Catching Up by ‘Deglobalizing’: Capital Account Policy and Economic Growth

While substantial empirical research has evaluated the question of whether capital account openness promotes economic growth, this paper finds empirical evidence for cases where the opposite is true—that a policy of capital controls can promote economic growth, when combined with a policy of reserve accumulation. Using panel data from 45 countries from 1985–2019, we find that capital controls combined with reserve accumulation—strategic capital account policy—contribute to growth in real GDP and TFP. This effect is stronger for emerging markets and prior to the global financial crisis. We show that the policy is strongly associated with enlarging the scale of the manufacturing sector and productivity, and is consistent with theories of learning-by-doing through exporting.

JEL classification codes: C23, E58, F21, F31, F41
Keywords: foreign exchange reserves, capital control, emerging economies, resource reallocation, dynamic panel estimation

1. Introduction

Financial liberalization has been a prominent development in the global economy and a central topic of study in international economics. Theory suggests that financial openness could promote growth in emerging markets by reducing financial constraints and facilitating the accumulation of capital. A large empirical literature has tested this proposition, with mixed success. This paper provides empirical evidence for a scenario where the opposite policy—pursuing a policy of financial deglobalization—appears to succeed in promoting economic growth in emerging markets. This scenario involves capital controls that are combined with reserve accumulation. Substantial reserve accumulation among some emerging markets is another prominent development of recent decades, and it is not by coincidence that some of these countries have had particular success in promoting economic growth.[1] China is an obvious, but not isolated example.

Recent theory has posited a number of reasons why financial openness could be harmful while capital controls could be welfare-improving. For example, capital controls may prevent excessive borrowing.[2] Michaud and Rothert (2014) present a model where borrowing constraints on households promote growth by increasing labor supply. A number of theories are based on the idea that capital controls can engineer a trade surplus, possibly by supporting exchange rate undervaluation; this may favor development of the manufacturing sector, and thereby address a learning-by-doing externality specific to that sector.[3] Some examples include Aizenman and Lee (2010), Korinek and Servén (2016), Benigno, et al. (2022), and Choi and Taylor (2022).[4] Our

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[1] While the average international reserves were around 5-10% of GDP in the early 1990s, emerging economies have accumulated reserves of more than 20-40% of GDP by the late 2000s. See Obstfeld, Shambaugh, and Taylor (2010) for further details.

[2] See for example Schmitt-Grohe and Uribe (2016) and Farhi and Werning (2016).

[3] The mechanism is also related to the economics of sovereign wealth funds, which use current account surpluses from natural resources (commodity dependent states) or manufacturing exports (non-commodity states) to purchase foreign assets to prevent currency appreciation (Balding, 2012). It is also related to 'Dutch Disease,' in that real exchange rate appreciation caused by aid inflows can lead to a lower relative growth rate of manufacturing industries (Rajan and Subramanian, 2011).

[4] See Dooley, Folkerts-Landau, and Garber (2004), Gúlzmann, Levy-Yeyati, and Sturzenegger (2012) for the early debate. Previous studies discussed motives of reserve accumulation: Aizenman and Lee (2007) compare the mercantilist and the precautionary motives. Obstfeld, Shambaugh, and Taylor (2010) consider reserves as a tool for managing domestic financial instability. Jung and Pyun (2016) focus on the liquidity role of reserves in attracting venture capital because decentralized trade with U.S. treasury bonds works as a facilitator for reserve accumulation. Lee and Luk (2018) introduce a precautionary motive generated by "model uncertainty" to understand a surge in the reserves after the Asian Financial Crisis. Bergin et al. (2022) and Bergin (2022) discuss a version of the mercantilist motive based on firm dynamics. Chinn (2017) and Gagnon (2017) shed light on the role of government policy (e.g., reserves and capital controls) on global imbalances. Cubeddu et al. (2019) also provide a comprehensive analysis on

work can be viewed as presenting empirical evidence to support this linkage between capital market restrictions and economic growth through sectoral reallocation favoring the manufacturing goods sector.

Using panel data from 45 countries during the period 1985 to 2019, we first confirm that capital account policy—capital controls combined with reserve accumulation—are positively associated with real GDP growth. We use a normalized capital control index modified from Chinn and Ito (2008). Our estimates indicate that, for an economy with a capital control index at the median for emerging markets, if such a country increases the growth of reserves relative to GDP by one percentage point (on an annual basis over a 5 year period), it has a higher annual real GDP growth rate by 0.08 percentage point.[5] It also affects productivity growth, raising the TFP growth rate by 0.14 percentage point and the rate of growth in manufacturing labor productivity by 0.33 percentage point. Further, we explore the channel, by documenting that reserve accumulation combined with capital controls leads to an expansion in the manufacturing sector, which acts as a workhorse for economic growth. If the growth of reserves accumulation as a ratio to GDP is higher by one percentage point along with capital account restriction at the median of emerging economies, the real value-added share of the manufacturing sector will increase by 0.24 percentage point. We further note that our results are stronger for a sample period ending in 2007 before the Global Financial Crisis (GFC). Our data confirm an observation in previous literature that this marked an end of the period of rapid reserve accumulation among emerging markets.

Past empirical work such as in Rodrik (2008) has provided evidence of a linkage between real exchange rate undervaluation and growth through learning-by-doing.[6] Our contribution is to show evidence linking the growth to capital account policy, which may be viewed as the underlying source of the real exchange rate undervaluation. We argue that there are several benefits to focusing empirical work on capital account policy rather than the exchange rate. First,

current account position and real exchange rate linkages considering policy factors. Bussière, Cheng, Chinn, and Lisack (2015) and Aizenman, Cheng, and Ito (2015) document the trend and heterogeneity of reserve accumulation after the crisis. Jeanne and Rancière (2011) construct a model of optimal reserves and document that the levels of reserves in Asian countries after the financial crisis are notably high. We note that Asian countries, including China, Korea, etc., have not only had high reserves, but also relatively severe capital account restrictions, even compared to others in the similar income group.

[5] While China, a country that represents our main message, features a capital control index of almost 1, we note that the median value in our sample is around 0.5. We note that the value is similar to Korea until 2007, another country that represents our overall story.

[6] Habib et al. (2017) show a greater positive effect of real exchange rate depreciation on growth utilizing an instrumental variable approach in the framework of Rodrik (2008).

the exchange rate is an endogenous variable that responds to a wide range of financial market forces. Rodrik (2008) acknowledges this limitation, and appeals to the idea of a capital account policy behind the currency undervaluation he studies, but he does not take the step of measuring this policy directly. Second, measuring currency undervaluation requires estimating the equilibrium exchange rate, which depends upon contestable theoretical assumptions. For example, the measurement of undervaluation in Rodrik (2008) is the product of computation using regressions of the real exchange rate on output, based on the theory of Balassa and Samuelson. Using a direct measure of reserve accumulation sidesteps this tricky inference and computational issue. Third, we build on existing theoretical models to demonstrate that reserve accumulation may successfully engineer a trade surplus and induce reallocation toward traded goods production even in some cases where it does not imply real exchange rate undervaluation. To demonstrate in practical terms the benefit of our approach, when we replicate the specification of Rodrik (2008) for our sample, regressing GDP and productivity growth on his measure of currency undervaluation, we no longer find a significant effect in our sample, in stark contrast to our benchmark results when regressing on a measure of capital account policy.

Our focus on a measure of capital account policy builds on the recent work of Adler et al. (2019), Blanchard et al. (2015), and Choi and Taylor (2022). Their contribution was to show evidence linking central bank's foreign exchange intervention via reserve accumulation (in the presence of capital controls or capital inflows) to exchange rate determination. Our distinct contribution is to show the further linkage to growth through manufacturing productivity levels and shifts in sectoral allocation of labor, as implied by the theories of learning-by-doing cited above.

We also contribute to the classic question of the relationship between economic growth and financial openness. There is a vast literature that documents the effect of financial globalization on economic growth, such as Bonfiglioli (2008) and Kose, Prasad, and Terrones (2009). Bonfiglioli (2008) finds that financial integration has a positive effect on productivity growth, but it does not significantly affect capital accumulation. Kose, Prasad, and Terrones (2009) further show that disaggregated financial openness measures (e.g., FDI, equity, and debt) have different effects on TFP.[7] Our work is distinct, in that we ask whether a closed capital account can have a positive effect on growth when complemented by large reserve holdings. Thus, our contribution proposes the possibility of a non-linear relationship between capital liberalization and productivity. Although conventional wisdom holds that financial liberalization spurs growth, if combined with reserve accumulation—taking a mercantilist point of view—financial de-liberalization could also be associated with economic growth.

Our empirical results also provide a potential answer to the *premature deindustrialization puzzle* posed by Rodrik (2016), noting a trend of deindustrialization in recent decades where East Asian countries are the exception.[8] We provide evidence that countries with high reserves and capital controls expand the share of the manufacturing sector, which could explain why Asian countries have a relatively larger manufacturing share. From another perspective, our work claims that the long run effect of reserves accumulation works through the reallocation of labor into the manufacturing sector, not through exchange-rate induced expenditure switching. It is widely accepted that reserve accumulation could not enhance productivity through nominal devaluation.[9] Our results support the conclusion that what was widely perceived as an external policy is effective on internal real reallocation.

Finally, our work is related to a well-known allocation puzzle of the negative correlation between growth and capital flows across developing countries. Gourinchas and Jeanne (2013) document that, unlike a neoclassical growth theory, capital does not flow more to countries that invest and grow more. Alfaro, Kalemli-Ozcan, and Volosovych (2014) claim that sovereign to sovereign transactions account for upstream capital flows. Our dynamic panel estimation provides a new perspective on the puzzle by utilizing not only cross sectional, but also time series variations of capital flows and growth.

The rest of the paper is organized as follows. Section 2 discusses some theoretical background for the mechanism we wish to study empirically. Section 3 details the data set and empirical specifications. Section 4 presents the empirical results regarding the impact of capital

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7 Kose, Prasad, and Terrones (2009) show that higher FDI and portfolio equity liabilities are associated with higher medium-term TFP growth, while external debt is actually negatively correlated with TFP growth. See Henry and Sasson (2008), Kose, Pradad, Rogoff, and Wei (2006) and the reference within for the early debate.

8 He claims that a hump-shaped relationship between the share of employment and the output of the manufacturing sector has shifted downward. Thus, the share of the manufacturing sector will decrease as the level of development evolves. However, the level is shrinking much faster, except in East Asian countries.

9 See Jeanne (2013) for further details.

account policy on growth in GDP and TFP. Section 5 presents empirical results regarding the impact on sectoral allocations. Our concluding remarks appear in Section 6.

2. Some Theoretical Context

The theoretical literature includes several papers with models that can provide theoretical motivation for our empirical estimations. Examples include Aizenman and Lee (2010), Michaud and Rothert (2014), Korinek and Servén (2016), and Benigno et al. (2022). These models share certain key features, with some variation in details and emphasis. The goods market includes both traded and nontraded sectors, production uses labor that is mobile between sectors, and the traded goods sector is characterized by learning-by-doing, whereby a rise in current production raises subsequent productivity. The asset market includes capital controls restricting private international asset trade, as well as government purchase of international assets as reserves or an equivalent policy reducing total capital inflow.

These models share a common main mechanism. Capital account policy involving capital controls and/or reserve accumulation serves as an instrument of the government to reduce external liability flows (capital inflows), which reduces the consumption of imported tradable goods. If the locally produced tradable good is a substitute to imported goods, labor will be reallocated to the domestic traded goods sector, which is typically associated with manufacturing. The resulting increased scale of production in the traded sector will enhance future productivity through learning-by-doing. Additionally, the reallocation between traded and nontraded goods tends to be associated in equilibrium with a fall in the relative nontraded price, which implies a real exchange rate undervaluation.

Aizenman and Lee (2010) highlight a finding that a policy of undervaluation is more beneficial if the learning-by-doing externality is associated with the quantity of labor inputs in the traded sector, relative to the case where the externality is embodied in the capital input. Michaud and Rothert (2014) evaluate an optimal capital control in the form of a borrowing constraint imposed on households, finding that it can promote learning-by-doing not only through reallocating labor between sectors but also by raising overall labor supply. It also demonstrates that this policy implies welfare improvements closest to the first-best allocation when the externality is not too large or too small. Korinek and Servén (2016) highlight that the net welfare gains from a policy of reserve accumulation depend on the balance between the static losses from lower tradable absorption and the dynamic gains from higher growth. Benigno, et al. (2022) show that in an environment with financial crises as well as a learning-by-doing externality, the possibility of using reserves to provide liquidity during crises amplifies the positive impact of reserve accumulation on growth. While these models vary somewhat in their details, our empirical work focuses on the theoretical implications that are common to the models in this literature and which are essential to the main mechanism discussed above. These implications include how capital account policy affects allocation of output and labor between sectors, and how it affects productivity levels overall and at the sectoral level.

The discussion of theoretical background above also helps motivate the choice in our empirical specification to use capital account policy, rather than the exchange rate, as the independent variable. We make the observation that a policy of reserve accumulation can lead to a trade surplus and rise in traded goods production, as needed to promote learning-by doing, even in cases where it is not associated with an exchange rate undervaluation.

The first point to note is that, while sectoral reallocation can be associated with real exchange rate devaluation, this is not a necessary implication. In each of the four papers cited above, goods prices depend on marginal costs faced by firms, so the relative price of nontraded goods depends on the relative marginal costs across sectors. For parameterizations of these models implying diminishing marginal products of labor, the reallocation of labor out of the nontraded sector will lower marginal cost and hence lower the relative price of nontraded goods, which implies real exchange rate depreciation.[10] However, for parameterizations not implying diminishing marginal products, such as a production function linear in labor as the only factor, reallocation of labor will have no effect on marginal cost, and the relative nontraded price and hence the real exchange rate will be unchanged.[11]

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[10] The assumption of a labor share less than one is required to induce real exchange rate devaluation in these models, since labor mobility between sectors otherwise would link sector prices through a common wage rate.

[11] For concreteness, suppose production technology and preferences as defined in the two-sector model in section 3 of Michaud and Rothert (2014). Using their equilibrium condition equating the value of marginal product of labor in the two sectors (the equation immediately above numbered equation (3.5)), the relative price of nontraded goods is determined as $p = A\mathrm{F}'(L^T)/\mathrm{G}'(1-L^T)$, where F and G are the production functions of the traded and nontraded goods, respectively, and L^T is the labor allocated to traded goods production. Using the production functions from their quantitative analysis: $y^T = A(L^T)^\alpha$ and $y^N = (1-L^T)^\alpha$ with $\alpha < 1$, the relative price of traded goods becomes: $p = A\left(\frac{L^T}{1-L^T}\right)^{\alpha-1}$, implying that a rise in labor in the traded sector lowers the nontraded price in the initial period where A is given. However, under the parameterization $\alpha = 1$, the nontraded price in their model would be $p = A$, which is constant for given level of A.

The second point to note is that capital account policy can induce sectoral reallocation to the traded sector, so as to activate learning-by-doing, even in a case like that defined above where this policy is not associated with a change in the real exchange rate. Intuition for this conclusion can be found in the balance of payments identity, which Michaud and Rothert (2014), for example, derive from the market clearing condition for traded goods along with the budget constraints of household, firm and government: $Y_t^T - C_t^T = B_{t+1} - R^* B_t$. Here Y_t^T and C_t^T are traded goods output and consumption, R^* the gross world interest rate, and B is private holding of international assets, where this last term can be dictated in Michaud and Rothert (2014) by a binding borrowing constraint imposed as part of a government capital control policy. This condition indicates that a capital control policy forcing a sufficient rise in B_{t+1} will necessarily imply a trade surplus in traded goods $(Y_t^T - C_t^T) > 0$, which is a key to triggering the learning-by-doing mechanism.[12] We note that this linkage of capital account policy to trade surplus is a matter of identity, and holds even under the parameterization above implying no change in the real exchange rate. In appendix A.1, we present a highly simplified model with an explicit policy of reserve accumulation, which provides an example illustrating the observations above in a transparent manner.

3. Empirical Methodology

3.1. Data

The sample includes 45 countries—23 emerging market economies and 22 advanced economies (see the list of countries and data coverage in Appendix Table A1). The main sample covers 1985-2019, and we also consider a sub-sample covering 1985-2007.

[Figure 1 about here]

We collect real gross domestic product (GDP), total factor productivity (TFP), foreign reserves, terms of trade from standard data sources such as *International Financial Statistics (IFS)*

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[12] This point can be demonstrated more fully utilizing the solution derived in Michaud and Rothert (2014) for the response of labor in the traded sector, L^T, to a change in borrowing constraint imposed by government capital controls, $\bar{b}$. Using their log preferences ($U = \log((C^T)^\eta (C^N)^{1-\eta})$, and under the parameterization of production function above ($\alpha = 1$), the solution in Michaud and Rothert (2014) simplifies to $\frac{dL^T}{d\bar{b}} = \frac{AU_{C^TC^T}}{U_{C^NC^N} + AU_{C^TC^T}}$ (see their equation (3.5)). A positive sign is ensured since the utility is concave, which indicates the labor allocation to the traded sector rises with a policy mandating asset accumulation. In terms of intuition, a rise in $\bar{b}$ that reduces domestic traded consumption would require a fall in nontraded consumption as well, given preferences and no change in relative price (for case with $\alpha = 1$); this requires movement of labor out of the nontraded sector.

from the IMF, the *Penn World Table (PWT)*, and *World Development Indicator* (*WDI*) from the World Bank. Figure 1 plots the average reserve accumulation for subsets of countries. Reserve accumulation of emerging economies was far more rapid than other countries, from the mid-90s until the years of the Global Financial Crisis (GFC). Moreover, the average accumulation of East Asian countries, including China, Korea, etc., shows an even higher level. This trend of rapid reserve accumulation ended after 2007.[13] Given these distinctions in reserve accumulation across countries and time periods, we will report results below for subsamples accordingly.

Private credit is collected from the *Global Financial Development Database*, World Bank. We computed annual percent changes, averaged over 5 years, for terms of trade, private credit to GDP and population. The quality of institutions is constructed based on the *Economic Freedom in the World database*. Following Estevadeordal and Taylor (2013), we aggregate the index of judicial independence and the index of impartial courts. The human capital index is the year of schooling that comes from Barro and Lee (2013). A crisis dummy variable contains historical banking, and currency and debt crisis events recorded by Laeven and Valencia (2020). All variables are 5-year averages. Please see Appendix Table A2 for the summary statistics.

For a measure of capital controls, we modify the capital control index of Chinn and Ito (2008). This is constructed using the Annual Report on Exchange Arrangements and Exchange Restrictions from the IMF, as follows,

$$CC = 1 - KAOPEN, \tag{1}$$

where *KAOPEN* is financial openness, which is standardized between 0 (relatively closed) to 1 (relatively open). The index is based on the binary dummy variables codified from the tabulation of restrictions on international financial flows reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The aggregate index runs between 0 and 1, where 1 stands for the no tabulated restrictions. Note that we will interchangeably use the index of capital control (CC) with financial closedness.[14]

[13] Benigno et al. (2022) also document the distinct nature of this subperiod as a phase of rapid reserve accumulation in emerging markets.

[14] Some previous studies such as Bonfiglioli (2008) used external asset and liability holdings of a country to identify the effect of globalization on economic growth. However, we believe that the legal measure is more appropriate in our exercise, especially if one wants to assess the combined effects with reserves. Under our framework, reserves combined with capital controls are the driving instruments, and these measures shape overall external asset and liability holdings and macroeconomic growth. This index captures the legislated breadth of capital controls, which will affect the endogenous decision of private external positions along with reserve accumulation. Careful assessment needs to be made though. We note that while a value of 0 reflects the most closed observations

For other variables that represent the channels of capital account policy on growth, we first calculate employment share and real value-added at the sectoral level.[15] Our data for the manufacturing sector come from several different sources, including the GGDC 10 sector database, Economic Transformation Database (ETD), EU KLEMS and KLEMS (WIWW), OECD STAN, and the World Input Output Database (WIOD). To discuss the implications of the tradable goods sector, we focus on the manufacturing sector.[16] More specifically, manufacturing share (*MS*) of employment and real value for country *i* are added as follows (see also Appendix A.2 for data construction);

$$Labor\ \ MS_{it} \ = \ L_{it}^{Manufacturing} \ / \ L_{it}^{Total} \ , \tag{2}$$

$$rVA\ \ MS_{it} \ = \ RVA_{it}^{Manufacturing} \ / \ RVA_{it}^{Total} \ . \tag{3}$$

Then we further divide real value added by employment to construct labor productivity (*LP*) by each industry *s*:

$$LP_{i,t}^{s} = RVA_{it}^{s} \ / \ L^{s}{}_{it}. \tag{4}$$

We construct annual data then take the average of 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2015, and 2015-2019. We note incorporating 5-year averaged data is standard in cross-country growth literature. Due to the data availability, we use only 4 years of information within the last period.

3.2. Empirical Specifications

3.2.1. Economic Growth and Total Factor Productivity

We use a cross-country panel regression, using 5-year averaged data. We analyze within variation to identify the effect of the capital account policy, using the following specification:

$$\begin{aligned}\Delta(\ln y)_{it} \ &= \beta_0 + \beta_1 lny_{i(t,0)} + \beta_2 CC_{it} + \beta_3 \Delta RSRV_{it} \ + \beta_4 (CC_{it} \times \Delta RSRV_{it}) \\ &\quad + X_{it}'\gamma + \varphi_i + \rho_t + \varepsilon_{it},\end{aligned} \tag{5}$$

in the data, no observations are fully closed; similarly, while a value of 1 reflects the absence of legal restrictions, it does not imply fully efficient markets.

[15] We restrict out interest to labor, and we do not incorporate physical capital. Capital stocks at the sectoral level are much more difficult to measure and are vulnerable to measurement errors, especially in emerging economies.

[16] Note that manufacturing is not the only traded sector. Agriculture, mining, and some services such as trade services are also tradable. We also report the labor productivity growth results for individual sectors.

where the subscripts i and t represent specific countries and five-year time periods. Here $\Delta(\ln y)_{it}$ is the average annual real GDP and TFP growth in period t. $ln\ y_{i(t,0)}$ is (log of) the initial level of real GDP or TFP at the beginning of each period t. CC_{it} is our measure for the breadth of capital controls, which also appears as part of the interaction term with reserves. We also note that $\Delta RSRV_{it}$ is an average of annual differences (over 5 years) in reserves as a ratio to GDP in the period t.

We first implement country fixed effect (henceforth FE) estimations to control for heterogeneity because φ_i can be correlated with ε_{it}. Accordingly, the FE estimator, in general, is consistent. However, the estimates of $lny_{i(t,0)}$ may be biased because the initial GDP or productivity variable in period t is correlated with the dependent variable, which causes a "Nickell" bias in the estimation of β_1 (Nickell, 1981). We also introduce the system-GMM estimator (Arellano and Bover, 1995, Blundell and Bond, 1998).[17] As the validity of the GMM estimator depends on whether the explanatory variables' lagged values are valid instruments, we conduct a weak instrument test (Sanderson and Windmeijer, 2016), and an over-identification restriction test where failure to reject the null hypothesis gives support for the valid instruments. Lastly, for the specification test, it is necessary to check whether the error term, ε_{it}, is serially correlated; if it is not, then the first order differenced error terms $(\varepsilon_{it} - \varepsilon_{it-1})$ are expected to have a serial correlation, and the second-order differenced error terms $(\varepsilon_{it} - \varepsilon_{it-2})$ have no serial autocorrelation. So, the test results for first and second order autocorrelation in the differenced error terms are also reported.

3.2.2. Sectoral Reallocation

Next, we shift focus to a different part of our mechanism, regarding how the level of reserves combined with capital controls affect sectoral allocation. Our baseline specification analyzes the effect of the interaction of reserve accumulation with capital controls on the share of manufacturing value added and employment. We have the following specification,

[17] The system GMM combines the first-differences regression with the levels regression. Thus, level variables are instrumented with suitable lags of their own first differences based on the fact that these differences are uncorrelated with the country fixed effects and error terms.

$$MS_{it} = \beta_0 + \beta_1 CC_{it} + \beta_2 \Delta RSRV_{it} + \beta_3 (CC_{it} \times \Delta RSRV_{it}) + H'_{it}\gamma + \eta_i + \rho_t + e_{it} \qquad (6)$$

where MS_{it} refers to manufacturing sector shares in real value added or labor for country *i* at period *t*. $\Delta RSRV_{it}$ is a 5-year average of annual differences in reserves as a ratio to GDP in the period *t*. H'_{it} control for log of real GDP per capita and its square to capture the hump-shaped pattern of the manufacturing sector. As documented in Rodrik (2016), the share of the manufacturing sector, in terms of employment and real value-added, follows a hump-shaped pattern along with the development path. At the initial stage of industrialization, the share increases as the economy starts to take off. Manufacturing expands as employment is reallocated from the agricultural sector to the manufacturing sector. This development continues until it hits a threshold, when the economy starts to transform from manufacturing to service. In our regression analysis, the initial positive correlation is captured with the log of real GDP per capita, and the subsequent negative transformation is captured by introducing the log of real GDP per capita squared.

4. Empirical Results: Capital Account Policy and Economic Growth

4.1. Real GDP Growth

Our first set of results documents the impact of capital account policy on real GDP growth. Table 1 reports the results from the estimation of equation (5) with 5-year averaged data. Country and period fixed effects are included to control for unobserved country-specific and time-specific components. Column (1) implements basic panel estimation with the measure of capital controls and the change in reserves included as separate regressors but not interacted. The country fixed effects estimation shows that the coefficients on capital controls and reserve accumulation both are statistically insignificant. The uninformative coefficient on capital controls reflects the inconclusiveness in past studies and the unresolved debate over the effect of financial globalization on growth. However, when we introduce the interaction term of capital controls and reserve accumulation, which is our main variable of interest, results in column (2) indicate this has a positive effect on output growth with significance at the 5% level.

[Table 1 about here]

Based on the results in column (2), for a country with the fullest extent of capital controls ($CC = 1$), a rise in the growth of the reserves-to-GDP ratio by one percentage point leads to a 0.41

(-0.3692 + 0.7784) percentage point rise in the annual real GDP growth rate. We note that this degree of capital control could represent the case of China up until 2011.[18] Even Korea, which is in a group of advanced economies recently, has had average capital control measures around 0.5 up until 2007. If we use the capital control value that is the median among emerging markets (CC = 0.58), our result indicates that there is a 0.082 (-0.3692 + 0.7784 × 0.58) percentage point increase in annual GDP growth.[19,20]

Statistical significance of the interaction term becomes yet stronger (at the 1% level) when we employ subsample regressions for emerging markets as well as a shorter sample period from 1985 to 2007 in columns (3) and (4), respectively. Recall that the shorter subsample was motivated by the distinct period of rapid reserve accumulation among emerging markets shown in Figure 1; it also excludes the onset of the GFC. The coefficient values for the interaction term also rise: to 0.9805 for the emerging markets sample, and it further increases to 2.071 for a sub-sample 1985-2007. In summary, we find that the effect of capital market policy (reserve accumulation along with capital controls) is particularly strong for the case of emerging markets and for the period prior to 2007.

We also implement a two-step system-GMM approach to address issues of endogeneity, in columns (5)-(7). Owing to the dynamic structure of the dependent variable and its correlation with initial real GDP on the right-hand side, incumbent panel estimation may produce inconsistent results. The specification for column (5) pursues a flexible specification for the system GMM by considering not only initial GDP, but also the terms of trade growth and the growth of private credit/GDP as endogenous or predetermined. Column (6) implements sub-sample analysis for emerging market countries, and column (7) does so for the 1985-2007 sub-sample. The estimated coefficients on the interaction terms of capital control and changes in reserves are positive and

[18] To aid in understanding scale, we note that Appendix Table A2 shows that the maximum value of the change in reserves ratio ($\Delta RSRV_{it}$) in our data set is 10.0 percentage points.

[19] One reason to focus on the median case is that the possibility of nonlinearity in the effects of reserve accumulation may complicate the interpretation of quantitative results for countries at the extremes.

[20] Rodrik (2008) finds that a 50 percent undervaluation, which corresponds roughly to one standard deviation, is associated with a rise in annual growth of real income per capita of 1.3 percentage points. By comparison, the estimate from column (1) in Table 1 of our paper implies that a rise in the growth of the reserves-to-GDP ratio by one percentage point leads to a 0.41 percentage point rise in the annual real GDP growth rate for a country with the broadest capital control coverage (CC=1). If we scale this for a 1 standard deviation rise in the change in reserve (1.58) taken from table A2, this implies a rise in GDP growth by 0.65 percentage points. This is smaller than the impact that Rodrik (2008) estimated for currency undervaluation.

significant, at the 5% level for the full sample, and at the 1% level for the emerging markets and 1985-2007 sub-samples. For consistent estimation in the dynamic panel in columns (5)-(7), the error $\varepsilon_{i,t}$ is required to be serially uncorrelated. AR(1) and AR(2) tests support the validity of the dynamic specification. Hansen's over-identifying restriction cannot be rejected, which supports the validity of instruments. Also, weak IV test statistics for three endogenous variables cannot reject the null of weak instruments. Coefficient estimates for the other controls are consistent with previous studies: initial GDP is negatively related to real GDP growth except in column (5), which supports convergence theory. The terms of trade growth have a positive impact on real GDP growth. The coefficient on the average of crisis events in the period is negative and significant, which implies that real GDP growth is negatively related to crisis events. Please also see Appendix Table A3 for a robustness check of Table 1, showing that our results are not sensitive to the inclusion or exclusion of controls.

One striking implication of our estimates is that capital account closedness does not necessarily imply a negative impact on growth, when considered in combination with positive reserve accumulation. This provides a counterpoint to findings in the literature, such as Bonfiglioli (2008) and Kose, Prasad, and Terrones (2009), suggesting general benefits of financial openness. While not in direct conflict with this finding, our results emphasize the importance of conditioning this conclusion on other factors, such as reserves. Closing a country's capital account potentially can be beneficial to growth if used as a means of supporting a trade surplus to promote the traded goods sector.

4.2. Productivity Growth

We now turn to productivity measures to examine the effect of capital account policy. First consider total factor productivity (TFP), collected from the Penn World Table 10.0. Table 2 reports the results of estimating a version of equation (5) with average annual TFP growth replacing GDP growth as the dependent variable, first for a benchmark panel regression (columns (1)- (4)) and then two-step GMM to control for a dynamic panel structure (columns (5)-(7)). In the dynamic panel, we consider not only initial TFP but also terms of trade growth and the growth of private credit to GDP as endogenous or predetermined variables as we did in Table 1. Results for TFP growth in columns (1)-(4) broadly echo our main findings in Table 1—capital controls plus reserve accumulation significantly promote TFP growth. For example, in column (2), for a country with the fullest extent of capital controls (*CC* = 1), a rise in the growth of reserves-to-GDP ratio by one percentage point per year leads to about 0.23 (0.0014+0.2319) percentage point rise in annual TFP growth rate, and for a country with the emerging market median capital control (*CC* = 0.58), the percentage point rise in TFP is 0.14 (0.0014+0.2319×0.58). Statistical significance becomes stronger in the sub-sample analysis for 1985-2007. The results for emerging markets become significant under the GMM specification. In column (6), system GMM results for emerging markets show a 0.36 (-0.0947+0.4542) percentage point rise. Results are statistically significant at the 5% level.

Regarding coefficients on the other regressors, initial TFP is negatively related to productivity growth in all columns except column (6), which is in line with convergence theory. Note that AR(1) and AR(2) tests and the Hansen over-identification test in columns (5) to (7) support not only the validity of specification but also that of instruments.[21]

[Table 2 about here]

Table 3 extends the examination of effects on productivity to consider labor productivity at the disaggregated sectoral level. Sectors now include agriculture, mining, manufacturing, utilities, construction, trade services, transportation services, business services, government services, and personal services. Table 3 shows that labor productivity only of the manufacturing sector and trade services respond to the capital account policy positively in columns (3) and (6), while the other sectors are muted in response to reserve accumulation combined with capital controls. The results of the interaction term of capital controls and reserves changes in manufacturing are significant at the 1% level in column (3). Estimates indicate that for a country with the median capital control among emerging markets, a one percentage point rise in the growth of reserves relative to GDP implies a percentage point rise in manufacturing labor productivity of

[21] See Appendix Table A4 for GDP and TFP growth regressions that consider endogeneity. It is also worth mentioning concerns regarding reverse causality. For example, the most open economies such as Switzerland with a productivity slow-down accumulated substantial reserves to fend off downward pressure on exports. Also, this reverse causality may be present for oil exporting countries, which increase external savings in the form of reserves when facing limited oil reserves and declining productivity in the industries. We first note that we employ a sub-sample analysis excluding advanced countries and do not include oil exporters in our sample. Second, we note that the correlation between productivity and the combined policy mix of reserves and capital controls is positive in East Asian countries, where the reverse causality mechanism is likely to be less of a concern.

0.71 (-0.1188+1.4270×0.58). Appendix Table A5 shows the robustness of Table 3 to system GMM estimation.

[Table 3 about here]

Our finding that capital account policy can raise GDP and productivity, specifically for the manufacturing sector, is consistent with a mechanism of learning-by-doing in our theoretical rationale. To further provide empirical support for this mechanism, section 5 will provide evidence regarding its prediction for sectoral reallocation.

4.3. Comparison with Real Exchange Rate Undervaluation

We now provide a comparison of our results to an alternative specification used in previous work, which used real exchange rate undervaluation instead of capital account policy as a regressor. The two approaches clearly are related, since the capital account policy with reserve accumulation can be used as a means of maintaining an undervalued currency and thereby boosting demand for the traded goods sector through trade surplus. But we argue below that there are benefits, both practical and conceptual, to using a measure of capital account policy as the regressor in an empirical investigation.

We apply the definition of real exchange rate undervaluation from Rodrik (2008) to our sample of countries. Using data from the *Penn World Table (PWT)*, we compute a PPP- adjusted value for the empirical real exchange rate (RER_{it}), and we then estimate an equilibrium real exchange rate ($\widehat{RER_{it}}$) based on the theory of Balassa and Samuelson that adjusts for the effect of per capita real income. We then compute undervaluation based on the deviation of the empirical real exchange rate from the computed equilibrium $UNDERVAL_{it} = \ln(RER_{it}) - \ln(\widehat{RER_{it}})$. See Appendix A.4 for a detailed explanation of methodology and a summary of the resulting measure of undervaluation. *UNDERVAL* greater than zero indicates that the exchange rate is set such that goods produced at home are relatively cheap in dollar terms: the currency is undervalued. We then estimate a version of regression equation (5), using $UNDERVAL$ in place of the regressors involving capital account policy:

$$\Delta(\ln y)_{it} = \beta_0 + \beta_1 ln y_{i(t,0)} + \beta_2 UNDERVAL + X_{it}'\gamma + \varphi_i + \rho_t + \varepsilon_{it}. \qquad (5')$$

Results reported in Table 4 show no clear relationship between currency undervaluation and real GDP growth in our sample. For no regression specification considered do we find a statistically significant positive coefficient on $UNDERVAL$. For the panel FE estimations, the point estimate is negative, both for the full sample (column (1)) and for emerging markets (column (2)); while the point estimate for the 1985-2007 subsample is positive (column (3)), it is not statistically significant. System GMM estimation and use of alternative measures of undervaluation considered in Rodrik (2008), such as using a 5-year average of log real exchange rate and using the GDP deflator for prices (columns (4)-(7)), also do not deliver a statistically significant relationship. We conclude that the estimated effect of real exchange rate undervaluation on growth is distinctly less clear and less robust in our sample than what we found in our benchmark growth regressions using a measure of capital account policy as a regressor. In Appendix Table A6, we report results of estimating the equation (5') with TFP growth as the dependent variable, again finding no statistically significant relationship with undervaluation measure.

[Table 4 about here]

The weaker results we obtain when using undervaluation as a regressor may reflect certain inherent difficulties in measuring real exchange rate undervaluation. Firstly, the exchange rate is an endogenous and volatile variable that responds to a wide range of financial market forces. Even Rodrik (2008) acknowledges this issue, and appeals to the idea of a capital account policy behind the currency undervaluation he studies, though he does not take the step of measuring this policy directly. If the objective of the researcher is to study policies to promote growth, it is arguably more fruitful to study the actual government capital and reserves policies, rather than study the behavior of an economic variable like the exchange rate, which is the endogenous and rather noisy outcome of that policy.

Second, measuring undervaluation requires estimating the equilibrium exchange rate, which is inherently dependent upon contestable theoretical assumptions. For example, the measurement of undervaluation in Rodrik (2008) is the product of computation using regressions of the real exchange rate on output, based on the theory of Balassa and Samuelson. In contrast, our use of reserve accumulation sidesteps this tricky inference and computation, since reserve accumulation can usually be measured directly. Further, it is highly problematic that the connection of exchange rates to a possible trade surplus depends fundamentally on the values of substitution elasticities in the demands for foreign versus home goods, which are hotly contested in the literature.

5. Capital Account Policy and Sectoral Reallocation

Next, we investigate the implications of capital account policy for sectoral allocation, as this sheds light on the mechanism by which a capital account policy can raise productivity by favoring the manufacturing (traded) sector.

Figure 2 shows how the development path and the 5-year average share of the manufacturing sector are linked by plotting each country's manufacturing labor and real value-added shares and (log) real GDP per capita. Again as in Rodrik (2016), the share of the manufacturing sector, in terms of employment and real value-added, follows a hump-shaped pattern along with the development path.

In Figure 2, however, we can observe that there is a wide variety of paths among different groups of countries. Most notably the hump-shaped trend is weakly observed for East Asian countries such as Korea, Thailand, and China; the trends of these East Asian countries are more linear than hump-shaped. In the upper panel of Figure 2, red diamonds represent the East Asian group, and we can see that this group of countries features larger shares of manufacturing sector labor as GDP per capita increases. Except for Hong Kong and Singapore after 2005, which are financial centers and belong to an advanced group, most of the middle-income East Asian economies are well above the hump-shaped trend of other countries. This is also easily observed in the bottom panel, where we plot the real value-added share. Most of the East Asian countries, again widely known for their high reserve accumulation, sit on the upper region of the hump-shaped trend. We argue that capital account policy plays an important role in shaping these trends, and that they are linked to growth.

[Figure 2 about here]

Table 5 shows results of estimating equation (6), regressing sectoral allocations on measures of capital account policy. In columns (1) and (4) of Table 5, we show the results for the real value-added and labor shares of the manufacturing sector, respectively. For robustness, columns (2), (3), (5) and (6) include sub-sample analysis for emerging markets and shorter periods 1985-2007.

[Table 5 about here]

In column (1) of Table 5, in an economy where the growth of reserve accumulation to GDP is higher by one percentage point with the fullest extent capital account restriction ($CC = 1$), the value-added share of the manufacturing sector is higher by 0.48 (-0.0985+0.5779) percentage point, compared to country's within average after controlling for the overall hump-shaped patterns. For a country at the median level of capital account restriction among emerging markets (*CC* = 0.58), this effect is 0.24 (-0.0985+0.5779×0.58) percentage point. Results become larger and more significant for our subsample analysis. In column (2) where we exclude the advanced country group, the effect on the manufacturing value added share becomes 0.51 (-0.3033 + 0.8124) percentage point for the case of capital control index at 1; for the 1985-2007 subsample in column (3), it becomes 0.79 (-0.4449 + 1.2363) percentage point. Columns (4)-(6) show that the pattern in manufacturing value added largely carries over to labor shares in manufacturing, though with somewhat smaller magnitudes. The effect on labor shares is largest and most significant in the 1985-2007 subsample, where higher reserve accumulation growth by one percentage point with the highest capital account restriction (*CC*=1) implies the labor share of the manufacturing sector is higher by 0.35 (-0.4401+0.7883) percentage point.

In summary, we can confirm that the same mix of capital account policy that enhances the economic growth in the manufacturing sector also boosts employment and production within the manufacturing sector. On top of the hump-shaped development path captured by GDP per capita and its squared terms, one can see that the combined reserves and capital controls play an important role and further provide a systemic wedge in explaining shares of the manufacturing sector.

In our final remarks, we discuss the possibility of capital account policy countering *deindustrialization*. Rodrik (2016) documents the premature industrialization of emerging economies; he claims that the hump-shaped relationship between labor share and incomes has shifted downward in Latin American countries, but not in Asian countries. In our sample, Asian countries tend to be in the group of countries with high reserves and relatively severe financial account restrictions. It is possible that the capital account policies adopted by these countries favor the manufacturing sector and exploit the externality from the tradable sector. Additionally, these policy tools feed the productivity growth in the tradable goods sector along with the current account surplus. We could not account for how long the externality persists, but up until the GFC, the effect of the policy adoption seemed positive on growth.

6. Conclusion

Using panel data from 45 countries during the 1985–2019 period, we find that a combination of capital controls and reserve accumulation contributes to the growth of real GDP and TFP, and that these gains are associated with sectoral reallocation toward manufacturing. It has long been argued that the manufacturing sector can function as a workhorse for economic growth. Our contribution is to show that a particular capital account policy that combines capital controls and reserves accumulation can contribute to this process of growth, and that this policy is positively associated with labor productivity growth in the manufacturing sector and with labor reallocation to this sector. We thus find a linkage between capital account policy in financial markets and theories of learning-by-doing in the tradable (manufacturing) sector of goods markets. By encouraging external saving and simultaneous increase in net exports, the relative scale of domestic production to absorption of the economy will be larger than one in a *laissez-faire* economy.

Our results have implications for the expansive debate regarding the benefits of financial globalization. Past work has documented scenarios where financial openness could promote growth in emerging markets, by reducing financial constraints and facilitating the accumulation of capital. In a counterpoint, our findings document a scenario where the opposite conclusion holds sway, where a policy of financial deglobalization combined with an open goods market can promote export-led growth. Our results also are of interest to the expansive literature on growth, and the macro policies that have positive effects on growth in emerging markets.

We do not make claims as to whether such a capital account policy is optimal from the stance of international cooperation, or whether the policy combination is fine-tuned by policymakers. It is possible that policymakers in emerging economies pursue reserve accumulation primarily to intervene in their nominal exchange rate market and impose a restriction on the capital account for political motivations. Nonetheless, regardless of motivation, we find that this policy mix has served to spur the growth of those economies through a larger scale of the manufacturing sector. It is still unclear, though, how sustainable over time such a policy combination can be. We leave such questions as an agenda for future research.

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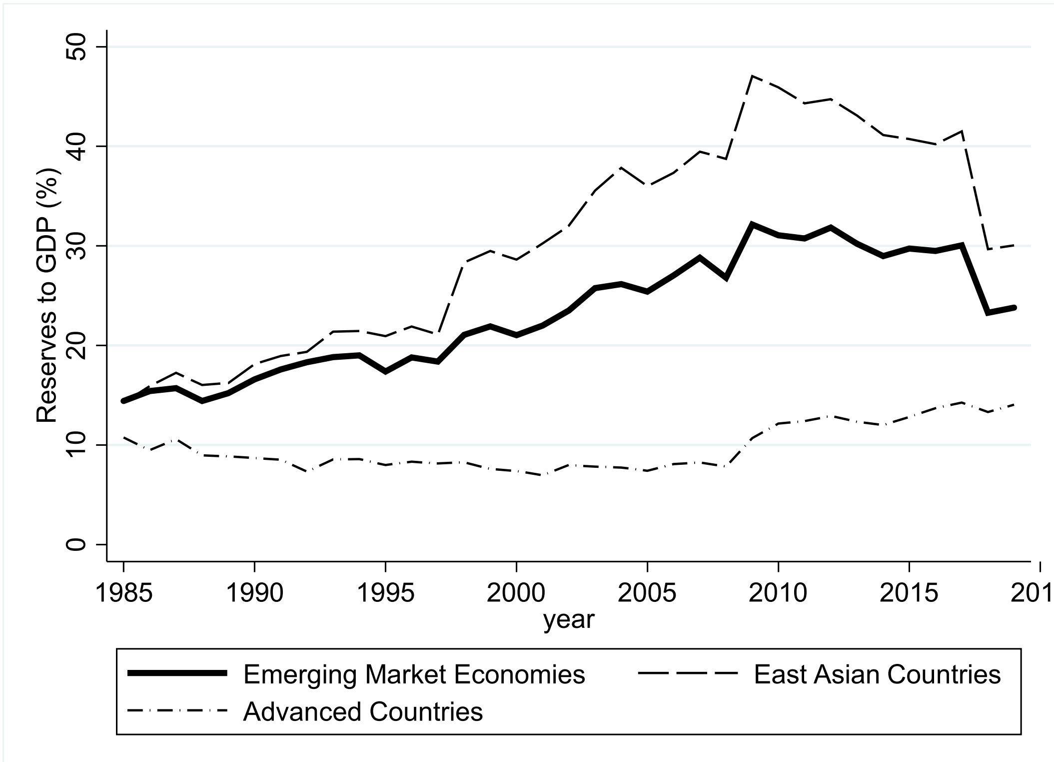
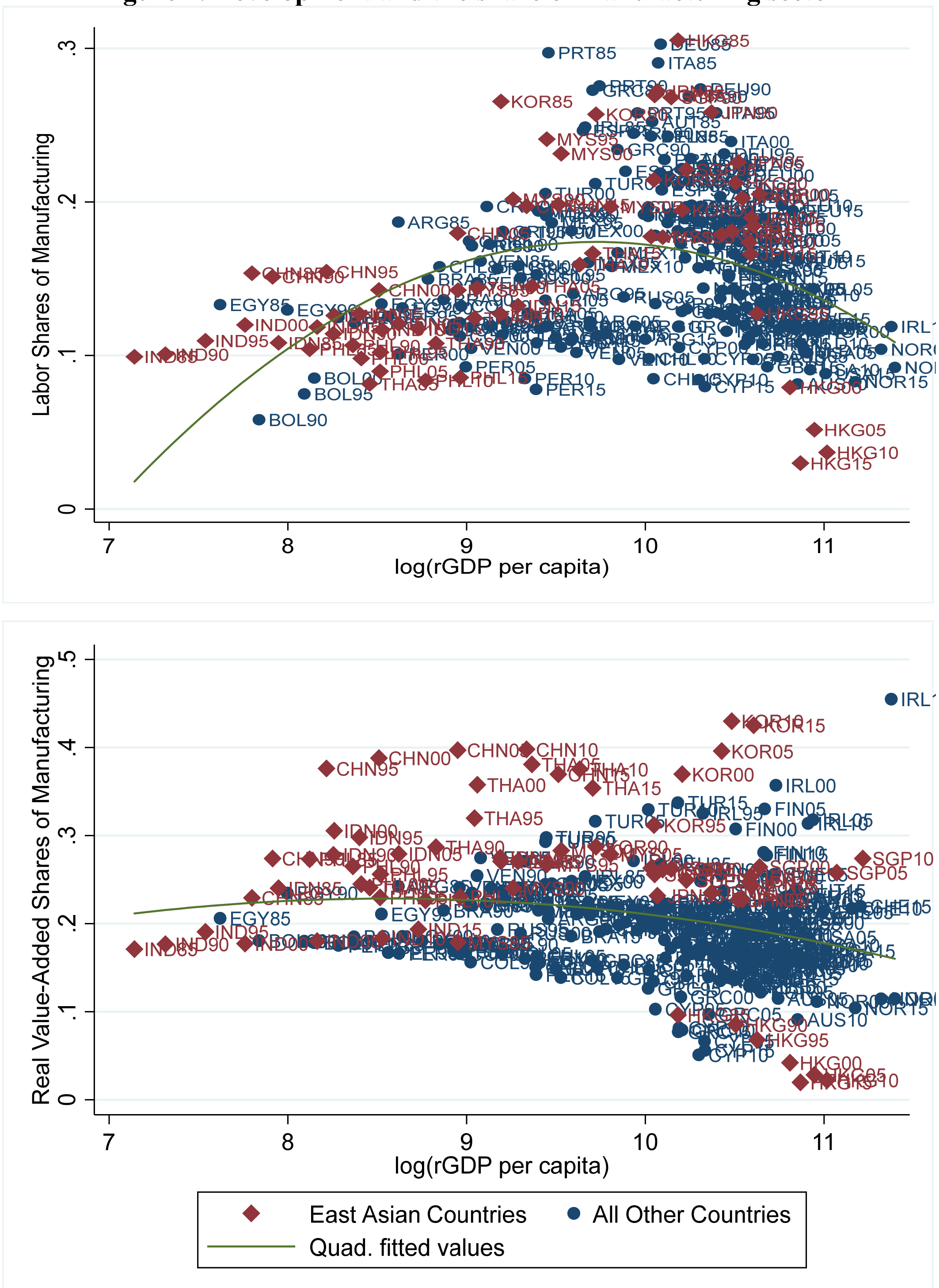
Figure 1. Average reserves (% of GDP) by group



Notes: Authors' calculation

Figure 2. Development and the share of manufacturing sector



Notes: Labor and real value-added shares of manufacturing sectors are depicted. We take the average of 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2014, and 2015-2019. Data come from several sources, including PWT, GGDC 10 sector, ETD, KLEMS, KLEMS(WIWW), WIOD, OECD STAN. Diamond symbols in red indicate East Asian countries.

Table 1. Capital account policy and economic growth: 5-year averaged data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	RGDP growth						
Method	Panel Within	Panel Within	Panel Within	Panel Within	System GMM	System GMM	System GMM
Sample	Full	Full	Emerging Markets	1985-2007	Full	Emerging Markets	1985-2007
Initial GDP	-0.0209*	-0.0176	-0.0302*	-0.0264	0.0029	-0.0128	-0.0042
	(0.0112)	(0.0115)	(0.0148)	(0.0179)	(0.0092)	(0.0107)	(0.0141)
Capital controls	0.0076	0.0080	0.0119	0.0026	0.0080	0.0108	-0.0052
	(0.0087)	(0.0084)	(0.0118)	(0.0115)	(0.0059)	(0.0196)	(0.0113)
d.Reserves to GDP	-0.1229	-0.3692*	-0.6209***	-0.7086**	-0.3941*	-0.6809***	-0.6488**
	(0.1232)	(0.1863)	(0.1757)	(0.3246)	(0.2238)	(0.2352)	(0.2635)
Capital controls		0.7784**	0.9805***	2.0710***	0.9983**	1.2971***	2.0219***
× d.Reserves to GDP		(0.3433)	(0.2830)	(0.5911)	(0.4584)	(0.4327)	(0.4969)
Private credit/GDP growth	0.0126	0.0133	-0.0089	0.0428*	-0.0075	-0.0032	-0.1090
	(0.0278)	(0.0288)	(0.0423)	(0.0243)	(0.0309)	(0.0642)	(0.1899)
Terms of trade growth	0.3828***	0.3888***	0.3345***	0.3605***	0.3664***	0.1810*	0.5063***
	(0.0611)	(0.0632)	(0.0804)	(0.0622)	(0.0601)	(0.1002)	(0.1772)
Population growth	0.1315	0.1222	-0.6125	0.1264	0.5528	-1.2827	0.5003
	(0.4856)	(0.4683)	(0.8096)	(0.4579)	(0.5247)	(0.9186)	(0.7521)
Human capital	0.0034	0.0034	0.0063	0.0073	-0.0012	-0.0049	-0.0010
	(0.0034)	(0.0033)	(0.0076)	(0.0068)	(0.0014)	(0.0060)	(0.0023)
Institution quality	-0.0415*	-0.0469*	-0.0567**	-0.0530**	-0.0211*	-0.0255*	-0.0226**
	(0.0231)	(0.0237)	(0.0239)	(0.0224)	(0.0121)	(0.0155)	(0.0112)
Crisis	-0.0292***	-0.0289***	-0.0236*	-0.0280***	-0.0313***	-0.0425***	-0.0372***
	(0.0067)	(0.0069)	(0.0117)	(0.0102)	(0.0055)	(0.0129)	(0.0128)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1) (p-value)					0.001	0.009	0.004
AR(2) (p-value)					0.576	0.502	0.822
Weak IV (p-value)					0.01/0.00/ 0.00	0.003/0.00/ 0.00	0.1/0.06/ 0.03
Over-id test (p-value)					0.499	0.142	0.351
# of instruments					34	20	22
# of countries	45	45	23	45	45	23	45
Observations	305	305	155	218	305	155	218
R-squared	0.5277	0.5395	0.5617	0.6195	--	--	--

Notes: Panel FE estimation results are reported in columns (1)-(4). Two-step system GMM results are reported in columns (5)-(7). Initial GDP, the terms of trade (TOT) growth, and private credit to GDP growth are considered endogenous or predetermined in columns (4)-(7). Weak IV test reports Sanderson-Windmeijer multivariate F test of excluded instruments for initial GDP, TOT growth, and growth of Prv. Credit/GDP, respectively. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%.

Table 2. Capital account policy and TFP growth: 5-year averaged data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable				TFP growth			
Method	Panel Within	Panel Within	Panel Within	Panel Within	System GMM	System GMM	System GMM
Sample	Full	Full	Emerging Markets	1985-2007	Full	Emerging Markets	1985-2007
Initial TFP	-0.0427***	-0.0415***	-0.0447***	-0.0552***	-0.0307***	0.0260	-0.0328**
	(0.0091)	(0.0090)	(0.0135)	(0.0121)	(0.0106)	(0.0266)	(0.0158)
Capital controls	0.0098***	0.0099***	0.0128**	0.0067	0.0063**	0.0110***	0.0087
	(0.0033)	(0.0033)	(0.0051)	(0.0055)	(0.0026)	(0.0034)	(0.0062)
d.Reserves to GDP	0.0772*	0.0014	-0.0024	-0.2560*	0.0129	-0.0947*	-0.1976
	(0.0454)	(0.0516)	(0.0666)	(0.1365)	(0.0395)	(0.0545)	(0.1432)
Capital controls		0.2319*	0.1942	0.7009**	0.2070**	0.4542**	0.4280
× d.Reserves to GDP		(0.1331)	(0.1590)	(0.2652)	(0.0947)	(0.1848)	(0.3196)
Private credit/GDP growth	-0.0009	-0.0005	-0.0011	0.0129	-0.0027	-0.0368	0.0072
	(0.0118)	(0.0118)	(0.0210)	(0.0169)	(0.0153)	(0.0317)	(0.0226)
Terms of trade growth	-0.0169	-0.0147	-0.0222	0.0304	0.0174	0.1341	0.1019***
	(0.0410)	(0.0397)	(0.0520)	(0.0333)	(0.0386)	(0.2356)	(0.0346)
Population growth	-0.5636***	-0.5706***	-0.8106***	-0.8941***	-0.4407***	-0.7587**	-0.4724***
	(0.1676)	(0.1686)	(0.2379)	(0.1986)	(0.1059)	(0.3546)	(0.1755)
Human capital	-0.0021	-0.0020	-0.0017	-0.0024	0.0007	0.0017	0.0009
	(0.0014)	(0.0015)	(0.0033)	(0.0018)	(0.0006)	(0.0013)	(0.0008)
Institution quality	0.0069	0.0053	0.0048	-0.0149	-0.0012	0.0066	-0.0060
	(0.0097)	(0.0095)	(0.0107)	(0.0106)	(0.0046)	(0.0111)	(0.0055)
Crisis	-0.0122***	-0.0122***	-0.0135**	-0.0073*	-0.0112***	-0.0197***	-0.0082**
	(0.0034)	(0.0033)	(0.0050)	(0.0039)	(0.0037)	(0.0052)	(0.0041)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1) (p-value)					0.000	0.006	0.000
AR(2) (p-value)					0.695	0.133	0.2
Weak IV (p-value)					0.13/0.00/ 0.05	0.16/0.00/ 0.14	0.13/0.03/ 0.07
Over-id test (p-value)					0.467	0.814	0.498
# of instruments					26	23	18
# of countries	45	45	23	45	45	23	45
Observations	305	305	155	218	305	155	218
R-squared	0.465	0.484	0.559	0.601	--	--	--

Notes: Panel FE estimation results are reported in columns (1)-(2). Two-step system GMM results are reported in columns (3)-(4). Initial GDP, the terms of trade (TOT) growth, and growth of private credit to GDP are considered endogenous or predetermined in columns (3)-(4). Weak IV test reports Sanderson-Windmeijer multivariate F test of excluded instruments for initial GDP, TOT growth, and growth of Prv. Credit/GDP, respectively. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%.

Table 3. Sectoral labor productivity growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dep. variable	Sectoral labor productivity growth									
	Agriculture	Mining	Manufacturing	Utilities	Construction	Trade Services	Transportation Services	Business Services	Government Services	Personal Services
Initial productivity	-0.0252*	-0.0319**	-0.0158	-0.0197***	-0.0448***	-0.0141	-0.0247***	-0.0590***	-0.0031	-0.0248
	(0.0132)	(0.0127)	(0.0101)	(0.0066)	(0.0133)	(0.0137)	(0.0083)	(0.0154)	(0.0066)	(0.0239)
Capital controls (CC)	0.0141*	-0.0074	-0.0090	0.0188*	0.0255**	0.0031	0.0155	0.0145	0.0120	-0.0095
	(0.0077)	(0.0217)	(0.0082)	(0.0111)	(0.0122)	(0.0067)	(0.0107)	(0.0168)	(0.0079)	(0.0132)
d.Reserves to GDP	-0.1088	0.5452	-0.3587	-0.0463	-0.4082	-0.2431	-0.2558	0.0488	-0.2245	0.2035
	(0.2193)	(0.5491)	(0.2445)	(0.1377)	(0.3613)	(0.1573)	(0.1935)	(0.1682)	(0.1692)	(0.6422)
CC × d.Reserves to GDP	0.2315	0.0024	1.1635***	0.4515	0.7205	0.6127**	0.2522	0.0501	-0.0350	-0.1466
	(0.3449)	(0.9823)	(0.4283)	(0.3055)	(0.6445)	(0.2883)	(0.3131)	(0.3141)	(0.3996)	(0.7655)
Growth of Private credit/GDP	-0.0964*	-0.0488	-0.0856**	-0.0160	0.0013	-0.0122	-0.0638**	0.1309***	0.0063	0.0889
	(0.0536)	(0.0674)	(0.0384)	(0.0450)	(0.0545)	(0.0294)	(0.0298)	(0.0439)	(0.0200)	(0.1103)
Terms of trade growth	-0.0032	-0.1149	0.0371	-0.0674	0.0940	0.0242	0.0699	0.0339	-0.0245	-0.1509
	(0.0493)	(0.0840)	(0.0496)	(0.0671)	(0.0950)	(0.0903)	(0.0515)	(0.1114)	(0.0410)	(0.2872)
Sectoral labor growth	-0.8802***	-0.9161***	-0.4103***	-0.9200***	-0.2666***	-0.7306***	-0.5891***	-0.7106***	-0.5114**	-0.6140**
	(0.0934)	(0.0779)	(0.0756)	(0.0431)	(0.0710)	(0.0922)	(0.1027)	(0.1226)	(0.1903)	(0.2365)
Human capital	0.0090**	0.0101	-0.0006	-0.0041	-0.0005	-0.0039	-0.0054	0.0007	0.0001	-0.0008
	(0.0039)	(0.0069)	(0.0032)	(0.0030)	(0.0040)	(0.0034)	(0.0038)	(0.0046)	(0.0033)	(0.0063)
Institution quality	-0.0112	0.0167	-0.0175	-0.0321**	-0.0019	-0.0454**	0.0281	-0.0068	0.0028	0.0063
	(0.0121)	(0.0394)	(0.0154)	(0.0135)	(0.0234)	(0.0208)	(0.0368)	(0.0275)	(0.0115)	(0.0366)
Crisis	-0.0210***	-0.0285*	-0.0220***	-0.0287***	-0.0373***	-0.0396***	-0.0224***	-0.0418**	-0.0087	-0.0132
	(0.0047)	(0.0167)	(0.0060)	(0.0063)	(0.0104)	(0.0079)	(0.0065)	(0.0164)	(0.0062)	(0.0109)
Country & Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	285	277	282	279	285	275	274	277	235	261
R-squared	0.781	0.678	0.560	0.818	0.393	0.607	0.537	0.634	0.665	0.240

Notes: Panel FE estimation results are reported. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%.

Table 4. Real exchange rate undervaluation and real GDP growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	RGDP growth						
	Panel FE	Panel FE	Panel FE	Panel FE	System GMM	Panel FE	Panel FE
	Full	Emerging markets	1985-2007	Full	Full	Alternative Underval1 (5 yrs avg.of log RER)	Alternative Underval2 (using GDP deflator)
Initial value	-0.0236**	-0.0555**	-0.0753***	-0.0298**	-0.0145	-0.0282*	-0.0311**
	(0.0115)	(0.0213)	(0.0221)	(0.0132)	(0.0131)	(0.0142)	(0.0131)
UNDERVAL	-0.0078	-0.0082	0.0166	-0.0078	0.0192	0.0018	0.0001
	(0.0149)	(0.0197)	(0.0206)	(0.0173)	(0.0355)	(0.0147)	(0.0190)
Growth of Private credit/GDP				0.0207	0.0681*	0.0239	0.0221
				(0.0277)	(0.0385)	(0.0273)	(0.0274)
Terms of trade growth				0.3013***	0.2463***	0.3855***	0.3023***
				(0.0602)	(0.0761)	(0.0624)	(0.0611)
Population growth				0.0749	-0.4366	0.0955	0.0642
				(0.4938)	(0.8204)	(0.4768)	(0.4959)
Human capital				0.0027	-0.0035	0.0035	0.0023
				(0.0038)	(0.0038)	(0.0037)	(0.0038)
Institution quality				-0.0198	-0.0233	-0.0409	-0.0174
				(0.0287)	(0.0237)	(0.0259)	(0.0289)
Crisis				-0.0299***	-0.0338***	-0.0262***	-0.0299***
				(0.0074)	(0.0069)	(0.0072)	(0.0072)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1) (p-value)					0.012		
AR(2) (p-value)					0.497		
Weak IV (p-value)					0.03/0.00/ 0.00/0.00		
Over-id test (p-value)					0.491		
# of instruments					19		
# of countries	44	22	44	44	44	45	44
Observations	301	151	213	298	298	310	298
R-squared	0.327	0.395	0.387	0.458	--	0.498	0.457

Notes: Two step system GMM results are reported in columns (5). Initial GDP, the terms of trade (TOT) growth, growth of private credit to GDP and UNDERVAL are considered endogenous or predetermined. Weak IV test reports Sanderson-Windmeijer multivariate F test of excluded instruments for initial GDP, TOT growth, growth of Prv. Credit/GDP, and UNDERVAL, respectively. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%.

Table 5. Captial account policy and its channels in manufacturing sectors

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variable	real VA share, manufacturing			Labor share, manufacturing		
Sample	Full	Emerging markets	1985-2007	Full	Emerging markets	1985-2007
Capital controls	0.0223	0.0218	0.0390***	0.0157	0.0244*	0.0141
	(0.0143)	(0.0180)	(0.0140)	(0.0116)	(0.0133)	(0.0156)
d.Reserves to GDP	-0.0985	-0.3033**	-0.4449**	-0.4894**	-0.5664**	-0.4401**
	(0.1457)	(0.1440)	(0.1897)	(0.1821)	(0.2354)	(0.2101)
Capital controls	0.5779*	0.8124**	1.2363**	0.5916*	0.5792	0.7883**
× d.Res to GDP	(0.3321)	(0.3373)	(0.5658)	(0.3432)	(0.3728)	(0.3424)
log rGDP per capita	-0.0098	0.0115	0.1965	0.3937***	0.4782***	0.4318***
	(0.1210)	(0.1725)	(0.1427)	(0.0733)	(0.1553)	(0.1013)
log rGDP per capita squared	0.0035	0.0014	-0.0079	-0.0203***	-0.0261***	-0.0234***
	(0.0068)	(0.0094)	(0.0074)	(0.0040)	(0.0082)	(0.0057)
Country & Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	292	146	209	293	150	210
R-squared	0.882	0.900	0.886	0.870	0.811	0.872

Notes: Panel FE estimation results are reported. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%.

Online Appendix for

Catching Up by 'Deglobalizing': Capital Account Policy and Economic Growth

By Bergin, Choi, and Pyun

A.1. A Simple theoretical framework

A.1.1. Model setup

This section provides a highly simplified theoretical rationale for the question studied in the empirical section. Consider a two-period, two-sector small open economy with no uncertainty. The economy produces and consumes goods in two sectors, traded and nontraded, both produced using labor as the sole input. Households have access to a domestic non-contingent bond that is traded purely domestically. We consider two alternative assumptions regarding the international asset market: either the household has access to an internationally traded non-contingent bond, or the asset market is fully closed, so domestic agents have no access to a global bond market.[22]

Households

Households solve the following two-period $(t = 0,1)$ utility maximization problem:

$$Max_{C_t^T,C_t^N,B_1,D_1^*}[ln(C_0^T) + \ln(C_0^N)] + \beta[ln(C_1^T) + \ln(C_1^N)] \tag{A1}$$

subject to
$$C_0^T + P_0^N C_0^N + B_1 \le W_0\ L_0\ + D_1^*, \tag{A2}$$

and
$$C_1^T + P_1^N C_1^N + (1 + r^*)D_1^* \le W_1 L_1 + (1 + r_1)B_1 + T_1. \tag{A3}$$

P_t^N is the price of home non-tradable goods in units of the numeraire traded good. Without trade frictions, the price of the traded good is equal to the (constant) world price of this good. D_1^* is external private debt, and B_1 is a domestic bond issued by the government, which only home agents can purchase. T_1 is a government transfer. To simplify the analysis and focus on the reallocation, we assume inelastic labor supply: $L_t = 1$ for $t = 0,1$.

First order conditions include the intratemporal choice between traded and nontraded goods:

$$P_t^N = \frac{C_t^T}{C_t^N} \qquad \text{for} \quad t = 0,1, \tag{A4}$$

and, for the case with international capital mobility, an intertemporal optimality condition:

[22] As in the analytical model of Jeanne (2013), we assume complete capital controls for the purpose of analytical tractability. A case with an occasionally binding capital control constraint would interact with learning-by-doing to significantly complicate analysis, making the intuition for results less transparent.

$$\frac{C_1^T}{C_0^T} = \beta(1 + r^*) = 1. \tag{A5}$$

The latter implies traded goods consumption is equalized across periods in this model if households have access to international debt. Alternatively, we can assume capital controls prevent household international asset trade, in which case the intertemporal optimality equation (A5) is replaced by: $D_1^* = 0$.

Firms

The firms maximize profits, defined as,[23]

$$Y_t^T - W_t \cdot L_t^T, \quad \text{and} \quad P_t^N Y_t^N - W_t \cdot L_t^N \quad \text{for} \quad t = 0, 1 \tag{A6}$$

where production functions are given by

$$Y_t^T = A_t L_t^T, \quad \text{and} \quad Y_t^N = L_t^N, \quad \text{for} \quad t = 0,1 \tag{A7}$$

and where A_t is the productivity for the home tradable goods sector. W_t is wage, and L_t^T and L_t^N are labor in home tradable and the non-tradable goods sectors, respectively. We assume that productivity at period zero is constant, $A_0 = \bar{A}_0$. However, following Michaud and Rothert (2014), we posit a learning-by-doing externality in the second period of the form:[24]

$$A_1 = A_0(2L_0^T)^{\vartheta},$$

where $\vartheta (> 0)$ is a learning-by-doing parameter, representing the elasticity of future productivity with respect to current labor supply. Aggregate labor allocated to the tradable goods sector in period 0 will enhance productivity in period 1. However, as each agent is infinitesimally small, this learning-by-doing is not internalized.

Profit maximization by nontraded goods firms implies the relative price of nontraded goods equals the wage rate:

$$P_t^N = W_t \quad \text{for} \quad t = 0,1. \tag{A8}$$

And profit maximization for traded goods firms implies the wage rate in turn is determined by productivity in the traded goods sector:

$$W_t = A_t \quad \text{for} \quad t = 0,1.$$

[23] As in Michaud and Rothert (2014), we assume firms do not make an intertemporal decision with discounting of future profits.

[24] We introduce a scaling factor of 2 to ensure that the argument inside the exponential is not less than unity in the case of no reserves policy, where it can be derived that equilibrium L_0^T=1/2. A value less than unity would imply negative productivity growth in the absence of government policy.

Together these two conditions imply that the relative price of nontraded goods is determined by the productivity level in the traded sector:

$$P_t^N = A_t \quad \text{for} \quad t = 0,1. \tag{A9}$$

Government

The government budget constraints are given by,

$$RSRV_1^* = B_1, \tag{A10}$$

and

$$(1 + r_1)B_1 + T_1 = (1 + r^*)RSRV_1^*, \tag{A11}$$

which combined determine the government transfer:

$$T_1 = (r^* - r_1)B_1, \tag{A12}$$

where $RSRV_1^*$ denotes international reserve accumulation. From these equations we can see that government is doing one single operation; managing capital flows with reserves. It accumulates reserves financed by issues of domestic bonds to domestic households, saves those externally, and pays those back to households with the interest earned in the next period.

Linking reserve accumulation to net exports

Resource constraints of the economy for nontraded goods, traded goods, and labor, are:

$$C_t^N = L_t^N \quad \text{for} \quad t = 0,1 \tag{A13}$$

$$C_0^T = A_0 L_0^T - (RSRV_1^* - D_1^*) \tag{A14}$$

$$C_1^{\mathrm{T}} = A_1 L_1^T + (1 + r^*)(RSRV_1^* - D_1^*) \tag{A15}$$

$$L_t^T + L_t^N = 1 \ \text{for} \quad t = 0,1. \tag{A16}$$

Equations (A14) and (A15) are found by combining budget constraints for household, firm and government, and netting out nontraded goods using condition (A13).

In this setting, net foreign asset position is $NFA_1 = RSRV_1^* - D_1^*$, which will also equal both the current account and trade balance (TB_0) in the initial period, given the assumption of no debt coming into the initial period. We can rewrite (A14):

$$TB_0 = A_0 L_0^T - C_0^T = RSRV_1^* - D_1^*. \tag{A14'}$$

This equation demonstrates that there is a one-to-one relationship between the level of reserve accumulation chosen by the government and a rise in the country's trade surplus, for a given level of private international debt.[25] The tighter the degree of capital control that restrains private international debt, the more tight will be this relationship. While the implications of reserve accumulation for the real exchange rate, summarized here in P_t^N, can easily be computed, the relationship between reserves policy and trade balance in the identity above does not depend on the degree of exchange rate depreciation.

A.1.2. Model equilibrium with no reserve accumulation or capital control

To establish a benchmark, consider a case with no capital account policy: suppose there is no reserve accumulation (with government choosing $RSRV_1^* = 0$), and suppose there is no capital control preventing private agents from purchasing foreign assets. The logic for the equilibrium under this policy configuration will be similar to that for the case in section 2.3 of the main text, where there likewise was no capital control restriction.

Given household access to the global financial market, traded good consumption follows the intertemporal Euler equation (5), which indicates intertemporal smoothing:

$$C_0^T = C_1^T.$$

Apply this conclusion to set equal to each other the right-hand sides of the resource constraints for each period (14) and (15), in the case where $RSRV_1^* = 0$:

$$Y_0^T + D_1^* = Y_1^T - (1 + r^*)D_1^*,$$

and solve for D_1^*:

$$D_1^* = -(Y_0^T - Y_1^T)/(2 + r^*).$$

This condition indicates that if traded goods output were constant across periods, then private foreign borrowing and trade balance in the initial period would be 0: $D_1^* = 0$ and $C_0^T = Y_0^T$.

We now verify this is an equilibrium allocation, by confirming the converse is also true: if $D_1^* = 0$ and the trade balance is zero, then there is no learning-by-doing, so traded goods output will be constant across periods.

The household intratemporal optimality condition (A4) implies that traded goods consumption will be:

$$C_0^T = P_0^N C_0^N.$$

Use the firm optimality condition (9) indicating that $P_0^N = \bar{A}_0$,

[25] Recall that since the model assumes no holding of foreign assets coming into the initial period, the trade balance equals the current account in the initial period. The model also assumes no unilateral transfers.

$$C_0^T = \bar{A}_0 C_0^N.$$

Use the market clearing conditions for nontraded goods (13) and labor (16) to write:

$$C_0^T = \bar{A}_0 L_0^N = \bar{A}_0(1 - L_0^T).$$

Substitute this into the traded goods resource constraint (14):

$$\bar{A}_0(1 - L_0^T) = \bar{A}_0 L_0^T + D_1^*.$$

Under the conjecture that $D_1^* = 0$, we solve for labor: $L_0^T = \frac{1}{2}$. This implies that productivity in the next period is:

$$A_1 = \bar{A}_0(2L_0^T)^{\vartheta} \quad = \bar{A}_0,$$

so there is no productivity change between periods.

Since the productivity is constant across periods, the equilibrium conditions for period 1 are the same as those for period 0 above. So we know that the labor allocation will be $L_1^T = \frac{1}{2}$. This is easily verified below.

Just as in period 0, the household intratemporal optimality condition (A4) implies that traded goods consumption in period 1 will be:

$$C_1^T = P_1^N C_1^N.$$

Use the firm optimality condition (9) indicating that $P_1^N = W_1 = A_1$, and since here $A_1 = \bar{A}_0$,

$$C_1^T = \bar{A}_0 C_1^N.$$

Use the market clearing conditions for nontraded goods (13) and labor (16) to write:

$$C_1^T = \bar{A}_0 L_1^N = \bar{A}_0(1 - L_1^T).$$

Substitute this into the traded goods resource constraint (14) under the condition above that $D_1^* = 0$:

$$\bar{A}_0(1 - L_1^T) = \bar{A}_0 L_0^T.$$

Solve for labor: $L_1^T = \frac{1}{2}$. So $Y_1^T = \frac{\bar{A}_0}{2} = Y_0^T$. This confirms that output is the same across periods. And it confirms our conjectured solution, with $D_1^* = 0$ and $L_0^T = L_1^T = \frac{1}{2}$.

A.1.3. Reserve accumulation with full capital controls

This section motivates the main claims we test in the empirical section, that reserve accumulation promotes learning-by-doing by reallocating labor to the traded goods sector.

Suppose complete capital controls ($D_1^* = 0$). The resource constraint for traded goods for period 0, Equation (A14) then becomes:

$$C_0^T = \bar{A}_0 L_0^T \ - RSRV_1^*. \quad \text{(A17)}$$

The household intratemporal condition (4) implies that traded goods consumption will be $C_0^T = P_0^N C_0^N$. Use the firm optimality condition (9), indicating that $P_0^N = \bar{A}_0$, to conclude $C_0^T = \bar{A}_0 C_0^N$. Then, use the market clearing conditions for nontraded goods (A13) and labor (16) to write:

$$C_0^T = \bar{A}_0 L_0^N = \bar{A}_0(1 - L_0^T) \quad \text{(A18)}$$

Substitute (18) into (17): $\bar{A}_0(1 - L_0^T) = \bar{A}_0 L_0^T \ - RSRV_1^*$. Then solve for L_0^T:

$$L_0^T = \frac{1}{2} + \frac{RSRV_1^*}{2\bar{A}_0} \ . \quad \text{(A18')}$$

From (A18'), we know: $\frac{\partial L_0^T}{\partial RSRV_1^*} > 0$. Given fixed productivity in period 0, this directly implies higher traded goods production in period 0.

Growth in productivity in the traded sector is: $g = \frac{A_1}{\bar{A}_0} = (2L_0^T)^{\vartheta} \ = \left(1 + \frac{RSRV_1^*}{\bar{A}_0}\right)^{\vartheta}$. Thus, $\frac{\partial g}{\partial RSRV_1^*} > 0$. This clearly shows that a higher value of reserve accumulation implies a higher share of labor allocated to the traded sector in period 0, a higher level of traded output in period 0, and most importantly, a higher rate of productivity growth in the traded goods sector.

Lastly, we highlight that the equilibrium condition (A9) implies that in the initial period, where traded productivity was specified to be constant at $A_0 = \bar{A}_0$, the relative price of nontraded goods is likewise constant: $P_0^N = \bar{A}_0$. This result is notable since the relative price of nontraded goods is a common metric of the real exchange rate in a small open economy environment. It implies that even as the reserves policy is successfully engineering a trade surplus and reallocation of labor toward the traded sector, this process does not require a devaluation of the real exchange rate in this particular model setting. As discussed in section 2 of the main text, this result comes from the fact that the price of traded goods and nontraded goods are linked by a common wage rate paid to labor that is mobile between sectors, and the fact that under a linear production function, labor reallocation between sectors does not alter, per se, the marginal product of labor in a sector. As discussed in section 2 of the main text, under a nonlinear specification of production, it is entirely possible that reserve accumulation would imply devaluation of the exchange rate. But the result here demonstrates that such an implication for the real exchange rate is not necessary. This theoretical observation helps motivate our empirical specification focusing on changes in reserves as the independent variable, rather than exchange rate undervaluation, which may or may not be present in a particular case.

A.1.4. Reserve accumulation without capital controls:

We present this section to demonstrate that reserve accumulation must be paired with capital controls or some type of capital market friction in order to imply productivity improvement in our model. The logic of our argument will be, first, to show that if output is constant across periods, then consumption smoothing dictates that private agents adjust private international debt to exactly offset the effect of government reserves accumulation on the trade balance. Second, we then verify that in a case with a zero trade balance, this implies no learning-by-doing, so it indeed implies the constant level of traded goods output across sectors assumed in the first step.

Suppose that the government engages in reserve accumulation, but there is no capital control preventing domestic households from accruing international debt or other financial market friction preventing the capital market from being efficient. Given household unimpeded access to the global financial market, traded goods consumption follows the intertemporal optimality condition (A5), which indicates intertemporal smoothing: $C_0^T = C_1^T$.

Apply this conclusion to set equal to each other the right-hand sides of the resource constraints for traded goods for each period (14) and (15):

$$Y_0^T \quad - (RSRV_1^* - D_1^*) = Y_1^T + \quad (1+r^*)(RSRV_1^* - D_1^*), \tag{A19}$$

and solve for $D_1^* = RSRV_1^* - \frac{Y_0^T - Y_1^T}{(2+r^*)}$. This condition indicates that if traded good output were constant across periods, then private foreign borrowing would exactly offset government reserve accumulation, and trade balance in the initial period would be 0: $RSRV_1^* - D_1^* = 0,\ C_0^T = Y_0^T$.

We now verify this is an equilibrium allocation, by confirming the converse is also true: if $RSRV_1^* - D_1^* = 0$ and the trade balance is zero, then there is no learning-by-doing, so traded goods output will be constant across periods. The household intratemporal optimality condition (A4) implies that traded goods consumption will be: $C_0^T = P_0^N C_0^N$. Use the firm optimality condition (A9) indicating that $P_0^N = \bar{A}_0$, to write $C_0^T = \bar{A}_0 C_0^N$. Use the market clearing conditions for nontraded goods (A13) and labor (A16) to write: $C_0^T = \bar{A}_0 L_0^N = \bar{A}_0(1 - L_0^T)$. Substitute this into the traded goods resource constraint (A14): $\bar{A}_0(1 - L_0^T) = A_0 L_0^T \quad - (RSRV_1^* - D_1^*)$. Under the condition found above that $RSRV_1^* - D_1^* = 0$, this becomes: $\bar{A}_0(1 - L_0^T) = A_0 L_0^T$. Solving for labor: $L_0^T = \frac{1}{2}$. This implies that productivity in the next period is: $A_1 = \bar{A}_0(2L_0^T)^{\vartheta} \;\; = \bar{A}_0,$ so there is no productivity change between periods.

Steps to derive equilibrium labor allocated to the traded goods sector in period 1 mirror those for period 0. The household intratemporal optimality condition (A4) implies that traded goods consumption in period 1 will be: $C_1^T = P_1^N C_1^N$. Use the firm optimality condition (A8) indicating that $P_1^N = A_1$, and the fact that $A_1 = \bar{A}_0$ to conclude $C_1^T = \bar{A}_0 C_1^N$. Use the market clearing conditions for nontraded goods (A13) and labor (A16) to write: $C_1^T = \bar{A}_0 L_1^N = \bar{A}_0(1 - L_1^T)$. Substitute this into the traded goods resource constraint (A14) under the condition above that $RSRV_1^* - D_1^* = 0$: $\bar{A}_0(1 - L_1^T) = \bar{A}_0 L_0^T$. Solve for labor: $L_1^T = \frac{1}{2}$.

Since the productivity is constant across periods, the equilibrium conditions for period 1 are the same as those for period 0 above. With both productivity and labor inputs constant across periods, traded output is constant across periods. Combined with the result of step one above, this confirms that private holding of debt will offset official reserve accumulation ($D_1^* = -RSRV_1^*$), and hence, the equilibrium with no capital controls is unaffected by reserve accumulation.

A.2. Data Construction

For real GDP, TFP growth and real undervaluation, we incorporate *Penn World Table* 10. More specifically, we use *rgdpo* as our baseline gdp measure and use *rtfpna* for tfp measure. For the real exchange rate, we incorporate *PL_CON* divided by the nominal exchange rate to USD as our baseline measure.

For sectoral value added, price index, and labor, we construct our data from multiple different sources; Groningen Growth and Development Centre (GGDC) 10-sector, Economic Transformation Database (ETD), EU KLEMS, KLEMS (WIWW), World Input Output Database (WIOD), and OECD structural Analysis Database (STAN). In general, there are slight discrepancies between data, possibly due to different revisions (for example, ISIC Rev.3 and ISIC Rev.4) or accounting norms. Thus, we construct the series by its growth rate while merging series from different sources. We calculate real value added by deflating nominal value added by price indices (except for Groningen Growth and Development Centre (GGDC) 10-sector, Economic Transformation Database). To aggregate price indices from the disaggregate sector, we utilize the weights of nominal value added. And to maximize our coverage, we directly incorporate nominal value added and the deflator, instead of incorporating gross output and intermediate input using respective price indices. We note that nominal value added is denominated in current national currencies (millions). Price deflator index is re-anchored at 1995=100. For labor, we use the number of employees or the number of employment engaged (thousands), depending on the data availability.

For EU KLEMS, we take EU KLEMS Growth and Productivity Accounts, March 2007 Release as our benchmark, and update the data with The Vienna Institute for International Economics Studies (WIIW) Productivity data 2022.[26][27] The sectoral data is constructed based on ISIC Rev.3. For the manufacturing sector, we aggregate the industries of 15t16 to 36t37, or industry C.

Groningen Growth and Development Centre (GGDC) 10-sector data (2014 release) comes with three variables, VA, QVA, and EME, which stands for value-added, value added at constant 2005 prices, and persons engaged.[28,29] We supplement the data with Economic Transformation

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[26] http://www.euklems.net/.

[27] https://euklems.eu/archive-history/download-archive/?doing_wp_cron=1674302780.6924459934234619140625

[28] https://www.wider.unu.edu/project/etd-economic-transformation-database

[29] https://www.rug.nl/ggdc/productivity/10-sector.

Database (ETD), which is the successor of the Groningen Growth and Development Centre (GGDC) 10-sector data. The data disaggregates business service sector into business services, financial services, and real estate services. So we aggregate these sectors into business service to make the series consistent with the predecessor. Sectoral deflator is calculated by dividing VA with QVA. We use persons engaged (EME) for our measure for labor.

We take November 2016 release of World Input Output Database(WIOD) as our baseline benchmark, and then supplement the WIOD July 2014 release.[30,31] For the manufacturing sector, we aggregate C10-C12 to C33 of ISIC Rev.4 code; and 15t16 to 36t37 of ISIC Rev.3 code.

Lastly, we combine STAN from the OECD data for Norway, Switzerland, New Zealand, Iceland, and Israel.[32] We use SNA08, ISIC Rev.4 data as our benchmark data and supplement with SNA93, ISIC Rev.3 data if needed. For the manufacturing sector, we aggregate D10T33 of ISIC Rev.4 code; and 15tt37 of ISIC Rev.3 code. Table A1 shows the list of the countries.

Reference:

Timmer, P.M., Dietzenbacher, E., Los, B., Stehrer, R., de Vries, G.J., 2015. An illustrated guide to the world input-output database: the case of global automotive production. *Review of International Economics* 23(3), 575–605.

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[30] http://www.wiod.org/home.
[31] Please see Timmer et al. (2015) for further details.
[32] http://www.oecd.org/industry/ind/stanstructuralanalysisdatabase.

Table A1. Sample countries

Advanced countries		Emerging market countries	
Country	Data Source (WDI, PWT for growth, WIOD, KLEMS for Sectoral Data)	Country	Data Source (WDI, PWT for growth, WIOD, KLEMS for Sectoral Data)
	WDI, PWT (1985-2019)		WDI, PWT (1985-2019)
Australia	WIOD (1995-2014)	Argentina	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Austria	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Bolivia	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Belgium	KLEMS (1985-2004), KLEMS (WIIW) (2005-2018)	Brazil	GGDC (1990-2004), GGDC (ETD) (2005-2018)
Canada	WIOD (1995-2014)	Chile	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Denmark	KLEMS (1985-2004), KLEMS (WIIW) (2005-2018)	China	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Finland	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Colombia	GGDC (1985-2004), GGDC (ETD) (2005-2018)
France	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Costa Rica	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Germany	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Cyprus	KLEMS(WIWW) (1995-2019)
Greece	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Egypt	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Iceland	STAN (1991-2019)	Hong Kong	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Ireland	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	India	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Italy	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Indonesia	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Japan	KLEMS (1985-2004), KLEMS (WIIW) (2005-2018)	Israel	STAN (1995-2018)
Netherlands	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Korea	GGDC (1985-2004), GGDC (ETD) (2005-2018)
New Zealand	STAN (1989-2018)	Malaysia	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Norway	STAN (1985-2018)	Mexico	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Portugal	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Peru	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Spain	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Philippines	GGDC (1985-2004), GGDC (ETD) (2005-2018)
Sweden	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Russia	WIOD (1995-2014)
Switzerland	STAN (1991-2018)	Singapore	GGDC (1985-2004), GGDC (ETD) (2005-2011)
United Kingdom	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Thailand	GGDC (1985-2004), GGDC (ETD) (2005-2018)
United States	KLEMS (1985-2004), KLEMS (WIIW) (2005-2019)	Turkiye	GGDC (1990-2004), GGDC (ETD) (2005-2018)
		Venezuela	GGDC (1985-2004), GGDC (ETD) (2005-2010)

Notes: We utilize Penn World Table for GDP, TFP, and population; World Development Indicator or Global Financial Development, World Bank for private credit, and terms of trade. We exclude extreme outliers, such as Venezuela having more than 70% drops in *gdpo*. However, our results are broadly robust with these outliers included.

Table A2. Summary statistics data for 45 countries, 1985-2019

Variable	Obs.	Mean	Std. Dev.	Min	Max
Growth Regression (5 year Averaged)					
Real GDP growth (average)	305	4.0001	3.0783	-5.0538	19.9268
TFP growth (average)	305	0.4023	1.2910	-4.2204	6.1972
Capital controls	305	0.3099	0.3368	0.0000	1.0000
d.Reserves to GDP	305	0.2517	1.5835	-6.0133	10.0421
Private credit to GDP growth	305	1.4071	5.1397	-27.4674	29.4000
Terms of trade growth	305	0.2165	3.1718	-11.4654	26.9232
Population growth	305	1.0418	0.7362	-0.4970	3.4619
Human capital	305	9.4606	2.2427	3.0290	13.2750
Institutional quality	305	1.8722	0.2942	0.6710	2.2116
Crisis	305	0.1532	0.2776	0.0000	1.0000
Manufacturing Share Regression (5 year Averaged)					
Labor Share of Manufacturing (%)	291	14.751	4.464	2.988	28.222
rVA Share of Manufacturing (%)	290	20.754	7.040	1.991	45.492

Notes: GDP and TFP are from Penn World Table (gdpo, rtfpna). Capital control index is from Chinn-Ito measures. All other variables are from IMF *International Financial Statistics* (IFS), World Bank *World Development Indicator* (WDI), or *Global Financial Development Database*. The quality of institutions is constructed based on the Economic Freedom in the World database, following Estevadeordal and Taylor (2013). Human capital index is from Barro and Lee (2013), and Crisis index is from Laeven and Valencia (2020).

Table A3. Robustness check for Table 1

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	RGDP growth					
Method	Panel Within	Panel Within	Panel Within	System GMM	System GMM	System GMM
Sample	Sparse controls	w/ private credit and TOT growth only	Excluding insignificant controls from Table 1	Sparse controls	w/ private credit and TOT growth only	Excluding insignificant controls from Table 1
Initial GDP	-0.0156	-0.0133	-0.0161	-0.0855	-0.0159	0.0016
	(0.0096)	(0.0087)	(0.0100)	(0.1142)	(0.0122)	(0.0159)
Capital controls	0.0058	-0.0016	0.0073	0.0093	0.0124	0.0078
	(0.0134)	(0.0090)	(0.0086)	(0.0440)	(0.0109)	(0.0086)
d.Reserves to GDP	-0.4025*	-0.3544*	-0.4048*	-0.6071***	-0.5660**	-0.4210**
	(0.2356)	(0.2023)	(0.2233)	(0.2314)	(0.2412)	(0.1817)
Capital controls	0.5620	0.7150*	0.8363**	1.4246**	1.2803***	1.1035***
× d.Reserves to GDP	(0.5744)	(0.3835)	(0.3924)	(0.6717)	(0.4225)	(0.3963)
Private credit/GDP growth		0.0320	--		-0.0208	--
		(0.0267)			(0.0961)	
Terms of trade growth		0.4455***	0.3850***		0.5823***	0.4105***
		(0.0688)	(0.0650)		(0.1383)	(0.1496)
Population growth			--			--
Human capital			--			--
Institution quality			-0.0465*			-0.0292**
			(0.0262)			(0.0142)
Crisis			-0.0295***			-0.0330***
			(0.0065)			(0.0063)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
AR(1) (p-value)				0.694	0.001	0.000
AR(2) (p-value)				0.496	0.470	0.586
Weak IV (p-value)				0.53	0.42/0.03/0.32	0.22/0.12
Over-id test (p-value)				0.338	0.176	0.682
# of instruments				16	28	24
# of countries	45	45	45	45	45	45
Observations	308	305	308	308	305	308
R-squared	0.309	0.484	0.535	--	--	--

Notes: Panel FE estimation results are reported in columns (1)-(3). Two-step system GMM results are reported in columns (4)-(6). Initial GDP, the terms of trade (TOT) growth, and private credit to GDP growth are considered endogenous or predetermined in columns (4)-(6). Weak IV test reports Sanderson-Windmeijer multivariate F test of excluded instruments for initial GDP, TOT growth, and growth of Prv. Credit/GDP, respectively. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%.

A.3. Robustness: considering endogeneity

We further check the robustness of our results by incorporating an instrumental variable for reserve changes. Table A4 helps address endogeneity by pursuing a more flexible specification for the system GMM by considering not only initial GDP, the terms of trade growth, and growth of private credit to GDP, but also changes in reserves to GDP and its interaction term with capital controls as endogenous or predetermined. Here we simply use the lagged values of each endogenous variable as IVs. Table A4 includes real GDP and TFP growth as the dependent variable. In column (1) of Table A4, the estimated coefficients on the interaction terms of capital control and changes in reserves to GDP are significantly positive. Column (2) shows results for emerging market countries. Although our capital control index is persistent and (exogenously) shaped by policy regulation, we attempt to consider a possible endogeneity of capital controls for the sample. Again the results for the emerging market sample in column (2) are consistent with those in column (1). Columns (3) and (4) show the similar results for TFP growth.

Table A4. Robustness: System GMM considering d.(Res./GDP) as an endogenous variable

	(1)	(2)	(3)	(4)
Dependent variable	rGDP Growth		TFP Growth	
Specifications	Full	Emerging mkt.	Full	Emerging mkt.
Endogenous vars.	Initial GDP/TFP, TOT growth, Prv. credit/GDP growth, CC, d.(Res./GDP), and CC×d.(Res./GDP)			
Initial GDP/TFP	-0.0049	0.0047	-0.0352**	-0.0121
	(0.0061)	(0.0149)	(0.0141)	(0.0289)
Capital Controls	0.0226	0.0661*	0.0165*	0.0134
	(0.0147)	(0.0388)	(0.0085)	(0.0091)
d.Reserves to GDP	-0.2470	-0.7379***	-0.1201	-0.2745
	(0.2511)	(0.2008)	(0.1327)	(0.2051)
Capital controls	0.6268*	1.0695**	0.3004*	0.8484*
× d.Reserves to GDP	(0.3754)	(0.4337)	(0.1549)	(0.4629)
Private Credit to GDP	0.0058	-0.0300	-0.0308	0.0165
Growth	(0.0355)	(0.0782)	(0.0523)	(0.0494)
TOT growth	0.3173***	0.3101**	-0.0757	0.0213
	(0.0802)	(0.1513)	(0.0699)	(0.1265)
Population Growth	0.0607	1.0234	-0.4070***	0.2797
	(0.3828)	(1.0136)	(0.1489)	(0.8486)
Human Capital	-0.0011	0.0050	0.0014	0.0027*
	(0.0023)	(0.0053)	(0.0010)	(0.0015)
Institutional Quality	-0.0240**	-0.0137	0.0005	0.0029
	(0.0096)	(0.0236)	(0.0054)	(0.0074)
Crisis	-0.0395***	-0.0506***	-0.0128***	-0.0138**
	(0.0077)	(0.0143)	(0.0050)	(0.0068)
Country FE	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes
AR(1) (p-value)	0.001	0.01	0.000	0.002
AR(2) (p-value)	0.672	0.415	0.685	0.202
Weak IV (p-value)	0.74/0.74/0.6/ 0.008/0.45/0.6	0.21/0.18/0.04/ 0.00/0.07/0.00	0.44/0.44/0.01/ 0.29/0.28/0.02	0.01/0.00/0.22/ 0.1/0.22/0.27
Over-id test (p-value)	0.523	0.1	0.1	0.845
# of instruments	41	23	39	29
# of countries	45	23	45	23
Observations	305	155	305	155

Notes: Two-step system GMM results are reported in columns (1)-(4). Initial GDP, the terms of trade growth and private credit to GDP growth, capital controls, d.(Res./GDP) and their interaction term are considered endogenous or predetermined in columns (1)-(4). Weak IV test reports Sanderson-Windmeijer multivariate F test of excluded instruments for initial GDP, TOT growth, growth of Prv. Credit/GDP, CC, d.(Res./GDP), and d.(Res./GDP)×CC, respectively. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%.

Table A5. Sectoral labor productivity growth (system GMM)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable	Sectoral labor productivity growth									
	Agriculture	Mining	Manufacturing	Utilities	Construction	Trade Services	Transportation Services	Business Services	Government Services	Personal Services
Initial productivity	0.0055	0.0047	0.0153	0.0176**	-0.0203*	0.0170	0.0136***	-0.0097	0.0097	-0.0001
	(0.0060)	(0.0115)	(0.0116)	(0.0070)	(0.0120)	(0.0104)	(0.0051)	(0.0379)	(0.0166)	(0.0108)
Capital controls (CC)	0.0075	0.0229	-0.0355	-0.0087	0.0430*	-0.0120	0.0104	0.0599	0.0179	0.0193
	(0.0103)	(0.0395)	(0.0272)	(0.0199)	(0.0236)	(0.0198)	(0.0202)	(0.0640)	(0.0234)	(0.0145)
d.Reserves to GDP	-0.3752	0.3520	-0.1246	-0.1298	-0.1421	-0.3863	-0.4066*	0.2360	-0.1931	-0.1310
	(0.5850)	(0.5273)	(0.2026)	(0.1976)	(0.3357)	(0.2410)	(0.2224)	(0.5827)	(0.4585)	(0.2845)
CC × d.Reserves to GDP	0.5737	-0.0917	0.7898**	0.2305	0.7489	0.7644*	0.2314	-0.2520	0.0591	0.2534
	(0.7976)	(0.9161)	(0.3395)	(0.3128)	(0.7148)	(0.4557)	(0.4134)	(0.8337)	(0.8207)	(0.9418)
Growth of Private credit/GDP	-0.0832	-0.1183	-0.0790	-0.0251	0.0765	-0.0031	-0.0352	0.1826**	0.0012	0.0307
	(0.0594)	(0.0850)	(0.0598)	(0.0359)	(0.0726)	(0.0352)	(0.0490)	(0.0796)	(0.0494)	(0.0611)
terms of trade growth	0.0093	0.0201	0.0669	-0.1058	0.1140	0.1370	0.0233	-0.0952	-0.0931	-0.3809
	(0.0817)	(0.1595)	(0.0832)	(0.0785)	(0.1286)	(0.0995)	(0.0745)	(0.1743)	(0.0813)	(0.5095)
Population growth	-1.0177***	-0.9336***	-0.4573***	-0.9793***	-0.2766***	-0.7114***	-0.7577***	-0.7742***	-0.6005***	-0.6693***
	(0.0475)	(0.0585)	(0.1433)	(0.0453)	(0.0926)	(0.1183)	(0.1552)	(0.1483)	(0.2029)	(0.2252)
Human capital	-0.0013	-0.0052	-0.0072	-0.0064**	0.0050	-0.0057	-0.0054**	-0.0017	-0.0046	-0.0026
	(0.0026)	(0.0070)	(0.0062)	(0.0029)	(0.0048)	(0.0044)	(0.0025)	(0.0080)	(0.0044)	(0.0044)
Institution quality	-0.0304*	-0.0166	-0.0218	-0.0455**	0.0260	-0.0374	-0.0263	-0.0011	-0.0161	0.0116
	(0.0179)	(0.0461)	(0.0302)	(0.0193)	(0.0439)	(0.0286)	(0.0224)	(0.0902)	(0.0372)	(0.0195)
Crisis	-0.0213***	-0.0272	-0.0178**	-0.0273***	-0.0437***	-0.0420***	-0.0305***	-0.0547**	-0.0203**	-0.0281**
	(0.0069)	(0.0189)	(0.0085)	(0.0080)	(0.0141)	(0.0107)	(0.0085)	(0.0259)	(0.0090)	(0.0119)
Country & Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)/ AR(2) (p-value)	0.003/0.44	0.003/0.74	0.000/0.5	0.011/0.920	0.001/0.564	0.000/0.06	0.002/0.52	0.23/0.12	0.089/0.83	0.38/0.601
Weak IV (# of valid instruments, p-val<0.1)	0.04/0.0/0.0	0.29/0.03/0.00	0.08/0.00/0.00	0.12/0.00/0.00	0.86/0.85/0.51	0.23/0.06/0.00	0.15/0.00/0.00	0.11/0.00/0.00	0.1/0.00/0.003	0.99/0.99/0.98
Over-id test (p-value)	0.142	0.178	0.203	0.953	0.2	0.139	0.19	0.342	0.35	0.08
# of instruments	26	26	26	26	26	26	26	26	26	26
# of countries	44	43	44	44	44	43	44	44	37	42
Observations	285	277	282	279	285	275	274	277	235	262

Notes: Two-step system GMM results are reported in all columns. Initial productivity, the terms of trade (TOT) growth, and growth of private credit to GDP are considered endogenous variables. Weak IV test reports Sanderson-Windmeijer multivariate F test of excluded instruments for initial productivity, TOT growth, and growth of Prv.credit/GDP, respectively. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%.

A.4. Comparison with Real Exchange Rate Undervaluation

Rodrik (2008)'s index of under- or overvaluation uses a measure of the domestic price level adjusted for the Balassa-Samuelson effect—in practice, nontradable goods are cheaper in poorer countries. First, we collect data on exchange rates (*XR*) and purchasing power parity conversion factors (*PPP*) from the *Penn World Table (PWT)* to calculate a "real" exchange rate (*RER*) for country i in period t: $\ln(RER_{it}) = \ln\left(\frac{XR_{it}}{PPP_{it}}\right)$, where *XR* and *PPP* are expressed as national currency units per U.S. dollar. In the *Penn World Table (PWT)*, the consumption price level, equal to the PPP exchange rate divided by the nominal exchange rate (PL_CON), is available. Thus, *RER* is the inverse of PL_CON. For the robustness check, we also use the output price level (PL_GDP) to compute *RER*. A country *i*'s *RER* greater than one indicates that the currency value is lower (more depreciated) than indicated by PPP.

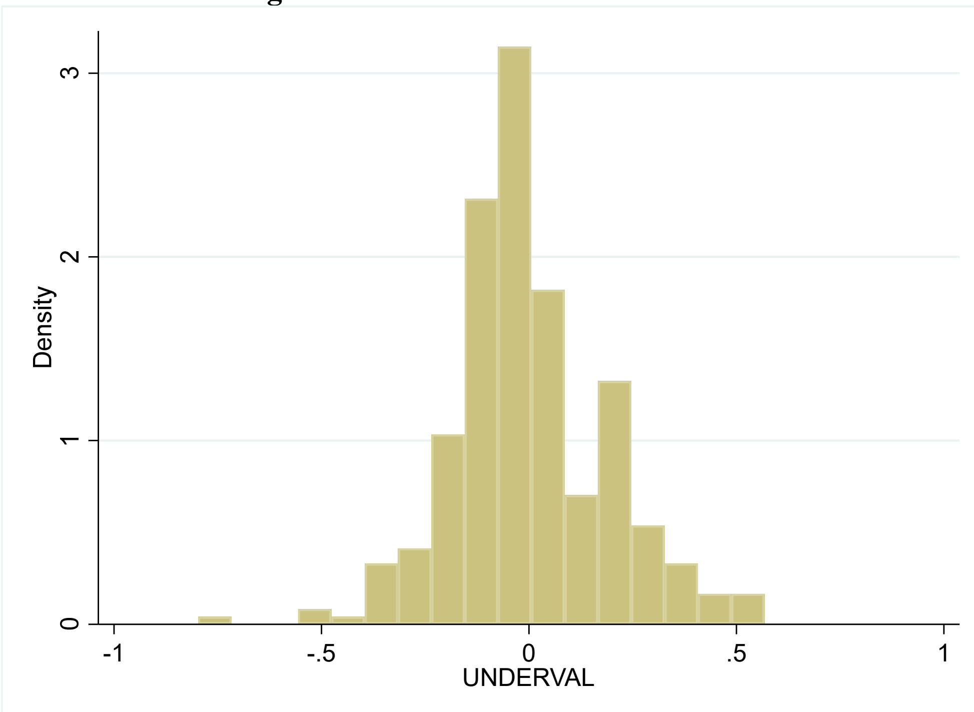
We then account for the Balassa-Samuelson effect by regressing log of *RER* on log of real GDP per capita (*RGDPPC*): $\ln(RER_{it}) = \alpha + \beta\ \ln(RGDPPC_{it}) + \rho_t + u_{it}$, where ρ_t is a period fixed effect and u_{it} is the error term. This regression yields an estimate of β ($\hat{\beta}$ of −0.42 with a high *t* statistic of around 43). Note that Rodrik (2008) gives the β coefficient, −0.24. Our results suggest a strong estimated Balassa-Samuelson effect: when incomes rise by 1 percent, the *RER* falls by around 0.42 percent. Finally, to obtain the index of undervaluation, we take the difference between the actual real exchange rate and the Balassa-Samuelson-adjusted rate, which is the predicted value of $\ln(\widehat{RER}_{it})$ from the above *RER* and *RDGPPC* regression:

$$UNDERVAL = \ln(RER_{it}) - \ln(\widehat{RER}_{it}).$$

UNDERVAL is comparable across countries and over time, which is centered at zero and has a standard deviation of 0.2 See Figure A1 below. *UNDERVAL* greater than zero indicates that the exchange rate is set such that goods produced at home are relatively cheap in dollar terms: the currency is undervalued.

Along with the results of GDP growth with real exchange rate undervaluation in Table 4, further evidence of a relative disadvantage of using currency undervaluation as a regressor comes from regressions with TFP. As shown in Table A6, we are not able to find little significant positive effect of currency undervaluation on TFP growth for any alternative measures or regression specifications. This result contrasts with our main results in Table 1.

Figure A1. Distribution of undervaluation measures



Notes: Undervaluation measure by Rodrik (2008) is calculated. Deviation of real exchange rate from Real GDP per capita and period fixed effects are calculated.

Table A6. Real exchange rate undervaluation and TFP growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	TFP growth						
	Panel FE	Panel FE	Panel FE	Panel FE	System GMM	Panel FE	Panel FE
	Full	Emerging markets	1985-2007	Full	Full	Alternative Underval1 (5 yrs avg. of log RER)	Alternative Underval2 (using GDP deflator)
Initial value	-0.0545***	-0.0584***	-0.0810***	-0.0440***	-0.0395***	-0.0450***	-0.0434***
	(0.0087)	(0.0112)	(0.0130)	(0.0084)	(0.0107)	(0.0088)	(0.0084)
UNDERVAL	0.0064	0.0024	0.0091	0.0066	0.0083	0.0055	0.0046
	(0.0058)	(0.0070)	(0.0068)	(0.0061)	(0.0098)	(0.0046)	(0.0057)
Growth of Private credit/GDP				-0.0049	0.0117	-0.0060	-0.0049
				(0.0107)	(0.0122)	(0.0113)	(0.0109)
Terms of trade growth				0.0474*	0.0530	-0.0070	0.0469*
				(0.0276)	(0.0379)	(0.0369)	(0.0278)
Population growth				-0.5534***	-0.3269***	-0.5531***	-0.5591***
				(0.1815)	(0.0866)	(0.1788)	(0.1844)
Human capital				-0.0014	-0.0001	-0.0023	-0.0013
				(0.0017)	(0.0005)	(0.0016)	(0.0017)
Institution quality				0.0028	-0.0002	0.0092	0.0018
				(0.0141)	(0.0042)	(0.0111)	(0.0140)
Crisis				-0.0078**	-0.0076***	-0.0098***	-0.0078**
				(0.0031)	(0.0027)	(0.0035)	(0.0031)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1) (p-value)					0.000		
AR(2) (p-value)					0.332		
Weak IV (p-value)					0.02/0.02/0.00/0.00		
Over-id test (p-value)					0.623		
# of instruments					19		
# of countries	44	22	44	44	44	45	44
Observations	300	150	212	297	297	309	297
R-squared	0.423	0.508	0.513	0.483	--	0.469	0.480

Notes: Two step system GMM results are reported in columns (5). Initial GDP, the terms of trade (TOT) growth, growth of private credit to GDP and UNDERVAL are considered endogenous or predetermined. Weak IV test reports Sanderson-Windmeijer multivariate F test of excluded instruments for initial GDP, TOT growth, growth of Prv. Credit/GDP, and UNDERVAL, respectively. Clustered robust standard errors at the country level are reported in parentheses. *, ** and *** are the significance level at 10%, 5% and 1%. Venezuela's UNDERVAL is missing.