes RER preferences, one should also note that countries with high natural resource endowments are likely to exhibit a tendency towards RER overvaluation (Bresser-Pereira, 2016). The discovery of a natural resources or a rise in commodity prices increases the amount of foreign currency inflows into the economy, and raises spending on goods including non-tradables. Both these developments creating a tendency for RER overvaluation. The "Dutch Disease" literature raises the concern that the RER overvaluation can cause a profitability squeeze in other tradable industries, leading to premature de-industrialization. Despite its long-term damage to the productive structure of the economy, the "easy" growth originating from primary commodity production discourages governments from neutralizing the Dutch Disease, given that a non-neutralized commodity boom enables populist spending while the RER appreciation that accompanies it boosts the purchasing power of the electorate.

### 2.3 Institutional and Political Explanations

Alongside macroeconomic/structural characteristics, institutions shape exchange rate policies in various ways. Steinberg (2015) examines how characteristics of financial and labor market institutions influence RER preferences by developing a framework he dubs the "conditional preference theory." This theory posits that the preferences and political influence of interest groups, rather than being fixed or constant, are shaped by the nature of financial and labor market institutions. Steinberg argues that manufacturing firms are more likely to campaign for an undervalued RER in countries where labor and financial market institutions are organized in a way that renders the operating costs of manufacturing firms less sensitive to the RER level.

Steinberg discusses two main ways by which state control over the financial markets can affect exchange rate preferences. Firstly, state-controlled financial systems can enable policymakers to engage in targeted lending policies whereby policymakers can decide who can borrow and lend and on what terms. The control over the allocation of credit can be achieved either through state-owned banks or through more informal mechanisms of control, such as the ability of state officials to appoint or remove bank personnel. Secondly, state-controlled financial systems can allow the costs of maintaining an undervalued RER to be shifted from manufacturing firms onto banks. To keep the exchange rate undervalued, central banks purchase foreign currency and sell domestic bonds simultaneously. The resulting increase in the supply of government bonds

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<sup>5</sup>Egan (2017) is the only study that explores the impact of dependency on imported inputs on exchange rate preferences based on firm-level data. Steinberg (2015) presents descriptive statistics on the extent of imported input dependency based on the World Bank's Enterprise Survey; however, he does not integrate this variable into his regression analysis possibly due to data limitations. To the best of our knowledge, none of the cross-country studies on the determinants of RER misalignment controls for imported input dependency of production.

causes interest rates to rise and hence increases the borrowing costs for businesses. Under state-controlled banking systems, the government can force commercial banks to purchase these ‘sterilization bonds’ at below-market interest rates, as, for instance, China did throughout the 2000s. This way, undervalued exchange rate policies do not put upward pressure on domestic interest rates in state-controlled financial systems. Similarly, Steinberg argues that state-controlled labor markets, characterized by weak collective labor laws, constitutional restrictions on the actions of labor unions, and weak ability of unions to pressurize and lobby policymakers, can increase manufacturing firms’ support for an undervalued RER as the restrictions on labor can reduce operating costs and hence compensate firms, to some extent, for the costs of RER undervaluation.

While the role of labor market institutions and state-owned banks in shaping exchange rate policies is relatively well studied, the question of how monetary policy institutions, such as central bank independence, affect RER misalignment has not received sufficient attention in the literature. There are two reasons to expect the RER to be negatively related to central bank independence. First, in many countries, legal reforms that assigned independence to central banks went hand in hand with the introduction of inflation-targeting frameworks. The conventional argument for central bank independence has been that greater independence leads to lower inflation by insulating monetary policy from political pressures. Under independent and inflation-targeting frameworks, central banks began to direct monetary policy to reach a low inflation target to the exclusion of almost all other goals (Epstein, 1996). One of the strategies central banks resorted to meet their inflation targets was to tolerate and, in some cases, encourage exchange rate appreciations. In a number of countries, central banks took an asymmetric stance on exchange rate movements, whereby they intervened in the foreign exchange markets in the case of depreciation and stayed inactive in the case of appreciations, given the functional role the latter plays in curbing inflationary pressures. Galindo and Ros (2009) and Benlialper and Cömert (2016) show that the low inflation objective lent a bias in favor of an overvalued exchange rate in Mexico and Turkey, respectively. Benlialper *et al.* (2017) present empirical evidence from a panel of 12 developing countries to the same effect.

Secondly, Central Bank independence can be seen as a proxy for the extent of state influence on the operations of the banking sector. Historically many developing countries have operated a critical degree of control through the use of development banks that subsidize lending to sectors that are seen as crucial to economic security and development (Gerschenkron, 1962). Indeed, Steinberg (2016) uses a measure of state-owned banks as a proxy to test his hypothesis that a higher share of manufacturing sector translates into a more undervalued RER in countries where the state exerts influence over the financial sector. In our view, Central Bank Independence serves as an alternative proxy for the state control over the financial system. To the extent that the Central Bank is independent, it is harder for the government to directly influence borrowing and lending conditions for targeted sectors such as manufacturing. By contrast, Chinese state control over the banking system played a major role in targeting lending and maintaining low interest rates and inflation through sterilization bonds purchased by the Peoples Bank.

Due to these reasons, we expect the RER to be more overvalued in countries with independent central banking regimes. To the best of our knowledge, Cermeño *et al.* (2010) is the only study to consider this relationship by examining whether electoral cycles in exchange rate policies were muted in Latin America following the wave of central bank independence. Frieden *et al.* (2010) and Berdiev *et al.* (2012) analyze whether central bank independence increases the likelihood of choosing a flexible exchange rate regime; however, the literature

Table 1: Summary of the key empirical papers in the literature

Paper	Data and Empirical Strategy	Key Explanatory Variables	Key Findings
Berdiev et al. (2012)	180 countries, 1974-2004, Multinomial logit	Government ideology, political institutions, central bank independence, financial development, globalization	The likelihood of choosing a flexible regime increases with left-wing governments, democratic institutions, central bank independence, and financial development
Broz et al. (2008)	Firm-level data for 80 countries, Probit	Government-ownership, firm size, GDP per capita, FDI per capita, manufacturing dummy, tradable dummy, exporter dummy	Producers in the tradable sector are more likely to be unhappy following an RER appreciation
Cermeño et al. (2010)	9 Latin American countries, OLS with fixed effects	Terms of trade, trade liberalization, government spending, international interest rate	A greater level of openness is correlated with a more depreciated exchange rate. Central bank reforms reduced political manipulation of the exchange rate.
Holtemöller and Mallick (2013)	69 countries, Logit	Openness, real GDP, exchange rate regime, the current account, terms of trade	More flexible currency regimes are associated with a lower RER misalignment.
Mahraddika (2020)	60 countries, Dynamic panel fixed effects, GMM	Exchange rate flexibility, capital account openness, resource rent to GDP, broad money to GDP	The exchange rate regime and capital account policy are significantly related to the degree of persistence and the magnitude of RER misalignment.
Rodriguez (2016)	20 Latin American countries 1985-2010, Probit with random effects	Share of agriculture and industry in GDP, reserves/M2, real GDP, high inflation dummy, trade openness, financial development, foreign liabilities, political risk, democracy, years in office	Smaller and more open economies are associated with fixed exchange rate regimes. The size of the tradable sector is negatively associated with a fixed exchange rate regime. Democratic institutions and political stability are positively associated with flexible regimes.
Rys and Steinberg (2020)	124 countries, 1975-2017, OLS and 2SLS	Partisanship, international capital mobility, manufacturing to GDP, trade openness, the share of urban population, political regime	International capital mobility has reversed which political parties maintain over or undervalued RER.
Steinberg (2016)	57 countries, 1976-2006, OLS with FE	State-ownership of banks, manufacturing to GDP, external debt, trade openness, GDP, democracy, workers' rights, capital account openness, exchange rate regime	State-owned banks are associated with undervalued exchange rates in countries with large manufacturing sectors.
Steinberg and Malhotra (2014)	1973-2006, OLS with FE	Authoritarian regime types, sectoral variables, real GDP, capital account openness	Monarchies and civilian dictatorships maintain more undervalued RER compared to democracies and military regimes
Quinn and Weymouth (2017)	105 countries, 1975-2014, Dynamic panel using OLS and IV	GDP growth, GDP per capita, trade balance, trade openness, population growth, eurozone membership, capital account openness, democracy, political competition	The degree of competitiveness of political institutions explains why countries do or do not pursue RER undervaluation.

does not investigate whether RER is more overvalued in countries with more independent central banks.

In addition to shaping exchange rate preferences, institutions also affect the extent to which policy preferences of interest groups are translated into actual policies. In general, one would expect electoral democracies and unstable political environments to make governments more vulnerable to pressures from interest groups. For instance, if the public view favors a strong domestic currency, governments in electoral democracies might be more inclined to keep the RER at overvalued levels as they feel democratic accountability to the electorate. Tenure insecurity can prevent the adoption of competitive RER policies as they can be economically costly in the short run and beneficial only in the long run. On the other hand, autocratic governments that lack political accountability face limited electoral competition and benefit from tenure security might be isolated from such pressures. A few studies in the literature confirm that authoritarian regimes are more likely to adopt undervalued exchange rates than democracies (Eichengreen, 2007; Steinberg & Malhotra, 2014).

To summarize, governments have an array of tools at their disposal that can be used to target an RER level. Even when not directed towards attaining a specific RER level, policy choices on fiscal spending,

interest rates, exchange rate regime, and capital account restrictions influence the RER level. The policy decisions to undervalue or overvalue the RER using these tools depend on various distributional, structural, and institutional considerations. One reason why politicians might be inclined to forego RER undervaluation despite their potential contribution to the long-run development is that undervalued RER policies may exert harmful effects on politicians’ key electoral constituencies and powerful interest groups, especially over the short run. Typically, workers, capitalists operating in the non-tradable sector, and rentiers are expected to be the primary opponents of competitive exchange rate policies. As for the tradable producers, their preferred RER policy is likely to be conditional upon various economic/structural and institutional factors, such as reliance on imported inputs, balance sheet vulnerabilities, reliance on price vs. quality competition, and the nature of financial and labor market institutions. Once the RER preferences of interest groups are shaped, how much these preferences are translated into actual policies depends on the institutional framework. On average, RER is expected to be more undervalued in countries where governments lack political accountability, face limited electoral competition, and exert influence over central banks. Our analysis in the next section seeks to identify regularities relating to RER undervaluation by testing the significance of various economic/structural, institutional/political, and policy factors.

Before we turn to data analysis, this is a good point to note that the subsets of regressors we employ contain variables that could plausibly be seen as exogenous (e.g., the extent of democracy), predetermined (e.g., the share of non-tradables in output and central bank independence), and partially endogenous (e.g., government spending, the share of capital goods in imports, and the wage share). While we employ different measures to try to minimize simultaneity/endogeneity concerns, it is an important issue to bear in mind.

### 3 Data

We use yearly unbalanced panel data for 68 developing and 39 developed countries for the period between 1988 and 2012. Appendix A lists the countries included in our sample. The data are extracted from several sources, namely Penn World Tables (PWT)<sup>6</sup>, World Bank’s World Development Indicators (WDI)<sup>7</sup>, World Bank’s World Integrated Trade Solution (WITS), Ilzetzi *et al.* (2019), Chinn and Ito (2008), Garriga (2016), Lane and Milesi-Ferretti (2001), and PolityIV. A complete list of variables and their respective sources are given in table 2. Summary statistics are presented in table 3.<sup>8</sup>

To speak of a RER under or overvaluation, one needs to define an “equilibrium” value of the RER. In this paper, we construct a measure of RER undervaluation ( $\ln\text{underval}$ ) following the three-step methodology proposed by Rodrik (2008). First, using PWT10, we construct an index of RER<sup>9</sup>:

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<sup>6</sup>The data is accessed through the pwt10 package in R developed by Zeileis (2021).

<sup>7</sup>The most recent version of the WDI dataset that we use lacks historical data for the manufacturing value added (% of GDP) series for China (this series starts only in 2004 for China). We complement the missing values of this series for the Chinese economy from the May 2018 version of the WDI.

<sup>8</sup>To ensure that the results are not driven by outliers, we winsorized some of our variables. We winsorized *govcons.GDP*, *tradeopenness*, *imp\_intensity*, and *resource\_rent* at the 99 and the 1 percent level.

<sup>9</sup>The series we use to calculate the RER misalignment index appear in PWT10 under the following names: *pl\_con*, *rgdpo*, *Pop*.

$$\ln RER = \ln\left(\frac{1}{pl\_con}\right) \quad (1)$$

Second, we adjust for Balassa-Samuelson effect by regressing the log values of RER on GDP per capita in a time-fixed effects panel data regression.

$$\ln RER_{it} = \beta_0 + \beta_1 \ln GDP_{PC_{it}} + f_t + u_{it} \quad (2)$$

The fitted values from this regression give the equilibrium RER. The intuition behind this regression is that richer countries, as measured by GDP per capita, tend to have more productive workers, which translates into higher real wages. Given that the price of non-tradables, unlike that of tradables, is determined domestically, higher wages translate into higher price levels for non-tradables (i.e., a lower RER). In the last step, we calculate RER undervaluation by subtracting the equilibrium RER from the observed RER:

$$\ln underval_{it} = \ln RER_{it} - \widehat{\ln RER}_{it} \quad (3)$$

Our index is thus comparable across countries and over time. Positive values imply that the RER is undervalued, while negative values indicate RER overvaluation.

We check the robustness of our results to four alternative measures of RER undervaluation. The first three measures are constructed following Demir and Razmi (2022). These measures are based on the so-called ‘behavioral equilibrium exchange rate approach,’ which measures RER misalignment in terms of deviations of the actual rate from its long-term equilibrium. The latter, in turn, is derived from reduced-form estimates based on short and medium-run fundamentals which are expected to cause short-term deviations in the RER from its long-run trend (*ibid.*). Specifically, in addition to controlling for the Balassa-Samuelson effect, these fundamentals include, respectively (1) net foreign assets (NFA) (*lnunderval2*), (2) NFA and (log) terms of trade (TOT) (*lnunderval3*), and (3) NFA, log TOT, and government consumption (*lnunderval4*). As a fourth alternative measure, we use the CEPII currency misalignment series constructed by Couharde *et al.* (2018). To derive this series, the authors first calculate a real effective exchange rate (REER) index using trade-weighted bilateral nominal exchange rates. Second, they calculate the “equilibrium” REER given by the fitted values obtained by regressing REER on several “fundamentals” that affect the equilibrium RER: productivity of the tradable sector, TOT shocks, and net indebtedness. Finally, they define the RER misalignment as the difference between actual and equilibrium REER<sup>10</sup>. Figure 1 shows the misalignment series for a select number of countries. As can be seen, although controlling for fundamentals reduces our sample periods, the overall trends do not change much across different measures.

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<sup>10</sup>The currency misalignment measure provided by the CEPII reports overvaluation. To make it consistent with our other undervaluation measure, we reversed the sign of this variable. The CEPII allows the construction of misalignment series using different weighting systems and panels of trading partners. We constructed our misalignment index by choosing 186 partners and 5-year time-varying weights.

Table 2: Variable descriptions

Variable Name	Definition	Source
lnunderval	undervaluation index — the Balassa-Samuelson (BS)	PWT10 (Feenstra & Inklaar, 2021)
lnunderval2	undervaluation index — NFA adjusted BS	PWT10 & Lane and Milesi-Ferretti (2001)
lnunderval3	undervaluation index — NFA and TOT adjusted BS	PWT10, Lane and Milesi-Ferretti (2001), & WDI
lnunderval4	undervaluation index — NFA, TOT and <i>govcons_GDP</i> adjusted BS	PWT10, Lane and Milesi-Ferretti (2001), & WDI
agr_GDP	Agriculture value added (% of GDP)	WDI
bank_assets	Total assets held by deposit money banks as a share of GDP	Beck <i>et al.</i> (2000)
capgoods.import	Imports of capital goods (thousand USD)	WITS
CBI	Central Bank Independence Index	Garriga (2016)
currency_crisis	Currency crisis dummy	Laeven and Valencia (2020)
democracy	Polity2 index of democracy	PolityIV
democracy_CGV	A binary index of democracy	Cheibub <i>et al.</i> (2010)
ECI	Economic complexity index ( <i>sitc_eci</i> )	Hidalgo and Hausmann (2009)
excregime	Exchange rate regime	Ilzetzki <i>et al.</i> (2019)
excregime_LYS	Exchange rate regime (alternative measure)	Levy-Yeyati and Sturzenegger (2016)
export_GDP	Exports of goods and services (% of GDP)	WDI
exports	Exports (thousand USD)	WITS
foreign_liab	Non-FDI Foreign Liabilities to GDP	Lane and Milesi-Ferretti (2001)
govcons_GDP	General government final consumption (% of GDP)	WDI
govinv_GDP	General government investment (GFCF) (% of GDP)	IMF Investment and Capital Stock Dataset
labsh	Share of labour compensation in GDP at current national prices	PWT10
imp_intensity	Imported intermediate and capital goods to total exports	WITS
import_GDP	Imports of goods and services (% of GDP)	WDI
intgoods.import	Imports of intermediate goods (thousand USD)	WITS
kaopen	Chinn-Ito Index of capital account openness	Chinn and Ito (2008)
manu_GDP	Manufacturing value added (% of GDP)	WDI
net_sensitivity	Net foreign currency exposure	Lane and Shambaugh (2010)
RCA_consgoods	Revealed Comparative Advantage in Consumption Goods	WITS
RCA_Kgoods	Revealed Comparative Advantage in Capital Goods	WITS
RCA_intgoods	Revealed Comparative Advantage in Intermediate Goods	WITS
resource_rent	Total natural resources rents (% of GDP)	WDI
services_GDP	Services, value added (% of GDP)	WDI
TI	Central bank transparency index	Dincer <i>et al.</i> (2022)
tradeopenness	$\text{export\_GDP} + \text{import\_GDP}$	WDI
worker_rights	Worker rights index	Cingranelli and Richards (2010)

Table 3: Summary Statistics

Variable	N	Mean	St. Dev.	Min	Max	Time Range
lnunderval	10,284	-0.002	0.43	-4.44	2.43	1950-2019
lnunderval2	3,336	-0.002	0.36	-4.78	1.55	1970-2019
lnunderval3	2,941	-0.002	0.36	-4.70	1.55	1980-2019
lnunderval4	2,749	-0.002	0.33	-1.27	1.45	1980-2019
CEPII	5,329	-0.002	0.21	-1.33	2.18	1974-2020
agr_GDP	7,675	16.65	14.52	0.08	89.41	1960-2019
CBI2	5,774	0.48	0.19	0.02	0.98	1970-2012
currency_crisis_1	8,481	0.03	0.16	0.00	1.00	1971-2021
democracy	8,773	0.89	7.46	-10.00	10.00	1950-2015
democracy_CGV	8,519	0.45	0.50	0.00	1.00	1950-2008
ECI	3,033	0.01	0.99	-2.42	2.83	1995-2017
excregime	11,282	0.38	0.53	0.00	2.00	1950-2016
excregime_LYS	5,531	0.76	0.87	0.00	2.00	1974-2013
export_GDP	7,873	33.31	20.84	0.01	166.36	1960-2019
Foreign_liab	8,391	1.25	5.11	0.00	101.62	1970-2020
govcons_GDP	7,174	16.10	7.77	0.00	136.35	1960-2019
govinv_GDP	8,473	5.38	4.30	0.001	40.33	1960-2017
labsh	7,920	0.53	0.12	0.09	0.90	1950-2019
import_intensity	4,007	90.17	76.07	15.55	523.10	1988-2019
import_GDP	7,882	38.97	21.46	0.00	209.02	1960-2019
kaopen	7,318	0.01	1.54	-1.92	2.33	1970-2018
manu_GDP	7,001	13.03	7.34	0.00	49.88	1960-2019
net_sensitivity	1,474	-0.11	0.78	-3.85	6.25	1990-2004
RCA_consgoods	3,875	0.99	0.66	0.00	3.21	1988-2017
RCA_Kgoods	3,822	0.44	0.52	0.00	2.73	1988-2017
RCA_intgoods	3,870	1.09	0.77	0.00	4.65	1988-2017
resource_rent	8,049	6.72	10.68	0.00	77.76	1970-2019
services_GDP	7,158	50.49	12.97	4.79	98.62	1960-2019
TI	2,288	5.74	3.11	1.00	14.50	1988-2019
tradeopenness	7,499	71.79	37.82	0.03	358.66	1960-2019
worker_rights	3,830	0.99	0.78	0.00	2.00	1981-2006

Note: Summary statistics are based on annual data

Table 4: Average RER Undervaluation by Region and Decades

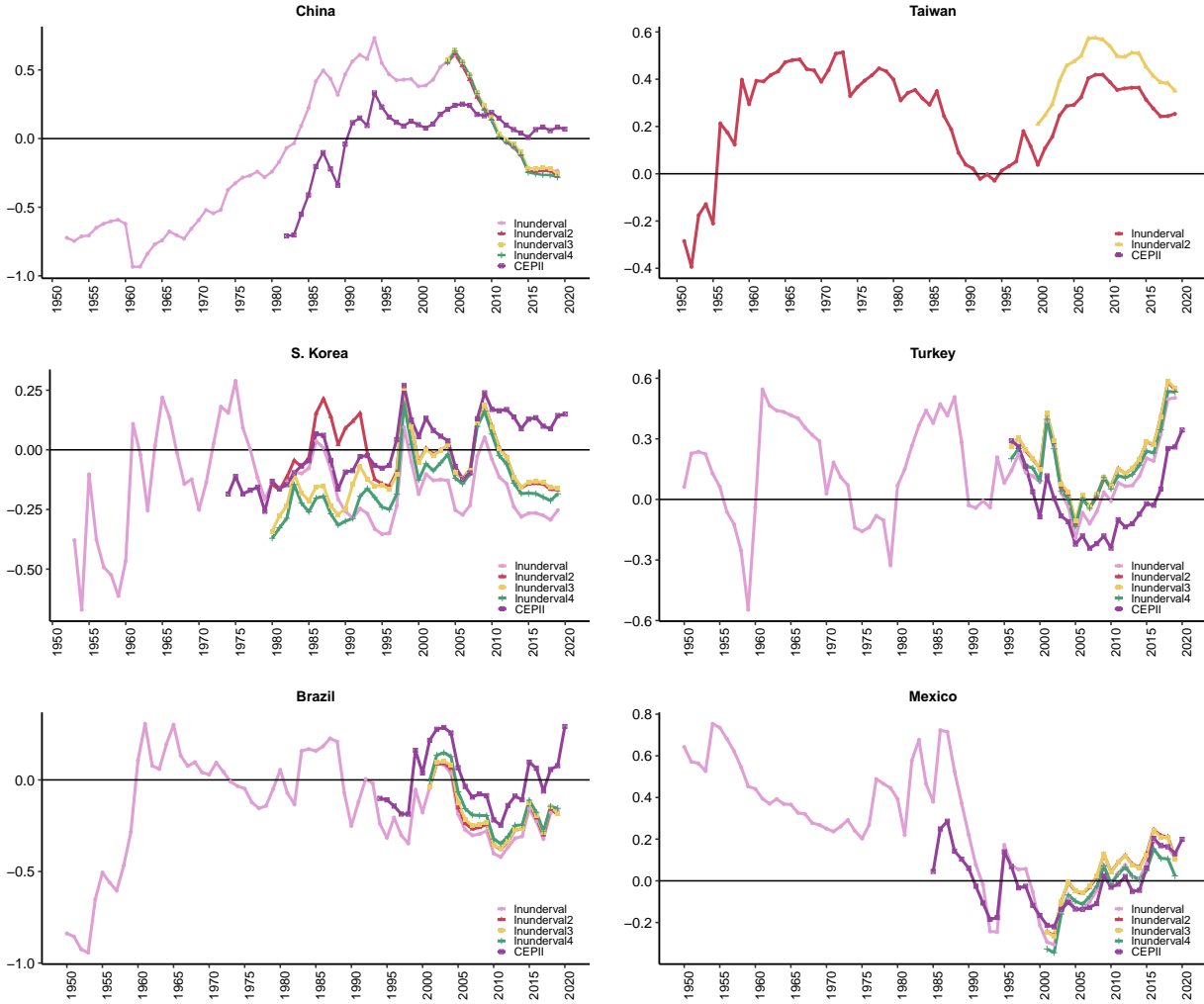
Region	1960s	1970s	1980s	1990s	2000s	2010s	1960-2019
East Asia and Pacific	-0.0865	0.149	0.193	0.0586	0.157	0.0924	0.104
Europe and Central Asia	-0.0281	-0.165	-0.108	0.0902	-0.0333	0.0288	-0.0153
Latin America and Caribbean	0.0895	-0.00774	-0.00529	-0.0987	-0.140	-0.198	-0.0712
Middle East and North Africa	-0.172	0.137	-0.0431	-0.0643	0.113	0.179	0.0447
North America	-0.169	-0.209	-0.198	-0.322	-0.376	-0.402	-0.280
South Asia	0.187	0.111	0.294	0.395	0.382	0.378	0.296
Sub-Saharan Africa	0.00626	-0.0716	-0.0615	-0.0705	-0.0137	-0.0397	-0.0424

Source: Authors' calculations based on PWT10 data

The political economy of development literature typically juxtaposes East Asian countries, which achieved high growth rates thanks to dynamic export-oriented industrialization (EOI), with the relatively sluggish growth performance of Latin American countries, which could not transition from the import substitution model to EOI. This contrast directs attention to the propensity toward undervaluation vs. overvaluation in these regions (Edwards, 1989). Table 4 depicts average values of RER undervaluation across regions by decades. We observe that the RER has been, on average, undervalued in East Asia and the Pacific, the Middle East and North Africa, and South Asia. In contrast, it has been overvalued in Europe and Central Asia, Latin America and the Caribbean, North America, and Sub-Saharan Africa for most decades since the 1960s. According to PWT data, the percentage of countries with an overvalued RER has been higher than that of countries with an undervalued RER for most of the period since 1950. This is consistent with Martins and Razmi (2022), who show that since 1950 the world economy has witnessed a higher number of episodes of overvaluation (238) than of undervaluation (189). Substantial differences in the economic development record of Latin American and East Asian nations further begs the question of why undervalued RER policies are not more prevalent?



Figure 1: RER undervaluation in selected countries



Note: The variable *lnunderval* shows the index of RER undervaluation calculated using the basic Balassa-Samuelson adjustment. *lnunderval2* further incorporates net foreign assets, *lnunderval3* includes NFA and (log) terms of trade, *lnunderval4* includes NFA, (log) terms of trade, and government consumption (divided by GDP), and finally *CEPII* shows the CEPII measure of RER undervaluation.

## 4 Empirical Strategy

Our baseline specification, given by equation 4, regresses log RER undervaluation (*lnunderval*) on a vector of economic/structural variables (*X*), institutional/political variables (*Y*), and policy variables (*Z*). All our regression models include country fixed effects to capture unobserved country specific characteristics that are likely to affect RER undervaluation; we thus capture “within” effects. We also include time fixed effects to control for common time factors.

$$\ln underval_{it} = \alpha_1 X_{it} + \alpha_2 Y_{it} + \alpha_3 Z_{it} + \theta_i + f_t + u_{it} \quad (4)$$

where  $\theta$  = country fixed effects,  $f$  = time fixed effects,  $u$  = error term, and  $i$  and  $t$  denote country and time, respectively.

To account for *economic and structural variables*, we include the services sector share of output (*services\_GDP*) as a proxy for the non-tradable sector output share, import intensity of exports (*import\_intensity*), the share of non-FDI foreign liabilities in GDP (*foreign\_liab*), the share of domestic money bank assets to GDP (*bank\_assets*), and labor share of income (*labsh*). As discussed in section 2, we expect a larger share of nontradable sector output to be negatively associated with RER undervaluation.<sup>11</sup> We incorporate import intensity of exports, measured by the ratio of imported intermediate inputs and capital goods to exports, because the support for undervalued RER is likely to decrease with higher dependence of domestic producers on imported inputs. We control for foreign liabilities because we expect RER to be less undervalued in countries with greater foreign debt burdens. Our measure of foreign debt, *foreign\_liab*, is taken from Lane and Milesi-Ferretti (2001), and reflects the ratio of non-FDI foreign liabilities to GDP. Using this measure, as opposed to the share of external debt to GNI data from the WDI as commonly done in the literature, allows us to work with a larger number of observations<sup>12</sup>. We include bank assets to GDP (*bank\_assets*) to capture the influence of the financial sector in shaping RER policies, and we expect *bank\_assets* to be negatively correlated with *lnunderval*. The final variable in this category is the labor share of income (*labsh*). We expect support for RER undervaluation to correlate negatively with the labor’s share of income.

To account for *institutional variables*, we include a measure of central bank independence (*CBI*) and a measure of democracy (*democracy*). Our measure of central bank independence is taken from Garriga (2016). We use this dataset because it is the most detailed and comprehensive (both in terms of country and time coverage) dataset on central bank independence. Garriga calculates an index of central bank independence by taking averages of 16 variables reflecting four dimensions of central bank independence,<sup>13</sup> namely (1) independence of the chief executive, (2) objective independence, (3) policy independence, and (4) limits on government ability to borrow from the central bank. Higher values of this index correspond to a higher degree of central bank independence. For reasons explained in the previous section, we expect the relationship between RER undervaluation and CBI to be negative. We use the *Polity2* index of democracy obtained from the *polityIV* dataset, which is a commonly used index in the international political economy literature (e.g., Frieden *et al.*, 2001; Rodriguez, 2016; Steinberg and Malhotra, 2014). The values for *Polity2*

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<sup>11</sup>Other empirical studies have used manufacturing value added in GDP, as a proxy for the tradable sector share. However, large parts of agricultural output too are tradable, and producers active in this sector too may favor undervaluation. The service sector is, therefore, likely to serve as a better marker to distinguish tradable from non-tradable activities (even though, of course, services such as banking and financial services are becoming increasingly more tradable).

<sup>12</sup>In table 9, we check the robustness of our results to an alternative measure of foreign indebtedness.

<sup>13</sup>These variables are: (1) term of office of CEO, (2) who appoints the CEO, (3) provisions for dismissal of CEO, (4) CEO allowed to hold another office in government, (5) central bank objectives, (6) who formulates monetary policy, (7) government directives and resolution of conflicts (8) central bank given active role in formulation of government’s budget, (9) limitation on advances, (10) limitations on securitized lending, (11) who decides control of terms of lending to government, (12) beneficiaries of central bank lending, (13) type of limits when they exist, (14) maturity of loans, (15) restrictions on interest rates, (16) prohibition on central bank lending in primary market to government.

can range from -10 (strongly autocratic) to +10 (strongly democratic). We expect the RER to be more undervalued in less democratic political systems. We check the robustness of our results to alternative measures of CBI and democracy in table 9.

To account for *policy* variables, we control for exchange rate regime (*regime*), shares of government consumption and investment expenditures in GDP (*govcons\_GDP* and *govinv\_GDP*, respectively), and an index of capital account openness (*kaopen*). Our measure of exchange rate regime is an index taken from Ilzetki *et al.* (2019). This index categorizes *de facto* exchange rate regimes by increasing degrees of flexibility. We use this data to construct a discrete variable that can take on three values: 0 if the regime is fixed, 1 if intermediate, and 2 if flexible. Controlling for the exchange rate regime can help ensure that the results are not driven by decisions to fix the exchange rate. Governments might fix the exchange rate at an undervalued level to boost external competitiveness (Levy Yeyati *et al.*, 2010 and references therein). On the other hand, some recent empirical studies indicate that the RER is more overvalued under fixed exchange rate arrangements (Libman, 2018). Therefore, the expected sign of *regime* is not apriori clear. Government spending is typically biased towards the nontradable sector. Therefore, we expect government expenditures to have a negative effect on RER undervaluation by raising the relative price of nontradables. The empirical measures we use distinguish between government consumption (*govcons\_GDP*) and government investment (*govinv\_GDP*). We use the de jure capital account openness index constructed by Chinn and Ito (2008), which captures the formal control and restrictions on the capital account transactions. The higher values of this index correspond to a higher level of capital account openness. We expect RER to be more overvalued in countries with a more open capital account (Montecino, 2018) since restrictions are typically stronger on outflows than on inflows.

We estimate the baseline regression shown in equation 4 using both annual and 3-year averages of our data series<sup>14</sup>. Using 3-year averages provides some advantages. First, it can help us capture the non-contemporaneous effects of the explanatory variables on RER undervaluation. Second, it helps address year-to-year mismeasurement issues by averaging out annual values. Third, it mitigates the effect of large changes in individual years that merely reflect, for instance, panic in the face of sudden stops, financial contagion, terms of trade shocks, or a currency crisis. Fourth, specifications with lags of 3-year average values provide an even stronger test to ensure that our results are not being driven by reverse causation since it is hard to argue that the level of misalignment today will significantly influence values of the regressors from 3 years ago. Due to sample size-related concerns, we provide the results for annual data in the main text and present the results for 3-year average data mainly in the appendix.<sup>15</sup>

As alluded to above, we are aware of the possibility of reverse causation. For instance, as much as a higher share of tradable sector output shapes RER preferences in favour of a competitive domestic currency, hence causing the RER to be undervalued, an undervalued RER could also be positively affecting the tradable sector

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<sup>14</sup>For the exchange rate regime variable, we calculate the mode over 3-year periods rather than the average. This allows an easier interpretation of the coefficient as a unit increase in the value of *regime* would indicate a change from fixed to intermediate or from intermediate to the flexible system. Our results did not change when we used averages.

<sup>15</sup>We could have averaged our series over 4, 5, or a different number of years. However, increasing the size of time intervals comes at the expense of losing degrees of freedom. We checked the robustness of our results using 5-year averages and did not observe any significant changes in the sign of our coefficients. However, some of our estimates lost statistical significance due to the dramatically reduced sample size. Results using 5-year averages are available upon request.

output share by making it more competitive in domestic and international markets. In the OLS estimations, we attempt to mitigate simultaneity or reverse causality bias by lagging all explanatory variables by one period<sup>16</sup>. However, if RER levels exhibit a high degree of persistence, as found by Mahraddika (2020), meaning that the past values of  $lnunderval$  are a significant determinant of its current values, using lagged regressors may not suffice to resolve endogeneity concerns. Therefore, as a robustness check, we also estimate a dynamic version of equation 4, given by:

$$lnunderval_{it} = \rho lnunderval_{it-1} + \alpha_1 X_{it} + \alpha_2 Y_{it} + \alpha_3 Z_{it} + f_t + \theta_i + u_{it} \quad (5)$$

where the coefficient  $\rho$  captures the degree of persistence in the RER undervaluation.

We estimate equation 5 using the generalized method of moments (GMM) approach in order to address the dynamic panel bias introduced by the use of the lagged dependent variable (Nickell, 1981). This is of particular concern if the time dimension is short relative to the cross-sectional dimension. The system GMM approach developed by Blundell and Bond (1998) that we employ uses lagged values of regressors in levels and in differences as instruments and have the additional advantage of allowing for lagged endogenous variables as regressors.

## 5 Results

Our baseline results are reported in table 5. The first two models report OLS estimates calculated using annual and 3-year averaged data, respectively. Note that these two models are estimated using contemporaneous values of regressors. Models 3 and 4, on the other hand, use one-period lagged values of all regressors to mitigate simultaneity-related concerns. Models 5 and 6 report results from GMM estimations.<sup>17</sup> The main findings from this table can be summarized as follows:

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<sup>16</sup>We expect reverse causation concerns to be stronger for the labor share variable given that, in the presence of nominal wage rigidities, changes in the RER level will effect real wages directly on impact. Therefore, for *labsh*, we use 3-period lags.

<sup>17</sup>The AR tests for the estimates based on annual data reject the presence of first and second order serial correlation although this is only true for first order correlation for the 3-year averaged data. The Hansen test fails to reject the null hypothesis that the overidentifying restrictions are jointly valid. We used 1-3 lags of the dependent variable in order to avoid instrument proliferation, which is a common issue with GMM estimates.

Table 5: Baseline Results

	<i>Dependent variable: lnunderval</i>					
	OLS Annual	OLS 3-year avg	OLS Annual	OLS 3-year avg	GMM Annual	GMM 3-year avg
	(1)	(2)	(3)	(4)	(5)	(6)
lnunderval.L					0.7956*** (0.0062)	0.4385*** (0.0522)
services_GDP	-0.014*** (0.003)	-0.021*** (0.003)	-0.012*** (0.001)	-0.010*** (0.003)	-0.004*** (0.0003)	-0.0196*** (0.002)
import_intensity	-0.001*** (0.0004)	-0.001*** (0.0004)	-0.001*** (0.0002)	-0.001*** (0.0004)	-0.0003*** (0.000)	-0.001** (0.0004)
foreign_liabilities	0.013*** (0.009)	0.027** (0.011)	0.013*** (0.005)	0.014 (0.011)	0.007*** (0.002)	0.029*** (0.009)
bank_assets	-0.001*** (0.0003)	-0.001 (0.0004)	-0.001*** (0.0002)	-0.0004 (0.0004)	0.000 (0.0001)	-0.0001 (0.0003)
labsh	-0.570*** (0.239)	-0.528** (0.236)	-0.393*** (0.115)	-0.147 (0.248)	-0.118*** (0.026)	-0.561** (0.220)
CBI	-0.278*** (0.068)	-0.419*** (0.084)	-0.276*** (0.040)	-0.214** (0.088)	-0.067*** (0.014)	-0.400*** (0.065)
democracy	-0.005* (0.004)	-0.009** (0.004)	-0.008*** (0.002)	-0.013*** (0.004)	-0.002** (0.001)	-0.006* (0.004)
excregime	-0.016 (0.020)	-0.018 (0.024)	-0.023* (0.013)	-0.039 (0.025)	-0.014*** (0.003)	-0.016 (0.020)
govcons_GDP	0.004 (0.005)	-0.001 (0.005)	0.005** (0.002)	0.008 (0.006)	0.005 (0.001)	0.002 (0.005)
govinv_GDP	-0.0003 (0.009)	-0.018** (0.008)	0.002 (0.003)	-0.005 (0.008)	-0.001 (0.001)	-0.019** (0.009)
kaopen	-0.024*** (0.010)	-0.049*** (0.011)	-0.024*** (0.006)	-0.024** (0.012)	-0.002 (0.001)	-0.023*** (0.007)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Regressors lagged	NO	NO	YES	YES	NO	NO
AR1	-	-	-	-	0	0.003
AR2	-	-	-	-	0	0.436
Hansen	-	-	-	-	0.146	0.472
# of countries	107	94	107	94	102	90
# of instruments	-	-	-	-	106	35
R2	0.871	0.933	0.873	0.918	-	-
Adjusted R2	0.858	0.905	0.861	0.884	-	-
Observations	1,557	380	1,557	380	1,450	380

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Robust standard errors are used

- i) RER undervaluation correlates negatively with services share of GDP. These results are significant at the standard levels both across OLS and GMM estimations. A percentage point increase in the share of services value-added in GDP is associated with a fall in RER undervaluation by about 1-2% on average. This result lends support to the interest group theories of exchange rate preferences. Even after controlling for factors that could complicate sectoral RER preferences, such as import intensity of production and foreign debt burden, a higher (lower) share of non-tradable (tradable) sector output is negatively (positively) correlated with RER undervaluation.
- ii) RER undervaluation correlates negatively with import intensity of production. A percentage point increase in the imported intermediate and capital goods to exports ratio is associated with a decline in RER undervaluation by 0.1%. This result suggests that a heavy reliance on imported intermediate and capital goods could generate dissatisfaction with depreciation and might impede the implementation of competitive RER policies.
- iii) We observe a positive relationship between foreign liabilities and RER undervaluation. This result runs counter to our expectation that foreign currency exposure lowers the support for undervaluation but is consistent with the findings of Steinberg (2016), who establishes a positive relationship between external debt to GNI series from WDI and undervaluation. There are two possible explanations for this result. First, it is possible that more indebted countries undervalue their RER in response to feeling greater pressure to pay off their debt (*ibid.*). This dynamic was on display in several Latin American countries following the debt crisis of the early 1980s. Second, to the extent that a devaluation lowers a government's *domestic* debt burden (when measured in foreign currency), and thus represents a transfer from the private to the public sector, governments that have heavy domestic and foreign debt burdens may still have an incentive to undervalue in spite of the increased burden in domestic currency terms. Put differently, governments' incentive to inflate their way out of debt may be partly at work here.
- iv) We find a negative relationship between our proxy for the importance of the financial sector, the bank assets to GDP ratio, and RER undervaluation. The effect of labor compensation in GDP on RER undervaluation is similarly negative. These findings are consistent with the empirical evidence on the negative effect of exchange rate depreciations on the share of income accruing to workers and rentiers.
- v) Among institutional variables, *CBI* has a negative coefficient with high statistical significance. This result suggests that governments might be less inclined to pursue undervaluation when they lack control over the central banking operations. In line with the findings presented by Steinberg and Malhotra (2014) and Eichengreen (2007), we also establish a negative relationship between democracy and undervaluation. This result too is statistically significant across different specifications at standard significance levels.
- vi) Regarding policy variables, our results indicate a negative relationship between exchange rate flexibility and RER undervaluation. While this result runs counter to some other findings in the literature (e.g., Libman, 2018), it could indicate governments' objective to fix the RER to avoid overvaluation, a rationale explored by Aizenman and Lee (2005). We similarly find a negative correlation between RER undervaluation and capital account openness.

- vii) Regarding government expenditures, we fail to establish a consistent and statistically significant relationship between government consumption expenditures and undervaluation. However, we find a negative relationship between government investment and undervaluation. The effect of government spending on RER is likely to depend on the composition of spending. If new government spending skews towards non-tradable goods, it will appreciate the RER. However, if the new spending is directed towards tradable goods (such as military spending), there is less of a direct effect in the domestic non-tradables market, and hence less pressure for appreciation (and perhaps even some pressure in the other direction considering the negative effect on the trade balance)(Cermeño *et al.*, 2010). The negative coefficient of *gov\_inv* can be explained by the fact that government investment is typically skewed toward non-tradable goods such as buildings and structures. This result also fits with the findings of Bénétrix and Lane (2021), who show that shocks to public investment generate larger and more persistent real appreciation than shocks to government consumption.
- viii) Our results do not change much whether we use annual or 3-year averaged data. In a small number of cases, coefficients lose statistical significance, but they always maintain their sign, which can be explained by the rather drastic reduction in the sample size when series are averaged. The results are also highly consistent across OLS and GMM estimations. In the remainder of the paper, when we conduct robustness tests and run extended models, we will use column 3 of table 5, which uses annual data and lagged regressors, as our benchmark model. Further robustness checks using 3-year averaged data are provided in the appendix.

In table 6, we look into the OLS estimations in more detail. The first three models are estimated using annual data, whereas models 4 to 6 use 3-year averages. In this table, we start by regressing *lnunderval* on our vector of economic/structural variables, and we progressively include vectors of political/institutional and policy variables. We do not observe alterations of signs for variables with statistical significance in any of the specifications, although the coefficient on government consumption – in either case insignificant – is positive for annual data and negative for the 3-year averaged data.

Table 6: OLS Estimations

	<i>Dependent variable:</i>					
	annual			Inunderval		
	annual	annual	annual	3-year avg	3-year avg	3-year avg
services_GDP	−0.006*** (0.001)	−0.008*** (0.001)	−0.012*** (0.002)	−0.007* (0.003)	−0.006* (0.003)	−0.010*** (0.003)
import_intensity	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	0.0003 (0.003)	−0.001*** (0.0004)	−0.001*** (0.0004)
foreign_liabilities	0.007*** (0.002)	0.013*** (0.004)	0.013*** (0.004)	0.008** (0.004)	0.011 (0.008)	0.014* (0.008)
bank_assets	−0.001*** (0.0001)	−0.0005** (0.0002)	−0.001*** (0.0002)	−0.001 (0.001)	−0.0004 (0.0003)	−0.0004 (0.0003)
labsh	−0.309*** (0.096)	−0.317** (0.150)	−0.393** (0.184)	−0.384 (0.420)	−0.328* (0.170)	−0.147 (0.203)
CBI		−0.219*** (0.034)	−0.276*** (0.037)		−0.193*** (0.056)	−0.214*** (0.063)
democracy		−0.006** (0.003)	−0.008*** (0.003)		−0.009** (0.004)	−0.013*** (0.004)
excregime			−0.023* (0.012)			−0.039* (0.022)
govcons_GDP			0.005 (0.003)			0.008 (0.005)
govinv_GDP			0.002 (0.004)			−0.005 (0.010)
kaopen			−0.024*** (0.006)			−0.024** (0.011)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
3-year avg	NO	NO	NO	YES	YES	YES
Regressors lagged	YES	YES	YES	YES	YES	YES
# of countries	123	111	107	121	103	94
Observations	2,596	1,806	1,557	750	465	380
R <sup>2</sup>	0.839	0.858	0.873	0.757	0.901	0.918
Adjusted R <sup>2</sup>	0.829	0.846	0.861	0.705	0.868	0.884

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Robust standard errors are used

In table 7, we explore the within-country variation in RER undervaluation across different country groups. We divide countries along three dimensions. First, we split countries into developing and advanced countries, where developing countries include all low-income, lower middle-income, and upper middle-income countries



based on the World Bank’s definition. Second, we use UNCTAD’s report on the state of commodity dependence to classify countries as commodity-dependent (resource-rich) and non-dependent (resource-poor), where a country is defined as commodity-dependent if commodities account for more than 60 per cent of its total merchandise exports (UNCTAD, 2019).

Third, we classify countries based on whether they have revealed comparative advantage in producing capital goods, consumption goods, or intermediate goods in a given year. RCA represents the share of a country’s exports of a specific good (or good category) to its total exports divided by the share of total exports of that good (or category) in world exports of all goods. For instance, in the case of capital goods, a country is said to have a RCA in capital goods when its ratio of exports of capital goods to its total exports of all goods is greater than the same ratio for the world as a whole. This can be algebraically represented as follows:

$$RCA_{i,Kgoods} = \frac{\frac{X_{i,Kgoods}}{\sum_{j \in P} X_{i,j}}}{\frac{X_{W,Kgoods}}{\sum_{j \in P} X_{W,j}}} \geq 1$$

where  $P$  is the set of all products (with  $Kgoods \in P$ ),  $X_{i,Kgoods}$  is country  $i$ ’s exports of capital goods,  $X_{W,Kgoods}$  is world exports of capital goods,  $\sum_{j \in P} X_{i,j}$  is country  $i$ ’s total exports of all products  $j$  in  $P$ , and  $\sum_{j \in P} X_{W,j}$  is total world exports (of all products  $j$  in  $P$ ). In table 7, the column named “RCA\_Kgoods” presents results based on all the rows of our dataset for which  $RCA\_Kgoods \geq 1$ . Likewise, columns “RCA\_consgoods” and “RCA\_intgoods” include all rows for which  $RCA\_consgoods \geq 1$  and  $RCA\_intgoods \geq 1$ , respectively.

Our main results for the size of the non-tradable sector, import intensity, central bank independence, and capital account openness hold almost without exception regardless of country classification. Specifically, we do not observe any significant differences in behavior between the developing and advanced economies except for that increased democracy is associated with a greater and statistically significant degree of undervaluation in advanced economies and the opposite in developing ones. The same is true for government investment although the coefficient is statistically significant only for advanced economies. Comparing resource poor and resource rich economies, foreign indebtedness, the labor share of income, exchange rate flexibility, and the share of government spending is associated with a more overvalued RER only in the former.

Regarding the nature of specialization in world markets, at 19,452 PPP-adjusted real dollars in the year 2000, the average real GDP per capita was higher for countries with a revealed comparative advantage (RCA) in capital goods (the corresponding numbers for consumer and intermediate good specialists were 14,713 and 15,557, respectively). One would, therefore, expect countries specialized in capital-intensive goods to behave similar to advanced economies. This expectation is partially borne out when we look at the coefficients on the labor share variable where countries specialized in capital goods act differently from the others, and similarly to the advanced economies. Other than that, we do not detect any marked consistent differences between the countries that have a RCA in capital goods and the other two groups.

To summarize, with the exception of democracy and the share of government spending, our main results do not appear to be driven by one or another group of countries.

Table 7: Regression Results by Country Groups

	<i>Dependent variable: lnunderval</i>						
	Developing	Advanced	Resource rich	Resource poor	RCA K_goods	RCA C_goods	RCA int_goods
services_GDP	−0.011*** (0.002)	−0.015*** (0.003)	−0.008*** (0.002)	−0.015*** (0.003)	−0.016*** (0.005)	−0.004 (0.003)	−0.015*** (0.003)
imp_intensity	−0.001*** (0.0002)	−0.001** (0.0003)	−0.001** (0.0003)	−0.001*** (0.0002)	0.004** (0.001)	−0.0002 (0.0004)	−0.001*** (0.0002)
foreign_liabilities	0.003 (0.006)	0.007 (0.005)	0.138*** (0.031)	−0.067* (0.036)	0.108*** (0.041)	−0.002 (0.004)	0.010* (0.005)
bank_assets	−0.001* (0.001)	−0.001*** (0.0002)	−0.001 (0.001)	−0.001 (0.001)	−0.001*** (0.0004)	0.0003 (0.0002)	0.0003 (0.0004)
labsh	−0.318 (0.220)	0.029 (0.241)	0.286 (0.314)	−0.772*** (0.173)	0.382 (0.614)	−0.125 (0.163)	−0.405** (0.159)
CBI	−0.282*** (0.061)	−0.200*** (0.051)	−0.163 (0.111)	−0.300*** (0.070)	−0.447*** (0.136)	−0.108** (0.055)	−0.236*** (0.046)
democracy	−0.009*** (0.003)	0.010** (0.004)	−0.014*** (0.005)	−0.004 (0.003)	−0.0001 (0.003)	−0.008** (0.004)	−0.013*** (0.004)
excregime	−0.012 (0.019)	−0.021* (0.013)	0.068** (0.033)	−0.048** (0.022)	−0.010 (0.024)	−0.065*** (0.014)	−0.046*** (0.014)
govcons_GDP	0.007** (0.003)	0.007 (0.005)	0.003 (0.004)	−0.010*** (0.004)	0.021** (0.009)	0.007* (0.003)	0.001 (0.004)
govinv_GDP	−0.002 (0.004)	0.013* (0.007)	0.020*** (0.006)	−0.001 (0.006)	−0.011 (0.008)	−0.008 (0.007)	−0.030*** (0.005)
kaopen	−0.007 (0.007)	−0.064*** (0.010)	−0.031*** (0.010)	−0.019** (0.008)	−0.011 (0.017)	−0.046*** (0.009)	−0.040*** (0.008)
Country FE	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES
Regressors Lagged	YES	YES	YES	YES	YES	YES	YES
# of countries	68	39	43	32	20	59	67
Observations	917	640	549	485	228	639	740
R <sup>2</sup>	0.750	0.903	0.705	0.766	0.957	0.937	0.923
Adjusted R <sup>2</sup>	0.719	0.891	0.659	0.730	0.945	0.926	0.911

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Robust standard errors are used

## 5.1 Extended Specifications and Robustness Checks

In table 8, we introduce additional regressors to our baseline results. To facilitate easy comparison, we reproduced our baseline OLS result in model 1 of table 8. We start by introducing the economic complexity index, *ECI*, developed by Hidalgo and Hausmann (2009). ECI measures the diversification and complexity of the export basket of each country. Countries with low economic complexity produce a less diverse set of goods and exhibit less capacity to innovate. This makes them more dependent on their existing export markets and more likely to compete on prices (Magacho *et al.*, 2022). For this reason, we expect greater support for undervalued RER policies in countries with low ECI. We do not include this variable in our baseline regression tables due to data limitations as the ECI series is available only from 1995. In line

with our expectations, we observe a negative and a statistically significant relationship between *ECI* and *lnunderval*. Model 3 introduces trade openness (*tradeopenness*), measured by exports plus imports as a share of GDP. We introduce this variable as a control variable because economies that are more open to trade can be more sensitive to exchange rate movements and, hence, have more overvalued or undervalued exchange rates than more closed economies (Steinberg, 2016). However, we do not find a statistically significant effect of *tradeopenness* on *lnunderval*, and adding this variable does not alter the rest of our results. In model 4, we introduce resource rents to GDP, which we use as a proxy for natural resource availability. This variable reflects the sum of oil rents, natural gas rents, coal rents, mineral rents, and forest rents in GDP. Contrary to our expectations, we find a positive association between resource rents and RER undervaluation. Note that Mahraddika (2020) likewise finds a positive relationship between resource rents and RER undervaluation. We do not think this result indicates potential endogeneity concerns, given that resource rents predominantly depend on the stock of natural resources and exogenous world prices (Bhattacharyya & Hodler, 2014). Besides, we continue to obtain a positive coefficient when we introduce this variable into our GMM estimations<sup>18</sup>. We leave further exploration of this result for future research.

In model 5, we interact services share of GDP with CBI. The inclusion of this variable is inspired by Steinberg’s conditional preference theory (Steinberg, 2015, 2016), which, as explained in section 2.3, predicts the support for RER undervaluation to be higher under state-controlled financial systems when the manufacturing sector is economically important. Steinberg empirically tests this hypothesis by interacting a measure of state-owned banks (named *ADT* in his regressions) and the share of the manufacturing sector in GDP (*manu\_GDP*). His results, which we successfully replicated in table 11<sup>19</sup>, establish a positive relationship between this interaction term and RER undervaluation.

For reasons discussed earlier, we believe that central bank independence can be seen as an alternative (imperfect) proxy for the extent of state control over the financial system. Therefore, it would be interesting to see whether and how the effect of the services sector output share on undervaluation changes with the degree of central bank independence. Our results indicate that the effect of the services sector output share on undervaluation decreases as the central bank gets more independent.

In model 6, following Steinberg (2016), we include an index measuring worker rights to account for the political importance of labor in shaping exchange rate policy. This index reflects workers’ rights to freedom of association, collective bargaining, and protection for the employment of children. We expect the support for RER undervaluation to decrease with better worker rights, given that workers could voice their discontent with undervalued RER policies more easily if they have rights to freedom of association and collective bargaining. While the negative sign indicates that RER undervaluation falls with better worker rights, the relationship is not statistically significant.

Model 7 introduces RCA variables as additional regressors. We expect RER undervaluation to be positively associated with revealed comparative advantage (RCA) in consumption goods and negatively associated

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<sup>18</sup>The results from these estimations are available upon request

<sup>19</sup>Replicating Steinberg’s results helps us validate our data collection and coding procedures, given that our regressions share a few variables in common, and both studies estimate a fixed-effects model. We managed to replicate Steinberg’s results with highly similar coefficient sizes and statistical significance.

with RCA in capital goods. This is because markets for consumption goods which are, on average, less sophisticated, are likely to be more competitive globally, leading to greater price-based competition<sup>20</sup>. While we find a negative relationship between RCA in capital goods, the results for consumption and intermediate goods are statistically insignificant. In model 8, we include a currency crisis dummy to ensure that the positive coefficients on the RER undervaluation index in earlier regressions are not driven by currency crises. Following Laeven and Valencia (2020), we define a currency crisis as a sharp depreciation of the local currency against the US Dollar. We use two conditions to define this variable: i) a nominal depreciation of at least 30 percent, and ii) at least 10 percentage points increase in the rate of depreciation compared to the previous year<sup>21</sup>. We do not observe any changes to our results when controlling for currency crises.

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<sup>20</sup>Put differently, the typical consumption good is likely to have many more close substitutes available in international markets than is true for capital goods.

<sup>21</sup>To construct the currency crisis dummy, we used end-of-period nominal bilateral exchange rates data obtained from the IMF. Following Laeven and Valencia (2020), when a country met the criteria for consecutive years, we used only the first year of each five-year window to identify the crisis.

Table 8: Extended Specifications

	<i>Dependent variable:</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
services_GDP	−0.012*** (0.002)	−0.011*** (0.002)	−0.012*** (0.002)	−0.010*** (0.002)	−0.016*** (0.003)	−0.013*** (0.002)	−0.011*** (0.002)	−0.012*** (0.002)
imp_intensity	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)
foreign_liabilities	0.013*** (0.004)	0.007* (0.004)	0.013*** (0.004)	0.014*** (0.004)	0.011*** (0.004)	0.017* (0.009)	0.009** (0.004)	0.011 (0.007)
bank_assets	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0003)	−0.001*** (0.0002)	−0.001*** (0.0003)
labsh	−0.393** (0.184)	−0.433* (0.236)	−0.357* (0.197)	−0.357* (0.191)	−0.429** (0.192)	−0.052 (0.387)	−0.370** (0.185)	−0.382** (0.190)
CBI	−0.276*** (0.037)	−0.280*** (0.045)	−0.282*** (0.038)	−0.273*** (0.038)	−0.644*** (0.229)	−0.254*** (0.046)	−0.257*** (0.037)	−0.304*** (0.041)
democracy	−0.008*** (0.003)	−0.002 (0.005)	−0.008** (0.003)	−0.009*** (0.003)	−0.007** (0.003)	−0.008** (0.003)	−0.007** (0.003)	−0.006** (0.003)
excregime	−0.023* (0.012)	−0.018 (0.014)	−0.025** (0.013)	−0.020 (0.013)	−0.022* (0.012)	−0.032** (0.013)	−0.018 (0.012)	−0.027** (0.014)
govcons_GDP	0.005 (0.003)	0.008** (0.003)	0.004 (0.003)	0.004 (0.003)	0.005 (0.003)	0.002 (0.003)	0.004 (0.003)	0.004 (0.003)
govinv_GDP	0.002 (0.004)	0.007 (0.004)	0.003 (0.004)	0.001 (0.004)	0.002 (0.004)	−0.011* (0.006)	0.001 (0.004)	0.003 (0.004)
kaopen	−0.024*** (0.006)	−0.024*** (0.006)	−0.024*** (0.006)	−0.025*** (0.006)	−0.025*** (0.006)	−0.026*** (0.008)	−0.023*** (0.005)	−0.022*** (0.006)
ECI		−0.071*** (0.022)						
tradeopenness			0.0001 (0.0004)					
resource_rents				0.007*** (0.002)				
services x CBI					0.007* (0.004)			
worker_rights						−0.008 (0.010)		
RCA_Kgoods							−0.158*** (0.035)	
RCA_consgoods							0.006 (0.020)	
RCA_intgoods							−0.005 (0.015)	
currency_crisis								−0.044 (0.084)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
# of lags	1	1	1	1	1	1	1	1
# of countries	107	97	107	107	107	99	107	106
Observations	1,557	1,348	1,508	1,509	1,557	1,013	1,552	1,413
R <sup>2</sup>	0.873	0.876	0.874	0.875	0.874	0.904	0.876	0.863
Adjusted R <sup>2</sup>	0.861	0.864	0.861	0.862	0.861	0.890	0.863	0.847

Note:

We perform several robustness checks. The first set of robustness checks is presented in table 9. Model 1 replicates our baseline specification. We recognize that changes in some of our explanatory variables might have lagged or non-contemporaneous effects on RER undervaluation. In our main regression tables, we addressed this problem by using one period lagged value of our regressors. In model 2, we check the robustness of our results by using 2-period lagged values<sup>22</sup>. The sign and statistical significance of all coefficients remain the same.

Models 3-7 test the robustness of our results to alternative proxies and data sources. In model 3, we use the tradable sector share of GDP (*tradable\_GDP*), as measured by the summation of the share of the agriculture and manufacturing sector in GDP, as an alternative proxy for the sectoral composition of output. Model 4 uses an alternative measure of foreign exchange liabilities, named *net\_sensitivity*. The *foreign\_liabilities* series used in baseline estimations do not distinguish domestic vs. foreign currency-denominated liabilities. In contrast, *net\_sensitivity* measures a country’s net foreign currency exposure by calculating the net sensitivity of a country’s external balance to a uniform movement of its domestic currency against all foreign currencies. Despite being a more detailed measure of balance sheet vulnerabilities, we use *net\_sensitivity* only as a robustness check due to its limited time and country coverage. In model 5, we use an alternative measure of democracy, *democracy\_CGV*. This index is a binary variable that takes the value of one if the chief executive office and the legislative body of a country are filled by contested elections<sup>23</sup>. In model 6, we replace *CBI* with a central bank transparency index (*TI*), taken from Dincer *et al.* (2022). This index takes values from 0 to 15, with higher values denoting higher transparency. While not being a direct measure of central bank independence, we expect higher central bank transparency to correlate positively with CBI. In model 7, we check the robustness of our results to an alternative exchange rate regime classification by Levy-Yeyati and Sturzenegger (2016)<sup>24</sup>. Higher values of this variable indicate a more flexible exchange rate regime. The main coefficients of interest maintain their sign and statistical significance in all instances except in model 6, where we fail to observe a statistically significant coefficient for central bank transparency. This may be due to the substantial reduction in both the cross-sectional and time dimension of our sample when we use the transparency index. Lastly, in model 8, we analyze how excluding country-fixed effects alter our results. We observe a significant reduction in our (adjusted) R-squared statistics, suggesting that unobserved time-invariant country characteristics explain a large part of the variation in *lnunderval*.

Next, we check whether our results are robust to using alternative measures of RER undervaluation. These results are reported in table 10. Note that we exclude *foreign\_liabilities* from the models that use *lnunderval2-CEPII* as the dependent variable, given that these measures already account for net foreign assets. Like-

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<sup>22</sup>Here, we continue using 3-period lags for labor share of income.

<sup>23</sup>More specifically, Cheibub *et al.* (2010) categorizes a country as a democracy if the following conditions are met: (1) “the chief executive must be chosen by popular election or by a body that was itself popularly elected,” (2) “the legislature must be popularly elected,” (3) “there must be more than one party competing in the elections,” (4) “an alteration in power under electoral rules identical to the ones that brought the incumbent to office must have taken place.” (p. 69)

<sup>24</sup>Levy-Yeyati and Sturzenegger (2016) classifies exchange rate regimes into five broad categories: inconclusive, float, dirty, dirty/crawling peg, and fixed. To ensure consistency and easy comparability with our baseline exchange rate regime measure based on Ilzetzki *et al.* (2019), we constructed a discrete variable that can take on three values (0 if the regime is fixed, 1 if dirty or dirty/floating, and 2 if floating. We coded inconclusive cases as missing values.

wise, we exclude *gov\_cons* when we use *lnunderval4* as we had controlled for *govcons\_GDP* to construct *lnunderval4*. All our qualitative results remain unchanged when we use *lnunderval2-lnunderval4*. Most results remain the same when we use the CEPII undervaluation measure except for *democracy*, *excregime* and *govinv\_GDP*.

Table 9: Robustness Checks I

<i>Dependent variable: lnunderval</i>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
services_GDP	−0.012*** (0.002)	−0.009*** (0.002)		−0.013*** (0.002)	−0.012*** (0.002)	−0.013*** (0.002)	−0.010*** (0.002)	−0.007*** (0.001)
tradable_GDP			0.007*** (0.002)					
imp_intensity	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.002*** (0.0002)	−0.002*** (0.0002)	−0.001*** (0.0003)	−0.001*** (0.0002)	0.001*** (0.0002)
foreign_liabilities	0.013*** (0.004)	0.012*** (0.004)	0.008** (0.004)		0.013* (0.008)	0.015 (0.013)	0.014*** (0.004)	−0.025*** (0.006)
net_sensitivity				0.015 (0.025)				
bank_assets	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001* (0.0003)	−0.001*** (0.0002)	−0.002*** (0.0003)	−0.0002 (0.0002)	−0.001*** (0.0002)
labsh	−0.020 (0.183)	−0.200 (0.123)	−0.063 (0.187)	0.118 (0.313)	0.418 (0.280)	−0.012 (0.230)	−0.008 (0.198)	−0.694*** (0.085)
CBI	−0.254*** (0.039)	−0.249*** (0.035)	−0.258*** (0.039)	−0.206*** (0.050)	−0.252*** (0.043)		−0.257*** (0.039)	0.185*** (0.042)
TI						0.003 (0.005)		
democracy	−0.008*** (0.003)	−0.008** (0.003)	−0.009*** (0.003)	−0.011** (0.005)		0.002 (0.004)	−0.006* (0.003)	−0.007*** (0.002)
democracy_CGV					−0.090** (0.039)			
excregime	−0.022* (0.012)	−0.035*** (0.012)	−0.013 (0.012)	−0.016 (0.016)	−0.035*** (0.012)	−0.073*** (0.024)		0.029** (0.014)
excregime_LYS							−0.010* (0.006)	
govcons_GDP	0.003 (0.003)	0.004 (0.003)	−0.0003 (0.003)	−0.003 (0.004)	0.002 (0.003)	0.004 (0.004)	−0.001 (0.003)	−0.008*** (0.002)
govinv_GDP	0.002 (0.004)	0.001 (0.004)	0.009** (0.004)	−0.013* (0.008)	−0.011** (0.005)	0.018*** (0.004)	−0.0003 (0.004)	0.001 (0.003)
kaopen	−0.023*** (0.006)	−0.016*** (0.006)	−0.022*** (0.006)	−0.026** (0.011)	−0.033*** (0.007)	−0.038*** (0.008)	−0.039*** (0.006)	−0.046*** (0.006)
Constant								0.795*** (0.078)
Country FE	YES	YES	YES	YES	YES	YES	YES	NO
Time FE	YES	YES	YES	YES	YES	YES	YES	NO
# of lags	1	2	1	1	1	1	1	1
# of countries	107	107	106	75	105	64	105	NA
Observations	1,557	1,557	1,549	707	1,241	918	1,501	1,557
R <sup>2</sup>	0.872	0.875	0.868	0.913	0.888	0.886	0.873	0.402
Adjusted R <sup>2</sup>	0.860	0.862	0.854	0.898	0.874	0.873	0.860	0.398

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Robust standard errors are used



Table 10: Robustness Check Using Alternative Measures of RER Undervaluation

	<i>Dependent variable:</i>				
	lnunderval	lnunderval2	lnunderval3	lnunderval4	CEPII
services_GDP	−0.012*** (0.002)	−0.011*** (0.002)	−0.012*** (0.002)	−0.009*** (0.002)	−0.003** (0.002)
import_intensity	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.001*** (0.0002)
foreign_liabilities	0.013*** (0.004)				
bank_assets	−0.001*** (0.0002)	−0.0005*** (0.0002)	−0.0004** (0.0002)	−0.0004** (0.0002)	−0.001*** (0.0002)
labsh	−0.020 (0.183)	−0.106 (0.109)	−0.072 (0.110)	−0.084 (0.114)	−0.184 (0.130)
CBI	−0.254*** (0.039)	−0.235*** (0.037)	−0.257*** (0.038)	−0.270*** (0.038)	−0.130*** (0.032)
democracy	−0.008*** (0.003)	−0.007*** (0.003)	−0.007*** (0.003)	−0.007*** (0.003)	0.009** (0.004)
excregime	−0.022* (0.012)	−0.043*** (0.013)	−0.036*** (0.014)	−0.028* (0.014)	0.006 (0.009)
govcons_GDP	0.003 (0.003)	0.004 (0.003)	0.004 (0.003)		0.007*** (0.002)
govinv_GDP	0.002 (0.004)	−0.020*** (0.004)	−0.020*** (0.004)	−0.020*** (0.004)	0.007** (0.003)
kaopen	−0.023*** (0.006)	−0.043*** (0.006)	−0.047*** (0.006)	−0.051*** (0.006)	−0.032*** (0.006)
Country FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES
Regressors lagged	YES	YES	YES	YES	YES
# of countries	107	98	98	97	90
Observations	1,557	1,285	1,262	1,260	1,376
R <sup>2</sup>	0.872	0.878	0.875	0.860	0.509
Adjusted R <sup>2</sup>	0.860	0.864	0.860	0.845	0.461

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
robust standard errors are used

Finally, we employ probit analysis to investigate the robustness of our key conclusions further. In probit estimations, our dependent variable, *undervalued*, is a binary variable that takes the value 1 if the RER is undervalued and 0 otherwise. The results from the probit estimation help us understand whether an increase in the value of our explanatory variables affects the probability that the RER is undervalued. The overall results, displayed in table 16 in appendix D, align with our general findings. A higher share of

services sector output, a higher import intensity of exports, a higher ratio of bank assets to GDP, a higher labor share of income, a higher central bank independence index, and a higher score of democracy index lower the probability that the RER is undervalued. We also find that a higher share of foreign liabilities in GDP increases the probability of undervaluation. We fail to establish statistically significant coefficients on government spending variables and capital account openness.

## 6 Concluding Remarks

There is robust evidence linking RER undervaluation with higher economic growth, particularly for developing countries. Insofar as policymakers are aware of the potential benefits of undervalued RER and have some influence over the RER level, what prevents them from pursuing undervaluation? This paper sought to address this question by examining economic/structural, political/institutional, and policy determinants of RER undervaluation using a large panel dataset.

We provide evidence that both inter-class (labor and capital) and inter-sectoral (tradable and non-tradable) distribution of income are important determinants of exchange rate misalignment. We find systematic evidence linking a higher share of non-tradable sector output, a larger labor share of income, and a larger financial sector with less undervalued RER. These findings are consistent with the view that undervalued RER policies generate discontent among workers and non-tradable industries. The negative association we observe between democracy and RER undervaluation further indicates that politicians might be more inclined to avoid undervaluation and/or pursue overvaluation to gain voter support when operating under electoral pressure. Further, we find a negative relationship between the import intensity of exports and RER undervaluation. Our results linking high import dependence with more overvaluation is robust across various specifications, data choices, and samples. Interestingly, we do not observe a similar negative link between balance sheet vulnerabilities and undervaluation. One possible interpretation is that policymakers might be pursuing undervaluation with a view to generating foreign currency revenues by boosting the international competitiveness of tradable industries. Analysing the conditions under which higher foreign debt burden translates into support for under or overvalued exchange rates could be a useful direction for future research.

Another key finding of our study is that the RER tends to be less undervalued under independent central banking regimes and open capital accounts, suggesting that central bank independence might limit policymakers' willingness and ability to pursue undervaluation for different reasons. From a policy perspective, these results suggests that undervalued RER policies cannot be implemented in isolation. When desirable, they should be integrated into a wider policy and institutional framework, such as one involving sectoral subsidies or tax and credit incentives, to ease the costs of undervaluation.

Before concluding, some caveats are in order. First, it is worth emphasizing that our key aim was to identify broad real exchange rate undervaluation patterns across countries and over time. Although we provided plausible interpretations for our results in light of various theoretical frameworks, the coefficients we report do not necessarily capture causal relationships. Causal inference tools, such as instrumental variable estimations or diff-in-diff techniques that exploit exogenous sources of variation in key independent variables of interest, or country-specific qualitative case studies, may be better suited to this end. The difficulty of using an IV regression in our context is that it is challenging to find exogenous regressors that influence our key

independent variables of interest, such as import intensity or central banking independence, without having an independent effect on the RER level. It is likewise challenging to identify exogenous variation in our independent variables. Therefore, country case studies that provide a detailed picture of the configuration of domestic interest groups, institutional characteristics, and industrial structure can be better suited to provide causal interpretation to our results.

While we have highlighted the theoretical and empirical arguments in favor of undervaluation, our results suggest that a nuanced view of RER policies, one that carefully considers under what conditions and for how long they ought to be implemented, is desirable. There are costs as well as benefits to having an undervalued RER. A sudden depreciation of the exchange rate can have disruptive financial, economic, and social consequences, especially when tradables and imported intermediate and capital goods are a large part of domestic consumption and production. A controlled and predictable undervaluation policy aimed at deriving the gains while minimizing domestic instability is, therefore, likely to require a mix of macroeconomic and industrial policies that will vary with the national context.

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## Appendix A: List of Countries

**Low income:** Benin, Burkina Faso, Burundi, Central African Republic, Guinea, Mozambique, Niger, Rwanda, Sierra Leone, Tanzania, Togo

**Lower middle income:** Bolivia, Cameroon, Cape Verde, Côte d’Ivoire, Egypt, Honduras, India, Indonesia, Kenya, Laos, Lesotho, Mauritania, Moldova, Mongolia, Morocco, Nicaragua, Nigeria, Senegal, Tunisia, Ukraine, Zambia, Zimbabwe

**Upper middle income:** Argentina, Armenia, Azerbaijan, Belarus, Botswana, Brazil, Bulgaria, China, Colombia, Dominican Republic, Ecuador, Fiji, Gabon, Georgia, Guatemala, Iran, Jordan, Kazakhstan, Lebanon, Malaysia, Mauritius, Mexico, Montenegro, Namibia, North Macedonia, Paraguay, Peru, Romania, Russia, South Africa, Sri Lanka, Suriname, Thailand, Turkey, Venezuela

**High income:** Austria, Bahrain, Belgium, Canada, Chile, Croatia Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Netherlands, New Zealand, Norway, Oman, Panama, Poland, Portugal, Saudi Arabia, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, United Kingdom, United States, Uruguay

## Appendix B: Replication of Steinberg (2016)

Table 11: Replication of Steinberg (2006, table 1, p.16)

	<i>Dependent variable: lnovervaluation</i>				
	(1)	(2)	(3)	(4)	(5)
State Bank (ADT)	0.173*** (0.028)	0.186*** (0.027)	0.163*** (0.029)	0.154*** (0.039)	0.233*** (0.043)
Manufacturing	0.015*** (0.004)	0.011** (0.004)	0.013*** (0.005)	0.012* (0.007)	0.022*** (0.007)
ADT x Manufacturing	-0.011*** (0.002)	-0.010*** (0.002)	-0.010*** (0.002)	-0.011*** (0.002)	-0.013*** (0.003)
trade	-0.001 (0.001)	-0.002*** (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
External debt	-0.001*** (0.0002)	-0.001*** (0.0002)	-0.001*** (0.0003)	0.0001 (0.0003)	0.0003 (0.0004)
GDP	0.013 (0.027)	-0.091*** (0.030)	0.022 (0.034)	-0.049 (0.032)	0.047 (0.037)
Democracy	0.010** (0.002)	0.010*** (0.002)	0.007*** (0.002)	0.009*** (0.002)	0.012*** (0.002)
Agriculture		-0.013*** (0.002)			
Services		-0.0002 (0.002)			
Worker rights			0.037*** (0.013)		
Textiles				0.001 (0.002)	
Capital account openness					0.017 (0.012)
Fixed exchange rate					0.027 (0.027)
Open trade policy					0.009 (0.026)
Observations	1,178	1,115	1,006	795	743
R <sup>2</sup>	0.700	0.747	0.739	0.701	0.674
Adjusted R <sup>2</sup>	0.685	0.733	0.723	0.681	0.647

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Appendix C: Further Robustness Checks

Table 12: Regression Results by Country Groups using 3-year Averages

	<i>Dependent variable: lnunderval</i>			
	Developing	Advanced	Resource rich	Resource poor
services_GDP	-0.010*** (0.002)	-0.009*** (0.003)	-0.010*** (0.002)	-0.014*** (0.002)
imp_intensity	-0.001*** (0.0002)	-0.001*** (0.0004)	0.0001 (0.0003)	-0.001*** (0.0002)
foreign_liabilities	0.017*** (0.006)	-0.001 (0.005)	0.152*** (0.031)	-0.002 (0.034)
RCA_consgoods	0.049** (0.022)	-0.088* (0.050)	0.044 (0.030)	0.098*** (0.036)
RCA_Kgoods	-0.089*** (0.029)	-0.205*** (0.054)	-0.584*** (0.077)	-0.049 (0.034)
labsh	0.026 (0.214)	-0.422* (0.236)	-0.173 (0.275)	-0.269 (0.191)
CBI	-0.032 (0.060)	-0.167*** (0.050)	-0.245** (0.105)	-0.191*** (0.072)
democracy	-0.020*** (0.003)	0.013*** (0.004)	-0.022*** (0.005)	-0.011*** (0.003)
excregime	-0.042** (0.018)	-0.024* (0.014)	-0.010 (0.033)	-0.075*** (0.020)
govcons_GDP	0.011*** (0.003)	0.005 (0.005)	-0.003 (0.005)	0.004 (0.004)
govinv_GDP	-0.012*** (0.004)	0.023*** (0.007)	0.026*** (0.006)	0.001 (0.006)
kaopen	0.001 (0.007)	-0.054*** (0.009)	-0.024** (0.009)	0.001 (0.008)
Country FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
3-year Avg	YES	YES	YES	YES
Regressors Lagged	YES	YES	YES	YES
# of countries	58	37	34	30
Observations	219	174	125	125
R <sup>2</sup>	0.847	0.925	0.819	0.834
Adjusted R <sup>2</sup>	0.766	0.891	0.693	0.733

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Robust standard errors are used



Table 13: Extended Specifications using 3-year Averages

	<i>Dependent variable:</i>						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
services_GDP	-0.010*** (0.003)	-0.006 (0.005)	-0.010*** (0.003)	-0.010*** (0.004)	-0.011** (0.005)	-0.010** (0.004)	-0.008*** (0.003)
imp_intensity	-0.001*** (0.0004)	-0.002*** (0.001)	-0.001*** (0.0005)	-0.001*** (0.0005)	-0.001*** (0.0004)	-0.002*** (0.001)	-0.001*** (0.0004)
foreign_liabilities	0.014* (0.008)	0.007 (0.007)	0.013* (0.008)	0.018** (0.009)	0.014* (0.008)	-0.008 (0.024)	0.009 (0.008)
bank_assets	-0.0004 (0.0003)	-0.0005 (0.0004)	-0.0004 (0.0003)	-0.001 (0.0004)	-0.0004 (0.0003)	-0.002*** (0.001)	-0.0004 (0.0003)
labsh	-0.147 (0.203)	-0.188 (0.274)	-0.074 (0.230)	-0.230 (0.241)	-0.153 (0.209)	0.574* (0.327)	-0.140 (0.204)
CBI	-0.214*** (0.063)	-0.191** (0.082)	-0.264*** (0.074)	-0.227*** (0.068)	-0.287 (0.330)	-0.164** (0.083)	-0.172*** (0.063)
democracy	-0.013*** (0.004)	-0.002 (0.005)	-0.012*** (0.004)	-0.016*** (0.004)	-0.013*** (0.004)	-0.020*** (0.005)	-0.013*** (0.004)
excregime	-0.039* (0.022)	-0.025 (0.027)	-0.038 (0.026)	-0.033 (0.024)	-0.039* (0.022)	-0.052* (0.028)	-0.034* (0.021)
govcons_GDP	0.008 (0.005)	0.012** (0.006)	0.009 (0.006)	0.009 (0.006)	0.008 (0.006)	0.018*** (0.007)	0.006 (0.006)
govinv_GDP	-0.005 (0.010)	0.002 (0.010)	-0.0003 (0.011)	-0.003 (0.010)	-0.005 (0.010)	-0.017 (0.011)	-0.006 (0.010)
kaopen	-0.024** (0.011)	-0.022 (0.016)	-0.025** (0.011)	-0.025** (0.012)	-0.024** (0.011)	-0.032* (0.018)	-0.024** (0.011)
ECI		-0.070 (0.049)					
tradeopenness			-0.0001 (0.001)				
resource_rents				0.004 (0.005)			
services x CBI					0.001 (0.006)		
worker_rights						0.004 (0.026)	
RCA_Kgoods							-0.146** (0.068)
RCA_consgoods							-0.007 (0.046)
RCA_intgoods							0.026 (0.033)
Country FE	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES
3-year avg	YES	YES	YES	YES	YES	YES	YES
# of lags	1	1	1	1	1	1	1
# of countries	94	89	94	93	94	87	93
Observations	380	326	345	343	380	226	379
R <sup>2</sup>	0.918	0.922	0.920	0.919	0.918	0.936	0.919
Adjusted R <sup>2</sup>	0.884	0.885	0.881	0.881	0.883	0.884	0.885

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Robust standard errors are used

Table 14: Robustness Checks I using 3-year Averages

	<i>Dependent variable:</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
services_GDP	-0.010*** (0.003)	-0.010		-0.010* (0.005)	-0.011*** (0.003)	-0.003 (0.004)	-0.010*** (0.003)	-0.009*** (0.002)
tradable_GDP			0.004 (0.004)					
imp_intensity	-0.001*** (0.0004)	-0.001	-0.002*** (0.0004)	-0.003*** (0.001)	-0.002*** (0.0005)	-0.001* (0.001)	-0.001*** (0.0004)	0.001*** (0.0004)
foreign_liabilities	0.014* (0.008)	0.014	0.012 (0.008)		0.021 (0.014)	0.105*** (0.026)	0.016** (0.008)	-0.042*** (0.013)
net_sensitivity				0.021 (0.057)				
bank_assets	-0.0004 (0.0003)	-0.0004	-0.001** (0.0003)	-0.002*** (0.001)	-0.0001 (0.001)	0.0001 (0.001)	-0.0002 (0.0003)	-0.0002 (0.0004)
labsh	-0.147 (0.203)	-0.147	-0.154 (0.206)	0.556 (0.486)	0.023 (0.245)	-0.682** (0.308)	-0.121 (0.194)	-0.690*** (0.131)
CBI	-0.214*** (0.063)	-0.214	-0.221*** (0.067)	-0.162** (0.081)	-0.246*** (0.068)		-0.255*** (0.070)	0.185** (0.081)
TI						0.007 (0.009)		
democracy	-0.013*** (0.004)	-0.013	-0.012*** (0.004)	-0.026*** (0.006)		-0.007 (0.008)	-0.012*** (0.004)	-0.009*** (0.003)
democracy_CGV					-0.144*** (0.051)			
excregime	-0.039* (0.022)	-0.039	-0.033 (0.022)	-0.047* (0.026)	-0.052** (0.022)	-0.161*** (0.051)		0.006 (0.025)
excregime_LYS							-0.005 (0.012)	
govcons_GDP	0.008 (0.005)	0.008	0.005 (0.005)	0.023** (0.009)	0.015*** (0.005)	-0.007 (0.008)	0.007 (0.006)	-0.011*** (0.003)
govinv_GDP	-0.005 (0.010)	-0.005	0.002 (0.010)	-0.019 (0.012)	-0.014 (0.011)	0.016* (0.009)	-0.003 (0.010)	-0.001 (0.005)
kaopen	-0.024** (0.011)	-0.024	-0.025* (0.013)	-0.030* (0.018)	-0.032** (0.013)	-0.030* (0.017)	-0.025** (0.010)	-0.037*** (0.012)
Constant								0.925*** (0.127)
Country FE	YES	YES	YES	YES	YES	YES	YES	NO
Time FE	YES	YES	YES	YES	YES	YES	YES	NO
3-year avg	YES	YES	YES	YES	YES	YES	YES	YES
# of lags	1	2	1	1	1	1	1	1
# of countries	94	94	93	70	95	59	92	NA
Observations	380	380	378	190	317	230	372	380
R <sup>2</sup>	0.918	0.918	0.914	0.943	0.926	0.945	0.920	0.486
Adjusted R <sup>2</sup>	0.884	0.884	0.879	0.897	0.886	0.919	0.887	0.471

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Robust standard errors are used

Table 15: Robustness Check Using Alternative Measures of RER Undervaluation and 3-year Averages

	<i>Dependent variable:</i>				
	lnunderval	lnunderval2	lnunderval3	lnunderval4	CEPII
services_GDP	−0.010*** (0.003)	−0.008** (0.004)	−0.009** (0.004)	−0.007* (0.004)	0.001 (0.003)
import_intensity	−0.001*** (0.0004)	−0.001*** (0.0004)	−0.001*** (0.0004)	−0.001*** (0.0004)	−0.001 (0.001)
foreign_liabilities	0.014* (0.008)				
bank_assets	−0.0004 (0.0003)	−0.0002 (0.0003)	−0.0002 (0.0003)	−0.00001 (0.0004)	−0.001*** (0.0003)
labsh	−0.147 (0.203)	0.088 (0.217)	0.103 (0.219)	0.162 (0.220)	−0.219 (0.225)
CBI	−0.214*** (0.063)	−0.158** (0.065)	−0.179*** (0.067)	−0.185** (0.075)	−0.114** (0.057)
democracy	−0.013*** (0.004)	−0.010** (0.005)	−0.010** (0.005)	−0.013** (0.005)	−0.0005 (0.003)
excregime	−0.039* (0.022)	−0.037* (0.021)	−0.039* (0.022)	−0.042* (0.025)	−0.005 (0.016)
govcons_GDP	0.008 (0.005)	0.011* (0.007)	0.011* (0.007)		0.009* (0.005)
govinv_GDP	−0.005 (0.010)	−0.024*** (0.007)	−0.024*** (0.007)	−0.031*** (0.008)	0.016*** (0.006)
kaopen	−0.024** (0.011)	−0.028** (0.014)	−0.029** (0.015)	−0.043*** (0.015)	−0.039*** (0.010)
Country FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES
3-year avg	YES	YES	YES	YES	YES
Regressors lagged	YES	YES	YES	YES	YES
# of countries	94	87	87	89	81
Observations	380	332	329	328	341
R <sup>2</sup>	0.918	0.902	0.900	0.887	0.691
Adjusted R <sup>2</sup>	0.884	0.859	0.854	0.835	0.569

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
robust standard errors are used

## Appendix D: Probit Estimations

Table 16: Probit Estimations

<i>Dependent variable: undervalued</i>						
	(1)	(2)	(3)	(4)	(5)	(6)
services_GDP	-0.046*** (0.011)	-0.075*** (0.015)	-0.136*** (0.022)	-0.046*** (0.011)	-0.075*** (0.015)	-0.136*** (0.022)
imp_intensity	-0.004*** (0.001)	-0.011*** (0.002)	-0.010*** (0.003)	-0.004*** (0.001)	-0.011*** (0.002)	-0.010*** (0.003)
foreign_liabilities	0.413** (0.187)	0.076 (0.258)	-0.223 (0.318)	0.413** (0.187)	0.076 (0.258)	-0.223 (0.318)
bank_assets	-0.017*** (0.004)	-0.013** (0.006)	-0.018** (0.008)	-0.017*** (0.004)	-0.013** (0.006)	-0.018** (0.008)
labsh	-1.916** (0.914)	-2.441* (1.394)	-3.995** (1.821)	-1.916** (0.914)	-2.441* (1.394)	-3.995** (1.821)
CBI		-1.505** (0.586)	-3.123*** (0.805)		-1.505** (0.586)	-3.123*** (0.805)
democracy		-0.099*** (0.029)	-0.115*** (0.036)		-0.099*** (0.029)	-0.115*** (0.036)
excregime			-0.776*** (0.273)			-0.776*** (0.273)
govcons_GDP			0.006 (0.034)			0.006 (0.034)
govinv_GDP			0.025 (0.046)			0.025 (0.046)
kaopen			-0.090 (0.098)			-0.090 (0.098)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
3-year avg	NO	NO	NO	NO	NO	NO
Regressors lagged	NO	NO	NO	YES	YES	YES
Pseudo R-squared	0.618	0.65	0.687	0.618	0.65	0.687
Observations	2,688	1,806	1,557	2,688	1,806	1,557

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01