Journal of Comparative Economics 51 (2023) 918–940

Contents lists available at ScienceDirect

Journal of Comparative Economics

journal homepage: www.elsevier.com/locate/jce

Political economy of real exchange rate levels ☆

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ARTICLE INFO

JEL classification:
E58
O11
O24

Keywords:
Exchange rate policy
Real exchange rate misalignment
Interest groups
Import dependence
Central bank independence

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 economic, institutional, and policy factors that help explain the within-country variation in RER undervaluation in a baseline panel of 68 developing and 39 developed countries between 1989–2013 using OLS and GMM estimators. Our results indicate that increases in the share of non-tradable sector output, imported input intensity of exports, and capital account openness is systematically associated with less undervalued RERs. We also provide evidence that independent central banks and democratic institutions are linked to RER overvaluation. Our key findings are robust to using alternative specifications, measures, estimation techniques, samples, and additional control variables. A preliminary comparison of Latin America and East Asia suggests interesting support for our key findings.

1. Introduction

A large body of theoretical and empirical research suggests that real exchange rate (RER) undervaluation is conducive to growth and economic development (Rodrik, 2008; Razmi et al., 2012; Guzman et al., 2018) while overvaluation has the opposite effect.[1] Despite their potential benefits, many developing countries either avoid implementing policies that facilitate RER undervaluation or intentionally opt for overvaluation (Steinberg, 2015). Why do many countries adopt RER policies that may impede their long-run development? In this paper, we address this question by examining the economic/structural, institutional, 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. Undervalued RER policies can diminish an economy's dependence on foreign capital inflows by stimulating exports

☆ We thank Peter Skott, Gerald Epstein, Adam Aboobaker, Karsten Kohler, David Steinberg, Jeffry Frieden, participants of the Analytical Political Economy Workshop at UMass Amherst, the editor and two anonymous referees for their helpful comments on earlier versions of this paper. We thank Aaron Medlin for data suggestions. Any remaining errors are ours. This research was supported by the Chair's Joint Summer Research Fellowship from the Department of Economics at the University of Massachusetts Amherst.

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[1] 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 defines 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 goods is identical across countries when measured in the same currency. 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 of the RER from its equilibrium level (as defined in Section 3).

https://doi.org/10.1016/j.jce.2023.03.004
Received 5 September 2022; Received in revised form 18 February 2023; Accepted 28 March 2023
Available online 13 April 2023

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 an 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 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 and 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 and 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 (Rapetti, 2020; Razmi, 2021). While pursuing RER undervaluation alone may not guarantee successful development, a substantial body of evidence indicates that avoiding RER overvaluation is necessary, and an undervalued RER may 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 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 policy coordination, and short-term 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.

There are two strands of literature that speak to 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 (Krugman and Taylor, 1978; Diaz-Alejandro, 1963). Although its primary concern is to analyze the potential adverse impacts 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 (IPE) 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 (Steinberg and Shih, 2012; Quinn and Weymouth, 2017), and labor and financial market institutions (Steinberg, 2015) in shaping exchange rate preferences and policies.

While the IPE literature has made significant advancements in the analysis of exchange rate policies, there remains room for further development in this literature. We seek 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 affect the preferences over and the level of the real exchange rate. In addition, we investigate how these preferences interact with political and economic institutions such as democracy and central bank independence. Finally, we recognize and explore the role of economic factors such as dependence on imported inputs, balance sheet considerations, technological sophistication, and (revealed) comparative advantage that guide and possibly constrain how inter-sectoral and intra-class preferences are 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 and predicts support for (opposition to) undervaluation by tradable (non-tradable) industries, provides a useful but somewhat simplistic account of RER preferences. To better account for complexities in the attitudes of sectoral interest groups towards the exchange rate level, we investigate how the import intensity of exports and exposure to foreign debt shape exchange rate preferences and policies. After examining the economic/structural influences on RER levels, we turn our attention to institutional factors. We investigate whether the proliferation of independent central banks and the presence of democratic institutions affect RER undervaluation.

It is worth emphasizing from the outset that our key aim in this paper is to identify regularities in RER undervaluation patterns using time variation within countries. Although we provide plausible interpretations for our coefficients in light of theory, we are aware that they do not necessarily capture causal relationships due to potential reverse causality and simultaneity concerns. However, we employ different tools to mitigate these concerns, such as using the Generalized Method of Moments (GMM) approach and lagging our regressors. In addition, we use three-year averaged (and lagged) values of our regressors in robustness checks to further weaken the influence of reverse causation or simultaneity, given that it is unlikely for the level of RER undervaluation today to have a significant impact on the values of our regressors from 3 years ago.

Our results indicate that a higher share of non-tradable sector output is linked with less undervalued RERs. This finding is consistent with the view that undervalued RER policies are unpopular among non-tradable industries. Our results further indicate that independent central banks and democratic institutions are linked with more overvalued RERs. We also find evidence that the dependence of domestic producers on imported inputs, capital account openness, and reliance on quality-based rather than price-based competition is associated with less undervalued RERs. However, contrary to our expectations, we do not find a negative link between foreign liabilities and RER undervaluation. In contrast, our findings suggest that foreign debt burden might, on average, encourage governments to pursue RER undervaluation as a way to boost their international competitiveness and generate foreign exchange revenues. The key results are economically and statistically significant, and are robust to alternative proxies, regression specifications, and additional control variables.

The rest of the paper is organized as follows. Section 2 provides a conceptual discussion of the political and economic factors that influence 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. Section 6 explores, in light of our empirical results, the sources of differences in undervaluation trends between Latin America and East Asia. Section 7 concludes.

2. Conceptual background

2.1. Policy tools

Before analyzing the correlates of RER undervaluation, it could be helpful to discuss whether RER is a policy variable and what tools governments can use to influence it in the desired direction.[2] 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 the short- to medium-run (Demir and Razmi, 2022). Therefore, policymakers can often 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.[3] Even under flexible exchange rate systems, many central banks, especially developing country ones, use these tools due to the "fear of floating" (Calvo and Reinhart, 2002). Capital controls and forcing banks to purchase sterilization bonds at interest rates lower than the market interest rate – an instrument China extensively used in recent decades – are other tools countries can utilize to affect the RER (Steinberg, 2015; Montecino, 2018). 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 attempt to factor in the extent to which these policy choices affect RER undervaluation.

2.2. Economic/structural explanations

As with most economic policy choices, competitive RER policies create winners and losers (Razmi, 2018). Undervalued exchange rate policies pit the working class against the owners of capital by altering the functional income distribution in favor of the latter. In the presence of nominal wage rigidities, exchange rate depreciations redistribute income away from workers (Diaz-Alejandro, 1963; Krugman and Taylor, 1978). Furthermore, given that tradables make up a substantial proportion of workers' consumption baskets, devaluations lower real consumption wages on impact (Demir and Razmi, 2022). As a result, workers typically express discontent with RER devaluations.[4] 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 inter-sectoral conflict by setting tradable industries, such as manufacturing, against 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

[2] See Frenkel (2008) and Demir and Razmi (2022) for a more in-depth treatment of this question.

[3] 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.

[4] Although undervalued RER policies can be 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 presented by Aklin et al. (2021) and based on Argentina, Serbia, and the UK supports this view. This study shows that "for mass publics – whose daily lives center more on economic consumption that on production – concerns over high inflation often resonate more deeply than their sector of employment, and that those preferences translate into attitudes about currency politics" (p. 2).

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 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 finance industry 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 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 institutions, particularly lending institutions, can still be wary of exchange rate depreciations 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 undervaluation policies. 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). Even in South Korea, a country that pursued undervaluation during the 1960s and 1970s with positive results, the textile industry initially favored overvalued exchange rates because they believed that competitive disadvantages of overvaluation would be dwarfed by the advantage of reduced input costs (Amsden, 1992, 67). 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.

There are two main reasons 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 sectors, particularly in manufacturing, relies on imported intermediate inputs, such as energy and raw materials, and capital goods, such as machinery and equipment (Campa and 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 firms' profits. Therefore, the extent to which domestic producers rely on imported inputs shapes their exchange rate preferences. The firm-level empirical evidence presented by Egan (2017) supports the view that firms with a high dependence on imported inputs are dissatisfied with real depreciation. Consistent with these findings, Weldzius (2021) argues that an increase in tradable inputs stemming from the globalization of production networks lowered the support for undervaluation even in countries that engaged in "currency manipulation" in recent years. 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 compete 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). 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 the added imported input and foreign borrowing costs that arise from depreciations impair 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, as reflected (imperfectly) in RER levels, 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 external indebtedness 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.[5] Our study addresses these gaps by including a measure of import intensity of production in our baseline regression and an index measuring the complexity of production in our extended specifications.

[5] 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 factors affecting RER misalignment control for imported input dependency of production.

On the question of how economic structure affects the RER level, 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 natural resources or a rise in commodity prices increases the amount of foreign currency inflows into the economy and raises spending on goods, including nontradables. Both factors create a tendency toward 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 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 in 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 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 routes 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 control mechanisms, such as state officials' ability 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 currency bonds simultaneously. The resulting increase in the supply of government bonds causes interest rates to rise, increasing 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 RER policies do not put upward pressure on domestic interest rates in state-controlled financial systems, at least in the short term. Similarly, Steinberg argues that state-controlled labor markets characterized by weak collective labor laws and legal restrictions on the actions of labor unions can increase manufacturing firms' support for an undervalued RER as the restrictions on labor can limit operating costs and hence compensate firms, to some extent, for the costs of RER undervaluation.

While the effects of labor market institutions and state-owned banks on RER misalignment are 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, legal reforms that assigned independence to central banks typically 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 (2008) 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 exercised a critical degree of control through the use of development banks that subsidize lending to industries 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 larger 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 an important 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 does not investigate whether RER undervaluation decreases with central bank independence (see Table 1).

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

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, Multinominal 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.
Weldzius (2021)	63 countries, 2000–2018, Panel FE	Export dependence, outward direct investment, domestic savings, financial openness, democracy	Reduced benefits and increased costs of currency manipulation reduced state-level support for undervaluation.

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 pursuit of competitive RER policies as they can be economically costly in the short run, even if beneficial 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 (Steinberg and Malhotra, 2014; Eichengreen, 2007).

To summarize, governments have an array of tools at their disposal that can be used to target an RER level. Even when not directed toward attaining a specific RER level, policy choices on fiscal spending, interest rates, exchange rate regime, and capital account restrictions can influence the RER level. The policy decisions to undervalue or overvalue the RER using these tools depend on various distributional, structural, and institutional considerations. A major reason why politicians might be inclined to forego RER undervaluation despite their potential contribution to long-run development is that undervalued RER policies could exert harmful effects on politicians' key electoral constituencies and powerful interest groups, especially over the short run. 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, the 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, and policy factors.

3. Data

We use yearly unbalanced panel data for 68 developing and 39 developed countries for the period 1989–2013. Table A.1 lists the countries included in our sample. The data are extracted from several sources, namely Penn World Tables (PWT),[6] World Bank's World Development Indicators (WDI),[7] World Bank's World Integrated Trade Solution (WITS), Ilzetzki et al. (2019), Chinn and Ito (2008), Garriga (2016) and 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.[8]

[6] The data is accessed through the pwt10 package in R developed by Zeileis (2021).

[7] 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.

[8] To ensure that the results are not driven by outliers, we winsorized some of our variables. We winsorized $govcons\_GDP$, $tradeopenness$, $import\_intensity$, $resource\_rent$, $primary\_balance$, and $overall\_balance$ at the 99th and 1st percentiles.

Table 2
Variable descriptions.

Variable name	Definition	Source
lnunderval	undervaluation index — the Balassa-Samuelson (BS)	PWT10 Feenstra and 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 $govcons\_GDP$ 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 et al. (2000)
CBI	Central Bank Independence Index	Garriga (2016)
CBI_CWN	Central Bank Independence Index based on objectives	Cukierman et al. (1992)
currency_crisis	Currency crisis dummy	Laeven and Valencia (2020)
democracy	Polity2 index of democracy	PolityIV
democracy_CGV	A binary index of democracy	Cheibub et al. (2010)
ECI	Economic complexity index (normalized)	Observatory of Economic Complexity (OEC)
excregime	Exchange rate regime	Ilzetzki et al. (2019)
excregime_LYS	Exchange rate regime (alternative measure)	Levy-Yeyati and Sturzenegger (2016)
export_GDP	Exports of goods and services (% of GDP)	WDI
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 labor compensation in GDP at current national prices	PWT10
import_intensity	Imported intermediate and capital goods to total exports	WITS & our calculations
import_GDP	Imports of goods and services (% of GDP)	WDI
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)
primary_balance	primary net lending/borrowing (% of GDP)	IMF Fiscal Monitor
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
tradeopenness	export_GDP + import_GDP	WDI
overall_balance	net lending/borrowing (% of GDP)	IMF Fiscal Monitor
worker_rights	Worker rights index	Cingranelli and Richards (2010)

To speak of RER under or overvaluation, one needs to define an "equilibrium" value of the RER. In this paper, we construct a measure of RER undervaluation ($lnunderval$) following the three-step methodology proposed by Rodrik (2008). First, using PWT10, we construct an index of RER[9]:

$$lnRER = ln\left(\frac{1}{pl\_con}\right) \tag{1}$$

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

$$lnRER_{it} = \beta_0 + \beta_1 lnGDPPC_{it} + f_t + u_{it} \tag{2}$$

The fitted values from this regression give the equilibrium RER.[10] In the last step, we calculate RER undervaluation by subtracting the equilibrium RER from the observed RER:

$$lnunderval_{it} = lnRER_{it} - \widehat{lnRER}_{it} \tag{3}$$

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 (Table B.3). 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)

[9] The series we use to calculate the RER misalignment index appear in PWT10 under the following names: *pl_con* (price level of CCON (PPP/XR, price level of USA GDPo in 2011 = 1), *rgdpo* (output-side real GDP at chained PPPs (in million 2011 USD), *pop* (population, in millions).

[10] 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).

Table 3
Summary statistics.

Variable	N	Mean	St. dev.	Min	Max	Time range	Exp. sign
lnunderval	9663	0.004	0.44	−4.44	2.43	1950–2019	
lnunderval2	3245	−0.0001	0.36	−4.78	1.55	1970–2019	
lnunderval3	2894	−0.0003	0.36	−4.70	1.55	1980–2019	
lnunderval4	2613	−0.001	0.33	−1.25	1.45	1980–2019	
CEPII	5172	−0.002	0.20	−1.33	0.87	1974–2020	
CBI	5636	0.47	0.19	0.02	0.98	1970–2012	−
CBI_CWN	5615	0.49	0.26	0.00	1.00	1970–2012	−
currency_crisis_1	7761	0.03	0.17	0	1	1971–2021	+
democracy	8550	0.97	7.48	−10	10	1950–2015	−
democracy_CGV	8223	0.46	0.50	0	1	1950–2008	−
ECI	5687	5.67	1.64	1.00	10.00	1995–2017	−
excregime	10,641	0.39	0.53	0	2	1950–2016	+/−
excregime_LYS	5207	0.79	0.87	0	2	1974–2013	+/−
Foreign_liab	7973	1.95	15.08	0.00	505.31	1970–2020	−
govcons_GDP	6936	16.02	7.68	0.00	136.35	1960–2019	−
govinv_GDP	8068	5.30	4.12	0.001	40.33	1960–2017	−
labsh	7688	0.53	0.12	0.09	0.90	1950–2019	−
import_intensity	4899	139.85	143.08	3.10	1569.23	1988–2019	−
kaopen	6986	−0.02	1.52	−1.92	2.33	1970–2018	−
manu_GDP	6684	13.39	7.26	0.00	49.88	1960–2019	+
net_sensitivity	1459	−0.15	0.67	−3.85	4.24	1990–2004	−
RCA_consgoods	3651	0.98	0.63	0.00	3.09	1988–2017	+
RCA_Kgoods	3607	0.44	0.51	0.00	2.69	1988–2017	−
RCA_intgoods	3652	1.12	0.77	0.00	4.65	1988–2017	+/−
primary_balance	3917	−0.42	4.04	−19.04	17.91	1991–2020	−
resource_rent	7592	6.99	10.81	0.00	77.76	1970–2019	−
services_GDP	6841	49.87	12.43	4.79	98.62	1960–2019	+
TI	2156	5.83	3.16	1.00	14.50	1988–2019	−
tradeopenness	7224	70.91	36.65	0.03	358.66	1960–2019	+/−
overall_balance	4788	−2.20	4.59	−21.03	20.14	1990–2020	−
worker_rights	3735	0.99	0.78	0	2	1981–2006	−

Note: Summary statistics are based on annual data.

($lnunderval3$), 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).[11] 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: tradable sector productivity, TOT shocks, and net indebtedness. Finally, they define the RER misalignment as the difference between actual and equilibrium REER.[12]

4. Empirical strategy

Our baseline specification, given by Eq. (4), regresses log RER undervaluation ($lnunderval$) on a vector of economic/structural variables (X), institutional 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. All our standard errors are corrected for heteroskedasticity and autocorrelation (HAC).

$$lnunderval_{it} = \alpha_1 X_{it} + \alpha_2 Y_{it} + \alpha_3 Z_{it} + \theta_i + f_t + u_{it} \tag{4}$$

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

To account for *economic/structural variables*, we include the services sector share of output ($services\_GDP$) as a proxy for the nontradable sector output share, import intensity of exports ($import\_intensity$), the share of non-FDI foreign liabilities in GDP ($foreign\_liab$), the share of domestic 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.[13] We incorporate the

[11] The misalignment measure of the CEPII reports overvaluation with a positive sign. 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 chose the option with the largest set of partners (186) and 5-year time-varying weights.

[12] Fig. A.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.

[13] 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).

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 is typically done in the literature, allows us to work with a larger number of observations. However, it is worth noting that this variable does not capture the currency composition of external debt. It is well documented that many developing countries have historically issued large amounts of foreign currency-denominated debt and experienced adverse balance sheet effects following depreciations (Eichengreen and Hausmann, 2010). Therefore, it would be ideal to use a measure of indebtedness that can capture the sensitivity of external liabilities to currency movements. Lane and Shambaugh (2010) introduce such a measure; however, due to the limited time and country coverage of this measure, we use this data, named $net\_sensitivity$, only as a robustness check in Table B.1. We include bank assets to GDP ($bank\_assets$) to capture the influence of the financial sector in shaping RER policies, and we expect this variable 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 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,[14] namely: (1) independence of the chief executive, (2) objective independence, (3) policy independence, and (4) limits on the government's 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 IPE literature (e.g., Rodriguez, 2016; Steinberg and Malhotra, 2014; Frieden et al., 2001). The values for *democracy* 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 B.1.

To account for *policy* variables, we control for exchange rate regime, shares of government expenditures in GDP, and an index of capital account openness. Our measure of exchange rate regime ($regime$), taken from Ilzetzki et al. (2019), 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.[15] 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 a priori 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 differentiate between government consumption ($govcons\_GDP$) and government investment ($govinv\_GDP$). We use the de jure capital account openness index ($kaopen$) constructed by Chinn and Ito (2008), which captures restrictions on capital account transactions. Higher values of this index correspond to a higher level of capital account openness. We expect the 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.

The subsets of regressors we employ contain variables that could plausibly be seen as exogenous (e.g., the extent of democracy) or predetermined/partially endogenous (e.g., the share of non-tradables in output, the labor share of income, and central bank independence). Consequently, we acknowledge the possibility of reverse causation. For instance, as much as a higher share of tradable sector output may shape RER preferences in favor of a competitive domestic currency, hence leading the RER to be undervalued, an undervalued RER could also positively affect the output share of the tradable sector by making it more competitive, both domestically and internationally. Estimating an instrumental variables (IV) regression with external instruments satisfying the exclusion and relevance criteria would have been an ideal way of addressing the endogeneity concerns. However, in a cross-country sample with macro-level variables, it is challenging to find variables that influence our key independent variables of interest, such as import intensity or central banking independence, without having an independent effect on the level of the RER. This challenge is particularly acute in the case of panel data. Therefore, as second-best solutions, we adopt several alternative approaches. In the OLS estimations, we attempt to mitigate simultaneity and reverse causality bias by lagging all explanatory variables by one period.[16] 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

[14] 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 the 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 the primary market to government.

[15] Table A.2 explains how exchange rate regime categories we use in this paper correspond to the coding presented by Ilzetzki et al. (2019).

[16] 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 affect real wages directly on impact. Therefore, for $labsh$, we use 3-period lags.

concerns. Therefore, as a second approach, we estimate a dynamic version of Eq. (4) (shown in Eq. (5)) using the Generalized Method of Moments (GMM) approach, which uses the lagged values of the explanatory variables as *internal* instruments. These lagged values can serve as instruments insofar as they are correlated with the contemporaneous values of regressors whilst being uncorrelated with the contemporaneous values of the error term, given that the instruments are generated at an earlier point in time. Furthermore, GMM addresses the dynamic panel bias introduced by the use of lagged dependent variables (Nickell, 1981). This is of particular concern if the time dimension is short relative to the cross-sectional dimension, as is the case in our sample.

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

where the coefficient ρ captures the degree of persistence in the RER undervaluation.

We employ the two-step difference GMM approach with the forward orthogonal deviations transformation and robust standard errors. The variable *lnunderval* is treated as endogenous, *services_GDP*, *import_intensity_2*, *Foreign_liab*, *labsh*, *kaopen*, as predetermined, and *regime*, *CBI2*, *polity2*, *gov_GDP*, *govinv_GDP*, *bank_assets* as strictly exogenous.[17]

Finally, as a third approach, we estimate the baseline regression shown in Eq. (4) using 3-year averages of our data series.[18] 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 the values of the regressors from 3 years ago. Due to sample size-related concerns, we generally provide the results for annual data in the main text while presenting the results for 3-year averaged data mostly in the online appendix.[19]

5. Results

Our baseline results are reported in Table 4. 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.[20] The main findings from this table can be summarized as follows:

(i) RER undervaluation correlates negatively with the services share of GDP. These results are significant at the standard levels 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. These results are economically significant. Taking the baseline case (column 3), a one standard deviation (about 12.43 percentage points according to Table 3) increase in the share of the services sector increases the extent of overvaluation by $(-0.012 \times 12.43 =)$ 0.15 percent, i.e., approximately 0.34 standard deviations. 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 the 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%. For comparison purposes, and again taking the baseline case (column 3), one standard deviation (about 143.1 percentage points) increase in this variable increases the extent of overvaluation by 0.14 percent, i.e., approximately 0.33 standard deviations. This result is consistent with our hypothesis that a heavy reliance on imported intermediate and capital goods could generate dissatisfaction with depreciation and might impede the pursuit of competitive RER policies.

(iii) We observe a positive and generally statistically significant relationship between foreign liabilities and RER undervaluation. This result runs counter to our expectations in light of the balance sheet hypothesis, which postulates that foreign currency exposure should weaken the support for undervaluation, but is consistent with the findings of Steinberg (2016), who establishes

[17] Given our sample size, instrument proliferation is a concern. We, therefore, use the first two lags of the independent variable and only the first lag of the regressors as instruments in levels and differences. Incorporating second lags of the predetermined variables does not affect the results qualitatively except for making the capital account openness variable statistically insignificant (without changing the sign) in the case of annual estimates and making the bank assets to GDP variable significant (without changing the sign) in the case of 3-year averaged data. The number of instruments, however, almost doubles. We apply the small sample correction to the covariance matrix.

[18] For the exchange rate regime variable, we calculate the mode over 3-year periods rather than the average. This allows for an easier interpretation of the coefficient as a unit increase in *regime* would indicate a change from fixed to intermediate or from intermediate to the flexible regime. Our results do not change when we use averages.

[19] 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 compared to 3-year averages. However, some of our estimates lost statistical significance, likely due to the dramatically reduced sample size. Results using 5-year averages are available upon request.

[20] 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 1–2 lags of the dependent variable in order to avoid instrument proliferation, which is a common issue with GMM estimates.

Table 4
Baseline results.

	Dependent variable: lnunderval					
	OLS annual (1)	OLS 3-year avg (2)	OLS annual (3)	OLS 3-year avg (4)	GMM annual (5)	GMM 3-year avg (6)
lnunderval.L					0.8109***	0.4523***
					(0.0145)	(0.0562)
services_GDP	−0.015***	−0.021***	−0.012***	−0.009***	−0.005***	−0.016***
	(0.002)	(0.003)	(0.001)	(0.003)	(0.001)	(0.004)
import_intensity	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.002***
	(0.0004)	(0.0004)	(0.0002)	(0.0004)	(0.0001)	(0.0004)
foreign_liabilities	0.013***	0.027**	0.013***	0.014	0.006***	0.039***
	(0.009)	(0.011)	(0.005)	(0.011)	(0.001)	(0.013)
bank_assets	−0.001***	−0.001	−0.001***	−0.0004	0.0002***	−0.0002
	(0.0003)	(0.0004)	(0.0002)	(0.0004)	(0.0001)	(0.0003)
labsh	−0.574***	−0.530**	−0.394***	−0.122	−0.285***	−0.460
	(0.238)	(0.235)	(0.115)	(0.249)	(0.099)	(0.363)
CBI	−0.279***	−0.419***	−0.276***	−0.208**	−0.071***	−0.282***
	(0.068)	(0.084)	(0.040)	(0.089)	(0.015)	(0.053)
democracy	−0.005*	−0.009**	−0.008***	−0.013***	−0.002**	−0.007*
	(0.004)	(0.004)	(0.002)	(0.004)	(0.001)	(0.004)
excregime	−0.016	−0.018	−0.024*	−0.038	−0.017***	−0.043**
	(0.020)	(0.023)	(0.013)	(0.025)	(0.005)	(0.019)
govcons_GDP	0.004	−0.001	0.005**	0.008	0.002*	0.004
	(0.005)	(0.005)	(0.002)	(0.006)	(0.001)	(0.006)
govinv_GDP	−0.0004	−0.018**	0.002	−0.005	−0.004***	−0.024**
	(0.009)	(0.008)	(0.003)	(0.008)	(0.001)	(0.009)
kaopen	−0.024***	−0.049***	−0.024***	−0.024*	−0.011***	−0.030*
	(0.010)	(0.011)	(0.006)	(0.012)	(0.003)	(0.016)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Regressors lagged	NO	NO	YES	YES	NO	NO
# of countries	107	94	107	94	102	102
R2	0.871	0.933	0.874	0.916		
Adjusted R2	0.858	0.905	0.861	0.882		
AR1	–	–	–	–	0	0.009
AR2	–	–	–	–	0	0.645
Hansen	–	–	–	–	0.970	0.143
# of instruments	–	–	–	–	125	237
Observations	1558	381	1558	381	1451	287

Note: HAC robust standard errors are used.
lnunderval, RER undervaluation index; lnunderval.L, one-period lagged RER undervaluation index; services_GDP, services value-added as a % of GDP; import_intensity, the ratio of imports of intermediate and capital goods to total exports; foreign_liabilities, non-FDI foreign liabilities to GDP; bank_assets, total assets held by deposit money banks as a share of GDP; labsh, the share of labor compensation in GDP; CBI, central bank independence index; democracy, polityIV index of democracy; excregime, exchange rate regime index; govcons_GDP, government consumption expenditures to GDP; govinv_GDP, government investment expenditures to GDP; kaopen, index of capital account openness.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

a positive relationship between external debt to GNI series from WDI and undervaluation. There are three possible explanations for this result. First of all, the lack of support for the balance sheet hypothesis might be stemming from the fact that the $Foreign\_liab$ series does not account for the currency composition of external debt. However, as we will discuss in relation to Table B.1, we continue to obtain a positive sign when we use an alternative measure of foreign liabilities that accounts for the currency composition of debt. Therefore, our results collectively indicate a lack of support for the balance sheet hypothesis. Second, it is possible that more indebted countries undervalue their RER to generate foreign exchange revenues to make debt repayments. This dynamic was on display in several Latin American countries following the debt crisis of the early 1980s (Ffrench-Davis et al., 1995). Finally, 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 the incentive to undervalue despite 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, i.e., the bank assets to GDP ratio, and RER undervaluation, although the relationship is often not statistically significant. The relationship between labor compensation in GDP and RER undervaluation is similarly negative. These findings are consistent with the view that undervalued RER policies are unpopular among workers and the financial sector.

(v) Among institutional variables, CBI has a negative coefficient with high statistical significance. A one standard deviation (about 0.19 index points) increase in the this variable increases the extent of overvaluation by 0.05 percent, i.e., approximately 0.12

Table 5
Regression results by country groups.

	Dependent variable: lnunderval						
	Developing (1)	Advanced (2)	Resource-rich (3)	Resource-poor (4)	RCA K_goods (5)	RCA C_goods (6)	RCA int_goods (7)
services_GDP	−0.011***	−0.015***	−0.007***	−0.015***	−0.002	−0.007**	−0.012***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
import_intensity	−0.001***	−0.001**	−0.001**	−0.001***	0.0004	−0.0005*	−0.001***
	(0.0002)	(0.0004)	(0.0003)	(0.0002)	(0.001)	(0.0003)	(0.0002)
foreign_liabilities	0.003	0.008*	0.140***	−0.075**	0.043***	0.006	0.011**
	(0.005)	(0.005)	(0.031)	(0.037)	(0.014)	(0.004)	(0.004)
bank_assets	−0.001*	−0.001***	−0.002	−0.001	−0.001	0.00005	0.0002
	(0.001)	(0.0002)	(0.001)	(0.001)	(0.0003)	(0.0002)	(0.0003)
labsh	−0.320	−0.597**	−0.104	−1.067***	−1.009***	−0.805***	−0.628***
	(0.216)	(0.234)	(0.275)	(0.189)	(0.330)	(0.186)	(0.173)
CBI	−0.282***	−0.209***	−0.234**	−0.297***	−0.320***	−0.168***	−0.186***
	(0.059)	(0.049)	(0.104)	(0.070)	(0.113)	(0.051)	(0.040)
democracy	−0.009***	0.010**	−0.014***	−0.004	−0.006	−0.008**	−0.010***
	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)	(0.003)	(0.003)
excregime	−0.012	−0.018	0.061*	−0.051**	−0.046***	−0.032**	−0.032**
	(0.019)	(0.012)	(0.033)	(0.021)	(0.018)	(0.014)	(0.013)
govcons_GDP	0.007**	0.010**	0.004	−0.006*	0.020***	0.005	0.010***
	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)
govinv_GDP	−0.002	0.014**	0.020***	0.002	−0.005	−0.001	−0.021***
	(0.004)	(0.007)	(0.006)	(0.006)	(0.008)	(0.006)	(0.005)
kaopen	−0.007	−0.063***	−0.029***	−0.023***	−0.043***	−0.036***	−0.025***
	(0.007)	(0.010)	(0.009)	(0.008)	(0.013)	(0.008)	(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	23	70	88
Observations	918	640	550	485	285	778	904
R^2	0.750	0.904	0.704	0.772	0.948	0.922	0.914
Adjusted R^2	0.719	0.892	0.657	0.736	0.935	0.910	0.900

Note: HAC robust standard errors are used.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

standard deviations. This result suggests that governments may be less able or willing to pursue undervaluation when they lack control over central banking operations. Alternatively, independent central banks with a mandate to target inflation may often deliberately pursue overvaluation. This result is statistically significant across different specifications at standard significance levels. In line with the findings presented by Steinberg and Malhotra (2014) and Eichengreen (2007), we also establish a negative relationship between democracy and undervaluation. However, as will be discussed in relation to Table 5, this negative relationship is driven mainly by the developing countries in our sample.

(vi) Regarding policy variables, our results indicate a negative relationship between exchange rate flexibility and RER undervaluation, although this relationship is statistically insignificant in half of the specifications. 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 (2007). In accordance with our predictions, we also observe a negative and significant relationship between RER undervaluation and capital account openness. This result holds across all robustness tests presented in Tables B.1–B.3.

(vii) The results of our analysis regarding the relationship between government expenditures and RER undervaluation are inconclusive. The effect of government spending on RER is likely to depend on the composition of spending. If new government spending is skewed towards non-tradable goods (such as buildings and structures), it will likely 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). In line with these expectations, we find (in most cases) positive coefficients on government consumption expenditures and negative coefficients on government investment expenditures to GDP. These results also fit 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. However, the lack of statistical significance in most cases limits our ability to draw strong conclusions.

(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 potentially 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 Model 3 in Table 4, which uses annual data and lagged regressors, as our benchmark model. In Table 5, we run our baseline regression on 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 definitions from 2021. 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 percent of its total merchandise exports (UNCTAD, 2019). Third, we classify countries based on whether they have revealed comparative advantage (RCA) in producing capital goods, consumption goods, or intermediate goods in a given year. The RCA index is derived by dividing the share of a country's exports of a specific good (or good category) in its total exports by the global share of total exports of that good (or category) in exports of all goods. For instance, in the case of capital goods, a country is said to have an 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. Formally:

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

where P is the set of all products (with Kgoods ϵ P), $X_{i,Kgoods}$ is country i's exports of capital goods, $X_{W,Kgoods}$ is world exports of capital goods, $\sum_{j\epsilon P} X_{i,j}$ is country i's total exports of all products j in P, and $\sum_{j\epsilon P} X_{W,j}$ is total world exports (of all products j in P). In Table 5, the column named "RCA_Kgoods" presents results based on all the observations of our dataset for which $RCA\_Kgoods \geq 1$. Likewise, columns "RCA_consgoods" and "RCA_intgoods" include all observations for which $RCA\_consgoods \geq 1$ and $RCA\_intgoods \geq 1$, respectively.

Our main results for the size of the non-tradable sector output share, import intensity, and central bank independence hold consistently and with statistical significance across country groups with rare exceptions. In general, we do not detect any significant differences in behavior between developing and advanced economies, with a few exceptions. 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. Upon close examination of democracy trends over time, we observe that out of 43 advanced countries in our sample, 22 have not experienced any changes in their democratic regimes due to already having the highest score throughout the period (e.g., Norway, Switzerland) or the lowest score (e.g., Qatar, Saudi Arabia). In the remaining countries, a few experienced a one-time jump in their democracy score due to the fall of dictatorships (e.g., Portugal, Spain) or the collapse of Soviet control (e.g., Poland). The number of countries exhibiting a higher degree of variation is quite limited (e.g., S. Korea, Bahrain, and Kuwait). We suspect that the lack of time variation in the democracy scores in advanced countries, particularly the large number of countries where the score has been stagnant, may explain the different coefficients obtained on this variable. In other words, the negative relationship between democracy and undervaluation seems to be driven primarily by developing countries.

Our analysis reveals two key differences between resource-rich and resource-poor economies.[21] First, the positive relationship observed between $Foreign\_liab$ and $lnunderval$ in our baseline results is valid only for resource-rich countries, whereas the opposite relationship appears in resource-poor economies, thereby lending support to the balance sheet hypothesis in the latter. Secondly, exchange rate flexibility is associated with a less undervalued RER only in resource-poor countries. One potential explanation for this result is that resource-rich countries might choose to fix their exchange rate at an undervalued level to counteract the structural tendency they face toward experiencing "Dutch disease" problems.

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 goods specializers were 14,713 and 15,557, respectively). One would, therefore, expect countries specialized in capital-intensive goods to behave similarly to advanced economies. Comparing the "advanced" and "RCA_Kgoods" columns, we do not observe any consistent differences (i.e., sign changes with statistically significant individual coefficients). We likewise do not detect marked differences between countries with RCA in producing capital, intermediate, or consumer goods, except that import intensity appears with a negative (and statistically significant) sign for the latter two categories.

To summarize, our main results (services share of GDP, central bank independence, import intensity, and capital account openness) do not appear to be driven by one or another group of countries. On the other hand, our results for foreign liabilities, democracy, and exchange rate regime are driven by resource-rich, developing, and resource-poor countries, respectively.

5.1. Extended specifications and robustness checks

In Table 6, we introduce additional regressors to our baseline results. To facilitate comparison, we reproduce our baseline OLS result in model 1 of Table 6. We start by introducing the economic complexity index, ECI, developed by Hidalgo and Hausmann (2009).[22] ECI measures the diversification and complexity of the export basket of each country. Countries with low economic

[21] The coefficients of government spending variables exhibit differences too, but these are statistically not significant half the time.

[22] We normalize the ECI series such that it takes a value between 1–10.

Table 6
Extended specifications.

	Dependent variable: lnunderval							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
services_GDP	−0.012***	−0.012***	−0.012***	−0.010***	−0.015***	−0.013***	−0.011***	−0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
import_intensity	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
foreign_liabilities	0.013***	0.024***	0.013***	0.014***	0.011***	0.019**	0.009**	0.010
	(0.004)	(0.006)	(0.004)	(0.004)	(0.004)	(0.009)	(0.004)	(0.007)
bank_assets	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0002)
labsh	−0.019	−0.020	0.016	−0.017	−0.043	0.325	0.015	0.018
	(0.183)	(0.207)	(0.192)	(0.187)	(0.192)	(0.288)	(0.183)	(0.195)
CBI	−0.254***	−0.261***	−0.264***	−0.253***	−0.523**	−0.247***	−0.235***	−0.280***
	(0.039)	(0.040)	(0.040)	(0.040)	(0.237)	(0.047)	(0.038)	(0.043)
democracy	−0.008***	−0.004	−0.008***	−0.009***	−0.008**	−0.009***	−0.008**	−0.007**
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
excregime	−0.022*	−0.022*	−0.023*	−0.018	−0.021*	−0.031**	−0.015	−0.025*
	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.012)	(0.014)
govcons_GDP	0.003	0.003	0.003	0.003	0.003	0.001	0.002	0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
govinv_GDP	0.002	0.007*	0.003	0.001	0.002	−0.012*	0.002	0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)
kaopen	−0.023***	−0.026***	−0.024***	−0.025***	−0.024***	−0.027***	−0.023***	−0.021***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.008)	(0.005)	(0.006)
ECI		−0.038**						
		(0.016)						
tradeopenness			0.0003					
			(0.0004)					
resource_rents				0.007***				
				(0.002)				
services × CBI					0.005			
					(0.004)			
worker_rights						−0.008		
						(0.010)		
RCA_Kgoods							−0.166***	
							(0.036)	
RCA_consgoods							0.001	
							(0.020)	
RCA_intgoods							−0.007	
							(0.015)	
currency_crisis								−0.046
								(0.085)
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	92	107	107	107	99	107	106
Observations	1858	1704	1803	1805	1858	1266	1496	1717
R^2	0.839	0.847	0.839	0.840	0.840	0.871	0.872	0.828
Adjusted R^2	0.824	0.834	0.824	0.825	0.825	0.855	0.859	0.811

Note: HAC robust standard errors are used.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

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). Therefore, we expect a greater tendency for the RER to be undervalued in countries with low ECI. In line with our expectations, we observe a negative and 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 (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 and statistically significant association between resource rents and RER undervaluation. Note that Mahraddika (2020) likewise finds a positive relationship between these variables. We do not think this result is driven by endogeneity, given that resource rents predominantly depend on the stock of natural resources and exogenous

world prices (Bhattacharyya and Hodler, 2014). Besides, we continue to obtain a positive coefficient when we introduce this variable into our GMM estimations.[23]

In model 5, we interact the services share of GDP with CBI. The motivation for including this variable is rooted in Steinberg's conditional preference theory (Steinberg, 2015), which, as explained in Section 2, predicts 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 establish a positive relationship between this interaction term and RER undervaluation. As discussed previously, we consider central bank independence to be an alternative (imperfect) proxy for the extent of state control over the financial system. Therefore, we wanted to test whether and how the effect of the services sector output share on undervaluation changes with the degree of central bank independence. However, we fail to observe a statistically significant relationship between this interaction term and RER undervaluation.

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 safeguards regarding the employment of children. We expect the support for RER undervaluation to decrease with better worker rights, as workers will have the ability to voice 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 statistically insignificant.

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 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.[24] While we observe a negative sign for 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) an increase of at least 10 percentage points in the rate of depreciation compared to the previous year.[25] We do not observe any changes to our results when controlling for currency crises.

We perform several robustness checks and report the results in Appendix B. Our first set of robustness checks is presented in Table B.1 where Model 1 reproduces our baseline results for comparison. We recognize the possibility of endogeneity and 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 for the regressors.[26] 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. As expected, the relevant sign is positive (and statistically significant). Model 4 uses an alternative measure of foreign exchange liabilities, named $net\_sensitivity$. As explained earlier, 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, $democracy\_CGV$, presented by Cheibub et al. (2010). 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. In model 6, we replace CBI with an alternative central bank independence index named CBI_CWN based on Cukierman et al. (1992). This index is constructed to capture the legal mandates of central banks, with scores varying based on the importance placed on price stability in central banks' charters compared to other objectives that might be in potential conflict with price stability. Central banks whose charters specify price stability as the major and only goal is assigned the highest score of the six possible scores. In model 7, we check the robustness of our results to an alternative exchange rate regime classification by Levy-Yeyati and Sturzenegger (2016).[27] 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. 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 and time-fixed effects explain a large part of the variation in $lnunderval$.

[23] The results from these estimations are available upon request.

[24] Put differently, the typical consumption good is likely to have many more close substitutes available in international markets than is true for capital goods.

[25] 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.

[26] Here, we continue using 3-period lags for labor share of income.

[27] 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.

We continue with further robustness checks in Table B.2. Model 1 serves as a benchmark by reproducing the baseline results. In model 2, we attempt to mitigate limitations stemming from the time span of our analysis (1989–2013), which was constrained by the availability of *import_intensity* series (see Table 3). This time period misses the undervaluation-enabling policies implemented during the early stages of industrialization in East Asia. To address this, in model 2, we re-estimate our baseline specification by excluding *import_intensity*. This increases the time span of our analysis to 1971–2013. Regarding the results, we do not observe any change in the sign of the coefficients on $services\_GDP$, $foreign\_liabilities$, $bank\_assets$, $labsh$, and CBI. Also, the coefficients of these variables maintain their statistical significance. Capital account openness (*kaopen*) maintain its sign but loses significance. We obtain a different sign for our democracy measure but without statistical significance. We also observe changes in the sign of coefficients for the exchange rate regime (without statistical significance) and the government consumption variable (with statistical significance).

To further examine our findings on the relationship between government expenditures and RER undervaluation, in models 3 and 4, we use fiscal balance and primary fiscal balance to GDP ratios (*overall_balance* and *primary_balance*) as alternative proxies. The idea here is that high interest rates on government debt instruments that developing countries offer to attract foreign capital and finance fiscal spending might be appreciating the exchange rate. If this is the case, we would expect a negative correlation between fiscal balance to GDP ratios and *lnunderval*. However, for both variables, we obtain a positive coefficient, with the result being statistically significant only for *primary_balance*. Hence, our estimations remain inconclusive regarding the relationship between fiscal policy and RER undervaluation. In Models 5 and 6, we consider the possibility that exchange rate flexibility could be correlated with the decision to liberalize the capital account. If this is the case, *kaopen* and *exc_regime* could be capturing the same effect. Therefore, we re-estimate our baseline regression by excluding *kaopen* and *exc_regime* one at a time. We do not observe any significant difference in the size or the statistical significance of the coefficients on these variables. In models 7 and 8, we first exclude both institutional and policy variables, then only policy variables from our baseline regression specification. The motivation here is that institutional or policy variables might reflect the mechanisms through which governments influence the RER level in response to pressures from interest groups. For instance, if governments face pressure to appreciate the RER, they might achieve this by relaxing capital controls. As such, controlling for institutional and policy variables might partial out the channels through which economic/structural variables exert influence on the RER level. Our results do not indicate any changes in the signs of coefficients on economic/structural variables when we exclude institutional and/or policy variables from the analysis.

Next, we check whether our results are robust to using alternative measures of RER undervaluation. These results are reported in Table B.3. In model 1, we replicate our baseline results to facilitate comparison. In models 2 and 3, we test whether our results change when we remove the outliers in *lnunderval* series at the top and bottom 1st and 5th percentiles. The sign of all our coefficients remains the same. The size remains the same in most cases, and when it changes, the changes are only minor in the case of statistically significant variables. Regarding statistical significance, *bank_assets* and *excregime* are the only variables that lose significance when *lnunderval* is winsorized at the 5th & 95th percentiles. Models 4–7 employ alternative definitions of RER undervaluation. Note that we exclude $foreign\_liabilities$ from the models that use $lnunderval2-CEPII$ as the dependent variable, given that these measures are already incorporated into net foreign assets. Likewise, 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 $lnunderval2-lnunderval4$, although $labsh$ becomes insignificant in a couple of instances. The majority of results remain the same when we use the CEPII undervaluation measure, except for *democracy*, *excregime*, and $govinv\_GDP$.

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 probit estimation helps 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 B.4, 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 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 for the government spending variables and capital account openness.

6. Comparing Latin America and East Asia

The political economy of development literature often juxtaposes East Asian countries, which achieved high growth rates thanks significantly to an export-oriented industrialization strategy, with the relatively sluggish growth performance of Latin American countries, which could not transition from the import substitution model to an export-oriented one. This contrast directs attention to factors affecting the propensity toward undervaluation vs. overvaluation in these regions (Edwards, 1989). Table 7 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. Substantial differences in the economic development record of Latin American and East Asian nations beg the question of why undervaluation has not been more prevalent in the former. In this section, we briefly explore whether the differences in RER levels between these two regions can partly be attributed to the key variables identified as statistically significant in our empirical analysis.

Fig. 1 provides some suggestive answers to this question. This figure presents the normalized differences in the average values of our statistically significant regressors between Latin America and East Asia from the 1990s to the 2010s. We can see that the import intensity of exports, services share of GDP, capital account openness index, central bank independence, and democracy index have

Table 7
Average (log) RER Undervaluation by region and decades.
Source: Authors' calculations based on PWT10 data.

Region	1960s	1970s	1980s	1990s	2000s	2010s	1960–2019
East Asia and Pacific	−0.07	0.18	0.22	0.12	0.18	0.11	0.14
Europe and Central Asia	−0.03	−0.16	−0.10	0.10	−0.02	0.04	−0.01
Latin America and Caribbean	0.09	−0.01	−0.01	−0.10	−0.14	−0.20	−0.07
Middle East and North Africa	−0.08	0.15	−0.05	−0.06	0.13	0.22	0.06
North America	−0.17	−0.21	−0.20	−0.32	−0.38	−0.40	−0.28
South Asia	0.19	0.11	0.29	0.40	0.38	0.38	0.30
Sub-Saharan Africa	0.01	−0.07	−0.06	−0.07	−0.01	−0.04	−0.04

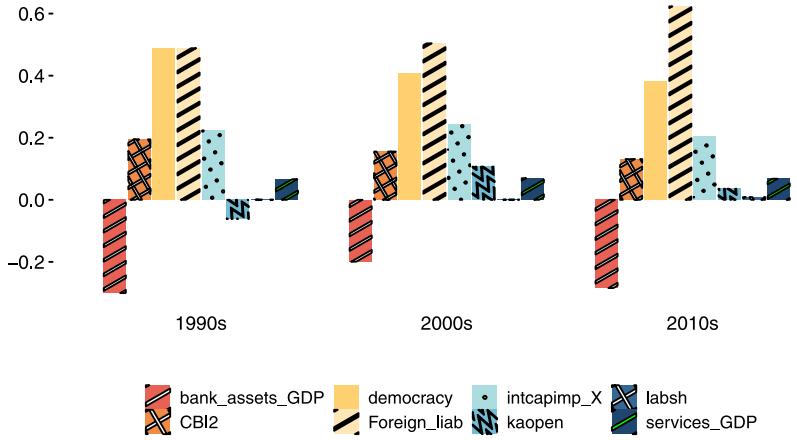

Fig. 1. Differences in normalized averages between Latin America and East Asia. *Note:* Each bar represents the normalized differences between the average values of variables in Latin America and East Asia. For instance, the bars representing CBI are calculated using the following formula: $CBI_t = \frac{avg(CBI_{t,LatinAmerica}) - avg(CBI_{t,EastAsia})}{avg(CBI_{t,LatinAmerica}) + avg(CBI_{t,EastAsia})}$, t = 1990s, 2000s, and 2010s.

been, on average, higher in Latin American countries than in East Asia. These differences are consistent with our findings from the regression analysis and Table 7 and help explain why Latin American countries' RERs have historically been more overvalued on average.

We do not observe substantial differences in the average value of labor share of income across the two regions. Additionally, our indicator for the size of the financial sector, i.e., bank assets to GDP, is larger in East Asia than in Latin America. Therefore, we cannot attribute differences in RER undervaluation across these two regions to the size of the financial sector and income distribution. Finally, the figure indicates that the average ratio of foreign liabilities to GDP has been higher in Latin America. Although our empirical exercise failed to establish a negative relationship between foreign liabilities and undervaluation, the presence of a high ratio of foreign liabilities could be a potential factor holding back Latin American nations, particularly resource-rich ones, from pursuing undervaluation.

The average decadal difference in the value of *lnunderval* between Latin American and East Asian countries was approximately −0.25 over the period 1990–2019.[28] Based on the baseline results reported in column 3 of Table 4, a first approximation tells us that our 8 key significant variables account for about 0.16, or about 62 percent, of this difference. While the numerical comparison should not be taken too literally, given that the possible presence of non-linearities means that marginal effects cannot be compared against averages, and that we are aggregating within-country effects at regional levels, this approximation underlines the economic significance of our results.

While a detailed investigation through country-level case studies is outside of the scope of our paper, we find some support for our arguments from the literature. For instance, MahonJr. (1992, 247), in his comparative analysis of the political economy of Latin America and East Asia, argues that the industrial sector in Latin America had a vested interest in a relatively appreciated exchange rate due to their dependence on imported inputs. While in East Asia land redistributions created a large and tradable agriculture sector that was against an appreciated currency, undervaluation was unpopular in Latin America because depreciations redistributed income away from workers and capitalists to landholders and export proprietors. Furthermore, insulation from domestic societal interests in East Asia due to the authoritarian nature of political institutions enabled technocrats to impose policies and reforms that proved challenging in Latin America, including large real depreciations (*ibid.*). This view is consistent with the negative coefficients we find on our democracy and central bank independence indices in this paper.

[28] That is, East Asian countries had RER levels that exceeded Latin American ones by, on average, $ln(0.75)$.

In sum, Table 7 shows that East Asian countries, on average, had undervalued RERs, unlike Latin American countries. Fig. 1 suggests that a combination of economic (sectoral structure and dependence on foreign inputs), institutional (central bank independence and democracy), and policy (capital controls) factors can help explain some of these differences.

7. 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, institutional, and policy correlates of RER undervaluation using a large panel dataset.

Our analysis has identified several key variables that are statistically and economically significant correlates of RER undervaluation. These include the non-tradable share of national output, the import intensity of exports, the degree of central bank independence, the nature of the political system, and capital account openness. These findings are consistent with the view that political considerations and institutional factors often override purely economic factors in driving policy. Moreover, the extent to which policymakers can employ instruments to achieve desirable targets is itself a function of the domestic configuration of political and institutional interests. From a policy perspective, these results show that undervaluation-friendly RER policies cannot be pursued in isolation. For instance, allowing monetary authorities to be fully independent may hinder the use of RER undervaluation as a developmental tool since the price stability objective associated with central bank independence makes it difficult to direct monetary policy tools to target undervaluation. Implementation of policies that are likely to have long-term benefits often faces daunting challenges and needs to be integrated, for practical reasons, into a broader political and institutional framework, such as one involving sectoral taxes, subsidies, and other types of directed measures that can ease the short-term pain associated with undervalued RER policies.

It is worth noting that our main goal in this study was to identify broad 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 IV estimations or diff-in-diff techniques that exploit exogenous sources of variation in key independent variables of interest, would be better suited to give a causal interpretation to our results. However, as discussed in the empirical strategy section, it is often not feasible to use these tools in a cross-country panel data set up with macro-level variables. An alternative approach to identify causal mechanisms could be to conduct country-specific case studies or survey analyses, similar to those presented by Steinberg (2015) and Aklin et al. (2021), that provide a detailed picture of the configuration of domestic interest groups, institutional characteristics, and industrial structure. Further applications of these approaches can complement our analysis and be valuable for future research on the political economy of exchange rates.

Our study also reveals a need for further examination of the relationship between external indebtedness and RER undervaluation. According to the balance sheet hypothesis, dependence on external borrowing is expected to lower support for an undervalued RER. However, our results indicated an opposite relationship whereby RER undervaluation increases with the external debt burden. It is possible that we fail to find support for the balance sheet hypothesis because our proxy for external debt burden does not fully capture the currency composition of external debt. An alternative explanation we presented, based on the history of currency crises in Latin America during the 1980s, is that countries with high external debt burdens intentionally pursue RER undervaluation in an attempt to generate foreign currency earnings. All in all, the interpretations we provide for this result are more suggestive than definitive, and further research is needed to understand the conditions under which greater external indebtedness translates into undervalued or overvalued real exchange rate levels.

While we have highlighted the theoretical and empirical arguments in favor of undervaluation, 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 gains while minimizing domestic instability is, therefore, likely to require a mix of macroeconomic and industrial policies that will vary with the national context.

Appendix A. Data explanations

See Tables A.1 and A.2, Fig. A.1.

Appendix B. Further robustness checks

See Tables B.1–B.4.

Appendix C. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jce.2023.03.004.

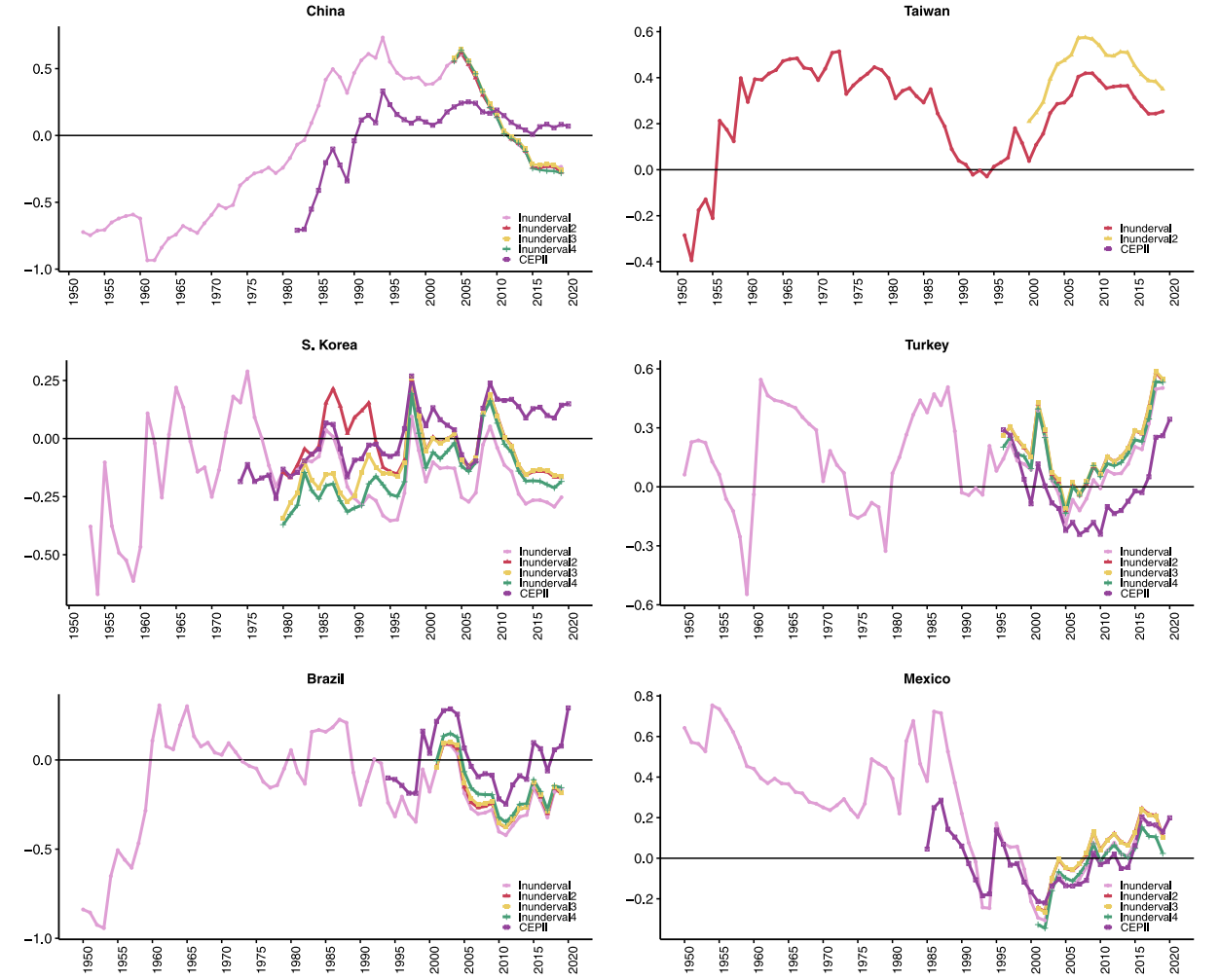

Fig. A.1. RER undervaluation in selected countries. *Note:* The variable *lnunderval* shows the index of RER undervaluation calculated using the basic Balassa–Samuelson adjustment. *lnunderval2* further incorporates net foreign assets, *lnunderval3* includes NFA and (log) terms of trade, *lnunderval4* includes NFA, (log) terms of trade, and government consumption (divided by GDP), and finally *CEPII* shows the CEPII measure of RER undervaluation.

Table A.1
List of countries.

Benin	Burkina Faso	Burundi	C. African rep.	Guinea	Mozambique	Niger
Rwanda	Sierra Leone	Tanzania	Togo	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	Argentina	Armenia
Azerbaijan	Belarus	Botswana	Brazil	Bulgaria	China	Colombia
Dominican Rep.	Ecuador	Fiji	Gabon	Georgia	Guatemala	Iran
Jordan	Kazakhstan	Lebanon	Malaysia	Mauritius	Mexico	Montenegro
Namibia	N. Macedonia	Paraguay	Peru	Romania	Russia	South Africa
Sri Lanka	Suriname	Thailand	Turkey	Venezuela	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					

Table A.2
Construction of exchange rate regime (*excregime*) series.

IRR coding	Explanation	Our coding
1	No separate legal tender	0 (fixed)
1	Pre-announced peg or currency board arrangement	0
1	Pre announced horizontal band that is narrower than or equal to +/−2%	0
1	De facto peg	0
2	Pre-announced crawling peg	1 (intermediate)
2	Pre-announced crawling band that is narrower than or equal to +/−2%	1
2	De facto crawling peg	1
2	De facto crawling band that is narrower than or equal to +/−2%	1
3	Managed floating	1
3	Pre-announced crawling band that is wider than or equal to +/−2%	1
3	De facto crawling band that is narrower than or equal to +/−5%	1
3	Moving band that is narrower than or equal to +/−2%	1
4	Freely floating	2 (flexible)
5	Freely falling	NA
6	Dual market in which parallel market data is missing.	NA

Table B.1
Robustness checks I.

	Dependent variable: lnunderval							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
services_GDP	−0.012***	−0.012***		−0.013***	−0.011***	−0.012***	−0.010***	−0.007***
	(0.002)	(0.001)		(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
tradable_GDP			0.008***					
			(0.002)					
import_intensity	−0.001***	−0.001***	−0.001***	−0.002***	−0.002***	−0.001***	−0.001***	0.001***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
foreign_liabilities	0.013***	0.013***	0.009**		0.014*	0.004	0.015***	−0.024***
	(0.004)	(0.004)	(0.004)		(0.008)	(0.004)	(0.004)	(0.006)
net_sensitivity				0.017				
				(0.025)				
bank_assets	−0.001***	−0.001***	−0.001***	−0.0004	−0.001***	−0.001***	−0.0003	−0.001***
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
labsh	−0.394**	−0.394***	−0.448**	−0.830***	−0.232	−0.344*	−0.307	−0.749***
	(0.184)	(0.123)	(0.187)	(0.257)	(0.297)	(0.182)	(0.188)	(0.090)
CBI	−0.276***	−0.276***	−0.281***	−0.217***	−0.271***		−0.271***	0.190***
	(0.037)	(0.035)	(0.038)	(0.049)	(0.041)		(0.038)	(0.042)
CBI_CWN						−0.182***		
						(0.031)		
democracy	−0.008***	−0.008***	−0.009***	−0.009*		−0.009***	−0.006*	−0.007***
	(0.003)	(0.003)	(0.003)	(0.005)		(0.003)	(0.003)	(0.002)
democracy_CGV					−0.085**			
					(0.041)			
excregime	−0.024*	−0.024*	−0.015	−0.016	−0.036***	0.005		0.030**
	(0.012)	(0.012)	(0.012)	(0.015)	(0.012)	(0.013)		(0.014)
excregime_LYS							−0.010*	
							(0.006)	
govcons_GDP	0.005	0.005*	0.001	0.001	0.003	0.007**	0.0002	−0.008***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
govinv_GDP	0.002	0.002	0.009**	−0.013*	−0.011**	0.003	0.0001	0.002
	(0.004)	(0.004)	(0.004)	(0.008)	(0.005)	(0.004)	(0.004)	(0.003)
kaopen	−0.024***	−0.024***	−0.023***	−0.026**	−0.032***	−0.026***	−0.039***	−0.047***
	(0.006)	(0.006)	(0.006)	(0.011)	(0.007)	(0.006)	(0.006)	(0.007)
Constant								0.787***
								(0.076)
Country FE	YES	YES	YES	YES	YES	YES	YES	NO
Time FE	YES	YES	YES	YES	YES	YES	YES	NO
3-year avg	NO	NO	NO	NO	NO	NO	NO	NO
# of lags	1	2	1	1	1	1	1	1
# of countries	107	107	106	75	105	106	105	0
Observations	1558	1558	1550	707	1242	1546	1502	1558
R^2	0.872	0.875	0.868	0.913	0.888	0.872	0.873	0.402
Adjusted R^2	0.860	0.862	0.854	0.898	0.875	0.859	0.860	0.398

Note: HAC robust standard errors are used.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

Table B.2
Robustness checks II.

	Dependent variable: lnunderval							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
services_GDP	−0.012***	−0.006***	−0.008***	−0.009***	−0.012***	−0.010***	−0.006***	−0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
import_intensity	−0.001***		−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.0002)		(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
foreign_liabilities	0.013***	0.014**	0.014***	0.009*	0.014***	0.014***	0.007***	0.013***
	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.002)	(0.005)
bank_assets	−0.001***	−0.001***	−0.001**	−0.001***	−0.001***	−0.0005**	−0.0004***	−0.0005**
	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
labsh	−0.394**	−0.235*	−0.146	−0.150	−0.455***	−0.511***	−0.309***	−0.319***
	(0.150)	(0.122)	(0.126)	(0.113)	(0.116)	(0.110)	(0.080)	(0.102)
CBI	−0.276***	−0.344***	−0.213***	−0.203***	−0.276***	−0.272***		−0.219***
	(0.034)	(0.041)	(0.045)	(0.041)	(0.041)	(0.038)		(0.037)
democracy	−0.008***	0.001	−0.002	−0.005**	−0.008***	−0.007***		−0.006***
	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)		(0.002)
excregime	−0.024*	0.007	−0.034**	−0.027*	−0.025*			
	(0.012)	(0.014)	(0.015)	(0.014)	(0.013)			
govcons_GDP	0.005	−0.009***			0.006***	0.003		
	(0.003)	(0.002)			(0.002)	(0.002)		
govinv_GDP	0.002	0.005**			0.001	0.002		
	(0.004)	(0.002)			(0.003)	(0.003)		
primary_balance			0.004***					
			(0.002)					
overall_balance				0.001				
				(0.001)				
kaopen	−0.024***	−0.002	−0.028***	−0.025***		−0.034***		
	(0.005)	(0.005)	(0.007)	(0.006)		(0.006)		
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
3-year avg	NO	NO	NO	NO	NO	NO	NO	NO
# of lags	1	1	1	1	1	1	1	1
# of countries	107	109	100	110	107	107	121	111
Observations	1558	2454	1439	1641	1573	1621	2569	1807
R^2	0.874	0.733	0.870	0.866	0.871	0.869	0.842	0.858
Adjusted R^2	0.861	0.714	0.857	0.854	0.859	0.856	0.832	0.846

Note: HAC robust standard errors are used.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

Table B.3
Robustness checks III.

	Dependent variable:						
	lnunderval	lnunderval (winsorized at 1st–99th)	lnunderval (winsorized at 5th–95th)	lnunderval2	lnunderval3	lnunderval4	CEPII
services_GDP	−0.012***	−0.012***	−0.012***	−0.011***	−0.012***	−0.009***	−0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
import_intensity	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)
foreign_liabilities	0.013***	0.015***	0.010**				
	(0.004)	(0.005)	(0.005)				
bank_assets	−0.001***	−0.001***	−0.0003	−0.0004**	−0.0004*	−0.0004*	−0.001***
	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
labsh	−0.394**	−0.442***	−0.338***	−0.199*	−0.170	−0.101	−0.368***
	(0.132)	(0.108)	(0.105)	(0.110)	(0.111)	(0.119)	(0.100)
CBI	−0.276***	−0.275***	−0.279***	−0.242***	−0.264***	−0.271***	−0.138***
	(0.032)	(0.038)	(0.039)	(0.039)	(0.040)	(0.041)	(0.032)
democracy	−0.008***	−0.011***	−0.008***	−0.008***	−0.008***	−0.007***	0.009***
	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
excregime	−0.024*	−0.023*	−0.022	−0.043***	−0.037***	−0.027**	0.005
	(0.009)	(0.012)	(0.013)	(0.013)	(0.014)	(0.014)	(0.011)
govcons_GDP	0.005	0.002	0.001	0.004	0.004		0.008***

(*continued on next page*)

Table B.3 (*continued*).

	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)		(0.002)
govinv_GDP	0.002	0.002	0.001	−0.020***	−0.019***	−0.020***	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
kaopen	−0.024***	−0.025***	−0.025***	−0.043***	−0.047***	−0.051***	−0.032***
	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)
Country FE	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES
3-year avg	NO	NO	NO	NO	NO	NO	NO
# of countries	107	107	106	98	98	97	90
Observations	1558	1555	1435	1285	1262	1260	1377
R^2	0.874	0.886	0.861	0.878	0.875	0.860	0.514
Adjusted R^2	0.861	0.875	0.846	0.864	0.861	0.845	0.467

Note: HAC robust standard errors are used.

*$p < 0.1$.

**$p < 0.05$.

***$p < 0.01$.

Table B.4
Probit estimations.

	Dependent variable: undervalued					
	(1)	(2)	(3)	(4)	(5)	(6)
services_GDP	−0.046***	−0.075***	−0.136***	−0.046***	−0.075***	−0.136***
	(0.011)	(0.015)	(0.022)	(0.011)	(0.015)	(0.022)
import_intensity	−0.004***	−0.011***	−0.010***	−0.004***	−0.011***	−0.010***
	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)	(0.003)
foreign_liabilities	0.413**	0.076	−0.223	0.413**	0.076	−0.223
	(0.187)	(0.258)	(0.318)	(0.187)	(0.258)	(0.318)
bank_assets	−0.017***	−0.013**	−0.018**	−0.017***	−0.013**	−0.018**
	(0.004)	(0.006)	(0.008)	(0.004)	(0.006)	(0.008)
labsh	−1.916**	−2.441*	−3.995**	−1.916**	−2.441*	−3.995**
	(0.914)	(1.394)	(1.821)	(0.914)	(1.394)	(1.821)
CBI		−1.505**	−3.123***		−1.505**	−3.123***
		(0.586)	(0.805)		(0.586)	(0.805)
democracy		−0.099***	−0.115***		−0.099***	−0.115***
		(0.029)	(0.036)		(0.029)	(0.036)
excregime			−0.776***			−0.776***
			(0.273)			(0.273)
govcons_GDP			0.006			0.006
			(0.034)			(0.034)
govinv_GDP			0.025			0.025
			(0.046)			(0.046)
kaopen			−0.090			−0.090
			(0.098)			(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	2688	1806	1557	2688	1806	1557

Note:

*$p < 0.1$.

**$p < 0.05$.

***$p < 0.01$.

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