The End of Currency Manipulation? Global Production Networks and Exchange Rate Outcomes

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Abstract

Between 2000 and 2017, eight major exporting countries engaged in currency manipulation in order to increase their trade surpluses with the rest of the world. As of 2018, however, no country continued to manipulate its currency. This change in policy is puzzling given the past successes of this export-led growth model. I argue that the state-level decision to stop depreciating its exchange rate stems from the reduced benefits and increased costs of currency manipulation. As production becomes more global, the increase in traded inputs decreases the traditional benefits of a depreciated currency, in particular, an increase in exports. Utilizing panel data across 70+ states between 2000 and 2018, I demonstrate that global production networks moderate the traditional relationship between export-dependence and currency manipulation. I further discuss how this relationship may reverse given the reshoring of production networks in response to the novel coronavirus pandemic.

Keywords: global production networks, currency manipulation, undervaluation, intermediate trade

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Introduction

For decades, export-dependent states gained a competitive edge in international trade by running a depreciated exchange rate, much to the ire of states enduring prolonged trade deficits. These neomercantilist states intervened heavily in foreign exchange markets in order to decrease (or stop the appreciation of) the value of their currencies (Levy-Yeyati, Sturzenegger and Gluzmann, 2013). Between 2000 and 2017, eight export-dependent states utilized this development strategy to increase their trade surpluses with the rest of the world: China, Israel, Japan, Malaysia, South Korea, Sweden, Taiwan, and Thailand. In 2007, at the height of contemporary currency manipulation, China, Malaysia, and Thailand purchased a combined $675 billion in foreign exchange reserves to maintain depreciated currencies (China accounting for over 90 percent of the purchases), leading to trade surpluses of 6 percent of GDP in Thailand, 10 percent in China, and an astonishing 15 percent in Malaysia (Bergsten and Gagnon, 2017). As the decade continued, however, currency manipulation abated, as have the massive trade surpluses. By 2018 no currency manipulators remained.[1] So why has this proven strategy for export-led development ceased, especially in an era of heightened protectionism amongst advanced economies when such a competitive edge should be desired?

I argue that deeper integration in global production networks over this same time period has decreased the benefits for states engaging in currency manipulation, while the political costs remain substantial. A depreciated currency alters relative prices, making exported goods and services more competitive (cheaper exports), as well as shifting domestic demand from foreign to domestic goods and services (more expensive imports). Consequently, this

[1] This remains true through the present (June 2020), including China, which, although labeled by the U.S. Treasury as a currency manipulator on August 5, 2019, does not actually meet the criteria of a manipulator, namely, net foreign exchange intervention over two percent of GDP.

policy tends to benefit exporting and import-competing industries and firms, while hindering other domestic groups. A depreciated currency leads to higher borrowing costs for domestic borrowers (Gagnon, 2011), an increased foreign debt burden for individuals borrowing in foreign currencies (Walter, 2008), and reduced purchasing power for domestic consumers (Frieden, 2014). The political challenge for states comes in deciding whether to engage in this neo-mercantilist practice given the domestic distributional effects. As the benefits diminish, ceteris paribus, states will find this component of an export-led growth strategy politically and economically disadvantageous.

Using country-level global production network data from the United Nations Commission on Trade and Development (Casella et al., 2019) that covers 143 countries between 2000 and 2018, I evaluate the relationship between global production network integration and currency manipulation. The empirical analyses confirm that increased global production network integration—in particular, a state's increased reliance on foreign inputs in production—reduces state intervention in foreign exchange markets. These results provide a unique explanation for the recent disappearance of currency manipulation amongst export-dependent states.

This research endeavor is particularly relevant given the recent policy discussions around reshoring global production networks in response to supply chain disruptions during the Covid-19 pandemic. While I do not directly take up the particular question of global production reversals in my analysis, the theoretical model suggests a return to the same beggar-thy-neighbor behaviors that marked the previous three decades as states begin to reshore their production networks. I discuss the implications of this reshoring of production in the discussion section following the analysis.

Outside of the policy implications, this research contributes to the literature on global production networks and currency politics in two ways. First, in my theoretical model I amend the now-standard model of currency politics (Frieden, 1991, 2014) with the explicit inclusion of global production networks. This addition to the model moderates the exchange rate preferences of socioeconomic groups that traditionally favor a depreciated currency, in particular, exporters. As global production networks now account for a majority of global trade (50.9 percent in 2018), this amended model may have meaningful implications for the study of currency politics. The second contribution comes from addressing one of these implications, in particular, does global production network integration help in explaining the puzzle of the disappearing manipulators? The political science literature has explored why states would initially depreciate their currencies, ranging from domestic institutional structures and lobbying (Steinberg, 2015) to the vulnerability of the electorate to monetary tightening (Walter, 2008). However, this literature has not explained the reversal, that is, why a country would stop depreciating its currency. To my knowledge, this is the first paper to address this puzzle.

The paper proceeds as follows. In the following section, I explore the development strategy of currency manipulation and how changing trade patterns may disrupt this growth model. I then explain my model of currency politics and global production networks in section 2, outlining the testable hypotheses. After introducing the main outcome and predictor variables required for my empirical approach in section 3, I test my hypotheses on global production networks and currency outcomes in section 4. In Section 5, I discuss the implications of these findings and suggest some potential mechanisms for the transmission of this relationship. Section 6 concludes.

1 Why do countries manipulate their currencies?

The international economics literature has praised export expansion as a viable path to robust economic growth (Krueger, 1998; Hausmann, Pritchett and Rodrik, 2005; Rodrik, 2008; Wacziarg and Welch, 2008; Freund and Pierola, 2012). By relying on foreign markets, this strategy allows for sustained economic growth even if domestic demand wanes. Exporting sectors and firms tend to expand more rapidly as more export opportunities arise (normally through trade liberalization) and they tend to be more efficient than non-exporters (Melitz, 2003; Bernard et al., 2007). Thus, export expansion can contribute to increased domestic employment and higher wages. With many countries seeking to reap the benefits from export expansion, competition inevitably intensifies.

One strategy among exporting states to skirt the competition in international trade is to cheapen the relative price of exported goods. A state can alter these relative prices by depreciating the value of its currency. Unless all of the state's trading partners simultaneously and equally depreciate their own currencies, the state should expect a surge in exports (Freund and Pierola, 2012). Because of these benefits of currency depreciation, more countries may seek this competitive edge leading to a tit-for-tat currency war among trading partners. Indeed, such a currency war broke out among the advanced economies in the 1930s (Eichengreen, 1992).

Concerns over these types of beggar-thy-neighbor currency policies were addressed in the Bretton Woods system of international finance, but with the move to floating exchange rates in the 1970s, fears of a return to the currency wars of the 1930s resurfaced. As I indicated in the introduction, several countries used currency depreciation to expand their export markets between 2000 and 2017, leading to massive trade imbalances. Japan also utilized this growth strategy following WWII, which led to the 1985 Plaza Accord that allowed for a depreciation of the US dollar to correct the trade imbalances between the US and the other G-5 nations: France, Germany, Japan, and the United Kingdom. Most recently, China depreciated its currency in the 1990s, maintaining a weakened renminbi until 2010 when the state began letting its currency slowly appreciate.

Currency wars made another resurgence in global policy debates following the depreciation of several advanced economies' currencies in 2010. After Japan, the UK, and the US engaged in unorthodox monetary policies in response to the 2008 global financial crisis, Brazil's finance minister Guido Mantega declared, "We're in the midst of an international currency war, a general weakening of currency. This threatens us because it takes away our competitiveness." The G20 attempted to address the issue of currency manipulation in its November 2010 meeting, but the host country South Korea—a currency manipulator—was rightly reluctant to highlight the issue, especially out of fear of offending its biggest trading partner China (Wheatley and Garnham, 2010).

China's massive trade surpluses and currency policies also instigated a resurgence of currency manipulation chatter with the candidacy and subsequent presidency of Donal Trump. Back in November 2015, then-candidate Trump pledged to declare China a currency manipulator on his first day in office. It took an extra two and a half years into his administration, but on August 5, 2019, the U.S. Treasury formally labeled China a currency manipulator. The labeling, however, did not meet the criteria as laid out in the Omnibus Trade and Competitiveness Act of 1988. According to the legislation, the Treasury may deem a trading partner a currency manipulator (and impose countervailing duties) if the trading partner has (*i*) a current account surplus that exceeds 3 percent of gross domestic product (GDP), (*ii*) their net official flows of foreign exchange reserves and other official foreign assets exceeds 2 percent of GDP, and (*iii*) their bilateral trade surplus with the U.S. (in goods, not services) exceeds $20 billion. According to this criteria, China was not a currency manipulator; in fact, the last time it met these criteria was in 2010.

The Peterson Institute for International Economics (PIIE) publishes a separate policy memo on currency manipulation, which captures more manipulators by casting a wider net. The PIIE drop the bilateral trade criterion of the U.S. Treasury, but add three additional benchmarks: a country's foreign exchange reserves and other official foreign assets must exceed three months of imports and 100 percent of short-term external debt (public and private), and the country must be classified as a high- or upper-middle-income country according to the World Bank (Bergsten and Gagnon, 2017). Given these criteria, the PIIE labeled eight manufacturing exporters as currency manipulators between 2000 and 2017—again, China, Israel, Japan, Malaysia, South Korea, Sweden, Taiwan, and Thailand. They also classify several other countries as currency manipulators, binning them into two other categories that differ from manufacturing exporters: financial centers (Hong Kong, Macao, Singapore, Switzerland) and petroleum exporters (Algeria, Kuwait, Libya, Norway, Oman, Russia, Trinidad and Tobago, United Arab Emirates). This paper focuses exclusively on manufacturing exporters given that these states tend to be the focus of policy debates over currency manipulation. Moreover, states that depend on financial services or petroleum exports tend to engage in foreign exchange intervention for purposes other than maximizing exports: to minimize the impact of hot money flows—financial centers—or to maximize savings for a post-petroleum economy—petroleum exporters (Bergsten and Gagnon, 2017).

As the research I highlighted points out, currency manipulation can have an appreciable impact on trade balances. The temporal range of this research, however, usually begins in the 1990s and ends in the early 2000s. More recent research on currency depreciation and exports tends to show a weakened relationship between the two (Ahmed, Appendino and Ruta, 2015; Ollivaud, Rusticelli and Schwellnus, 2015; Cheng et al., 2016). These studies address a recent temporal trend in international trade of the last decade: the elasticity of exports to the real effective exchange rate—a measure of price competitiveness—has decreased over time. The authors hypothesize that global production networks may play a role in this changing elasticity. In a globalized economy where firms import many of the inputs that comprise an exported good, a currency depreciation may no longer give a boost to these exports due to the increased cost of the foreign inputs. It is from this research that I build a theoretical model that addresses how this economic relationship between exchange rates and trade may impact currency politics.

2 Global Production Networks and Currency Politics

Research on currency politics tends to fall along two lines of inquiry: a state-centric approach where governments use their exchange rate or currency power for some domestic or foreign goal (Kirshner, 1997; Cohen, 2018), and the "open-economy politics" (OEP) approach where the preferences of socioeconomic actors affect currency outcomes (Frieden, 1991, 2014; Leblang, 2003; Broz and Frieden, 2006; Walter, 2008; Steinberg, 2015). I utilize both approaches, where the demand-side of the model draws from the OEP literature on exchange rate preferences and the supply-side assumes that the state acts as a unitary actor to maximize domestic growth. The theoretical model I develop in this section is a straightforward amendment of the exchange rate politics model of Frieden (2014), modified with the explicit inclusion of global production networks. The amended model helps to explain why a state would cease currency manipulation. The testable hypotheses of the theoretical model are derived from the intersection of the demand-side of the model—the aggregation of exchange rate preferences by socioeconomic actors—and the supply-side of the model—the exchange rate decisions of the state.

Demanding Currency Manipulation

The demand-side of the model furthers Frieden's (2014) model of exchange rate preferences of firms, industries, and/or socioeconomic groups,[2] which are dependent on (*i*) their international exposure to exchange rate risk, (*ii*) exchange rate pass-through, and (*iii*) the tradability of their goods and services. The first two components—international exposure and exchange rate pass-through—predict the preference for exchange rate stability (fixed versus floating), while the third component—tradability—predicts preferences for the exchange rate's level (depreciated versus appreciated). Although the latter is the focus of this paper—i.e., why countries stop depreciating their exchange rates—, I briefly explicate how the former operate in this model of currency politics and global production networks.

Starting with the first component—*international exposure*—Frieden predicts that the greater a firm's immersion in cross-border trade and investment, the greater its support for a fixed exchange rate due to the transaction costs associated with cross-border exchange.

[2]For ease of exposition, I will henceforth use only the term "firms" when discussing exchange rate preferences of these socioeconomic groups.

Indeed, this was a leading argument for monetary union among European states in the early 1990s, which follows from the theory of optimum currency areas (Mundell, 1961; McKinnon, 1963; Kenen, 1969). This should also hold for global production networks, where firms aim to minimize production costs. While globally-engaged firms often have access to hedging instruments for unexpected (or even expected) exchange rate movements (Garrett, 1998; Knight, 2010), this is an added cost firms seek to minimize.

The second component of the model—e*xchange rate pass-through*—involves the elasticity of domestic prices to exchange rate movements. Frieden predicts that the more incomplete a firm's pass-through—i.e., the more limited the effect of a change in the exchange rate on domestic prices—the greater its support for a fixed exchange rate. Generally, firms that produce highly differentiated and specialized products (Broz and Frieden, 2006) or are heavily-reliant on imported inputs (Amiti, Itskhoki and Konings, 2014; Gopinath et al., 2020) tend to exhibit more incomplete pass-through. It follows that firms reliant on global production networks would also prefer a fixed exchange rate. Although exchange rate stability in an environment of global production networks is an interesting research endeavor, it is beyond the scope of this paper. Thus, I will leave to future research a more in-depth theoretical treatment of exchange rate stability and global production networks.

The final component of the model—*tradability*—is the most important for my argument on the level of the exchange rate. Frieden predicts that the larger the share of tradable goods in a firm's output, the stronger its support for a depreciated exchange rate. Conversely, the larger the share of tradable goods in a firm's inputs, the stronger its support for an appreciated exchange rate. In an environment of global production networks where firms both import *and* export, there are contradictory predictions: firms that import goods for use in exported goods cannot prefer simultaneously an appreciated *and* depreciated exchange rate. It is here where I amend the model by explicitly accounting for a firm's reliance on global production networks.

I argue that increased reliance on global production networks moderates the traditional preference of exporting firms for a depreciated exchange rate. The greater the amount of imported inputs used by an exporting firm, the less benefit it receives from a currency depreciation, and, especially if the firm is limited in access to financial hedging instruments, the higher the cost. This inclusion of global production networks in the model moderates the preferences of exporting firms: as they become more reliant on imported inputs, their preference for a depreciated currency weakens. Before turning to the supply-side of the model, which considers the aggregation of these firm-level preferences at the state level, I want to first provide supporting evidence from previous studies that firm preferences are indeed conditioned by global production networks.

The most important micro-foundation for this amended model comes from Egan (2017), who uses cross-national surveys to show that firms reliant on imported inputs do indeed have a strong preference against a depreciated currency. These preferences tend grow stronger as the size of the firm increases. As research in new-new trade theory has shown, firms that are more dependent on global production networks also tend to be much larger and more productive than other firms, while employing more people overall (Melitz, 2003; Bernard et al., 2007). With increased market power comes increased political influence (Salamon and Siegfried, 1977; Faccio, 2006), and thus the aggregation of these firm-level preferences should influence currency outcomes at the state level.

There is considerable evidence that global production networks affect firm preferences on other elements of the global political economy beyond exchange rates, including trade policy. Blanchard and Matschke (2015) find that when U.S. multinational firms offshore production to a foreign country, there is increased incentive for policymakers to provide preferential access to imported products from the same industry, since (by law) trade policy cannot discriminate at the firm level (see also Kim, 2017). Similarly, as firms become more reliant on production networks they tend to show more restraint in seeking temporary trade protections (Blanchard, Bown and Johnson, 2017) or filing anti-dumping claims (Jensen, Quinn and Weymouth, 2015). These firms tend to be more supportive of trade liberalization overall (Osgood, 2018), but there is variability depending on a country's trade openness and the extent of foreign competition (Osgood, 2016).

With extensive evidence supporting the role of global production networks in firm preferences on economic policy, I now turn to the supply-side of the model, where states set policy based on aggregated preferences across the entire domestic political economy.

Supplying Currency Manipulation

On the supply side of the model, I predict that a state will maintain a depreciated currency only as long as the benefits outweigh the costs, all else equal. There would be little political or economic benefit for the state to run a depreciated currency outside of the traditional distributional effects detailed prior: providing a subsidy to exporting firms (or industries) and protection for import-competing firms (or industries).[3] The costs of depreciation come

[3]One could make the case that another political/economic benefit of a depreciated exchange rate is to outlast a trade competitor in a protracted trade war—e.g., China's recent depreciation of the yuan after an escalation in tariff increases by the Trump administration. China's seemingly small buildup in foreign exchange reserves may be seen as a hedge against counter moves by the Trump administration, or as a strategy to outlast the administration until after the 2020 presidential elections when more favorable trade terms may arise.

from the distributional effects clarified above, which impact political support for the policy: depreciation increases (*i*) import prices, (*ii*) foreign debt burdens, and (*iii*) borrowing costs, as well as (*iv*) decreases the purchasing power of consumers. Firms reliant on global production networks are hurt by increased import prices, foreign debt burdens, and borrowing costs, while consumers are hurt by decreased purchasing power. Holding the preferences of consumers constant, as the aggregate economy increases dependence on global production networks, the costs of this policy will rise while the benefits will continue to fall. Thus, as these costs start to outweigh the benefits of a depreciated currency, the state's support for the policy will abate.

Now, let us assume that the costs of depreciation to firms and individuals do not change, and instead focus entirely on the benefits from the (state) supply side. If currency depreciation is a costly enterprise by policymakers that favor a particular socioeconomic group (or groups), then as the benefits of this policy decrease—again, holding the costs constant—we should see a change in policy. Indeed, as I outlined earlier, related work in economics has shown that exporters no longer receive an export benefit from a depreciated currency due to increased reliance in global production networks (Ahmed, Appendino and Ruta, 2015; Ollivaud, Rusticelli and Schwellnus, 2015; Cheng et al., 2016). Thus, as global production networks expand, the benefit of currency manipulation should wane.

As Kim affirms in the introduction to this special issue, global production networks are the defining feature of the 21st century global economy. For centuries, international trade involved the arms-length exchange of goods extracted, farmed, or produced within a single border—e.g., raw materials, commodities, and manufactured goods. And, as affirmed earlier, exporters tended to prefer a relatively depreciated exchange rate. Over the last two decades, however, firms have increasingly unbundled the production process into global production networks: the cross-border exchange of intermediate inputs at different stages of the production process. This has been made possible by significant decreases in coordination costs as a result of innovations in communication and transportation. Moreover, hundreds of preferential trade agreements containing 'deep provisions' have decreased barriers to trade and provided protections for firms operating in foreign markets (Manger, 2009; Johns and Wellhausen, 2016). By 2018, a majority of exports were involved in global production networks.

This increased reliance on global production networks as well as the decreased elasticity of exports to changes in the exchange rate raises two questions about the relationship between global production networks and currency politics: First, do global production networks alter firm-level exchange rate preferences? According to Egan (2017), yes, increased reliance on imported inputs weakens exporting firms' preferences for a depreciated exchange rate. Second, will these aggregated preferences affect exchange rate policy? It is along this second question that I build my testable hypotheses.

Testable Hypotheses

I propose two hypotheses that underscore the role that export dependence and global production networks have in explaining currency manipulation. In particular, these testable hypotheses seek to show how an increased reliance on global production networks weakens the preference for a depreciated exchange rate among export-dependent states.

Hypothesis1 : The greater a state's reliance on exports as a share of GDP, the stronger the commitment to a depreciated currency and the greater its intervention in foreign exchange markets to accomplish this goal. This follows directly from Frieden's proposition on the role of *tradability* in exchange rate preferences. An exporting firm will prefer a relatively depreciated currency. Aggregating over all actors in the economy, the greater a state's exports as a share of GDP, the more depreciated the currency and the greater its intervention in foreign exchange markets to meet this currency goal. This hypothesis provides the baseline from which the second hypothesis derives.

Hypothesis 2: The greater a state's participation in global production networks conditional on their export dependence, the weaker the commitment to a depreciated exchange rate and the smaller its foreign exchange intervention. States whose economies rely heavily on the cross-border exchange of intermediate inputs will not prefer a depreciated currency (as in H1). This will lead to a decrease in foreign exchange intervention and a subsequent appreciating effect on the exchange rate. I test both of these hypotheses using data on currency values and foreign exchange intervention, which I explain further in the following section.

3 Data and Methods

For the empirical tests of the theoretical model, I require observational data on currency manipulation, export dependence, and global production network reliance. In this section, I describe and illustrate these respective outcome, treatment, and moderating variables. I then specify the empirical model for testing the hypotheses, followed by a description of the control variables included in the analyses.

Outcome Measure: Currency Manipulation

As defined before, currency manipulation involves the purposive action of the state to depreciate its exchange rate in order to gain a competitive edge in international trade. Recall from the criteria for currency manipulation by the US Treasury and Peterson Institute of International Economics that currency manipulators must have a current account surplus exceeding 3 percent of GDP and net foreign exchange flows that exceed 2 percent of GDP. While the current account surplus measures the impact of the currency manipulation, it is the foreign exchange intervention that measures the purposive action of the state. It is from this understanding that I derive my principal outcome variable. I measure a state's direct intervention in foreign exchange markets as a share of GDP (`forex/gdp`) with IMF data on the stock of total foreign exchange reserves, excluding gold and GDP data from the World Bank's World Development Indicators (WDI).[4] I also include a measure of the intensity of foreign exchange intervention (`forex_intensity`), which calculates how excessive the state's intervention in foreign exchange markets is beyond the 2 percent of GDP criteria set forth by the Treasury and PIIE, i.e., $\Delta\texttt{forex} /(\text{GDP}\times 0.02)$; I subtract one from `forex_intensity` to center the variable on zero, meaning a positive value meets the criterion for currency manipulation. In Figure 1 I plot this measure of foreign exchange intensity against a country's current account balance as a share of GDP, the two main criteria to be labeled a currency manipulator. Each point is partially transparent in order to highlight areas with multiple (layered) observations, for example, in Q4 (bottom-left quadrant). The triangle markers shown in Q2 (top-right quadrant) delineate the currency manipulators with a currency account surplus exceeding 3 percent of GDP and foreign exchange flows that exceed 2 percent

[4] The data is converted into constant 2010 USD, as are all continuous economic variables in this analysis.

of GDP.

[Insert Figure 1 here]

While these measures of the state's purposive intervention in foreign exchange markets are adequate for testing my hypotheses, I am still interested in the impact of global production networks on the value of a state's currency. The standard measures for currency values is to use the nominal or real exchange rate, both of which are not only affected by foreign exchange intervention, but also other macroeconomic variables such as capital account and current account openness. In order to account for these potentially confounding macroeconomic variables, I use an exchange rate estimate ($\widehat{\mathtt{xr}}$) that incorporates medium- and long-term fundamentals of a country's economy in its calculation.[5] This measure considers a country's real effective exchange rate (REER)—i.e., how competitive the exchange rate is against a basket of its top-30 trading partners—and the REER's deviation from its equilibrium real exchange rate (ERER), that is, "a value of the REER that is consistent with the macroeconomic balances (both internal and external) over the medium to the long term and given a set of fundamentals" (Couharde et al., 2017). The difference between the two measures is the intensity of depreciation (negative value) or appreciation (positive value). This data for 182 countries between 1973 and 2016 originates from the EQCHANGE database (Couharde et al., 2017). Given that the data range ends when countries were still engaging in currency manipulation rather than the 2018 cut-off of the foreign exchange measures, I expect these results to be biased downwards.

[5]These fundamentals, which are estimated sequentially, include: (*i*) productivity changes between the tradable and non-tradable sectors, relative to trading partners, (*ii*) net foreign asset position, and (*iii*) terms of trade.

I should note here that because the theoretical model and its empirical implications focus on manufacturing exporters exclusively, I drop from my sample the four financial centers (Hong Kong, Macao, Singapore, Switzerland) as well as 23 countries heavily dependent on petroleum exports.[6] These two groups do not fit within the model of currency politics I outlined in the previous section due to their particular objective functions. However, their stockpiles of foreign assets *do* have an appreciable effect on their current account balances and exchange rates, thus their inclusion in the empirical analysis may bias the effect of global production networks. I also drop state-level observations for members of the European Economic and Monetary Union (EMU), but include country-year observations for the original 12 members of the EMU (as a single entity) who were members of the currency union at the beginning of the data range: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain. For robustness checks, I report all empirical results using the full sample of countries in the online appendix; the main effects are consistent.

Treatment and Moderating Variables

I am substantively interested in testing whether the effect of export dependence on currency outcomes varies across values of global production network reliance. For the treatment variable, export dependence, I simply measure a country's exports of goods (not services) as a share of total GDP (`exp/gdp`). By excluding services, I am able to focus the analysis exclusively on manufacturing exporters. The data originate from the WDI and converted to 2010

[6]This includes countries whose petroleum exports were greater than 50 percent of all exports. These countries were in the top 0.89 percentile. They include Algeria, Angola, Azerbaijan, Bahrain, Brunei, Congo, Gabon, Iran, Iraq, Kazakhstan, Kuwait, Libya, Nigeria, Norway, Oman, Qatar, Russia, Saudi Arabia, Syria, Turkmenistan, Trinidad and Tobago, Venezuela, and Yemen.

US$. I predict a positive relationship between `exp/gdp` and `forex/gdp`: an export-dependent state will tend to engage in more foreign exchange intervention in order to depreciate the exchange rate—this implies a negative relationship between `exp/gdp` and $\widehat{\texttt{xr}}$.

The moderator for the export-dependence treatment variable is global production network participation. I follow convention in deriving an index of global production network participation (Koopman et al., 2010), utilizing data from the UNCTAD-Eora database (Casella et al., 2019). The components of this index include a country's foreign value added (`fva`)—i.e., imported inputs—utilized in the production of exported goods and the indirect value added (`dvx`)—i.e., domestically-produced inputs—that foreign countries use in the production of their exported goods. To highlight the importance of these components in the current account balance, each is taken as a share of total exports—i.e., `fva/exp` and `dvx/exp`. The sum of these two components creates the global production network index (`gpn/exp`).

In Figure 2a and 2b I plot the bivariate relationship between the treatment and the two moderating variables, `fva/exp` and `dvx/exp`, respectively. Each point on the plot represents a country-year observation between 2000 and 2018; similar to Figure 1, I delineate the currency manipulator's with red triangles. In Figure 2a we see a strong positive correlation between the treatment (`exp/gdp`) and moderator (`fva/exp`), where more export-dependent countries tend to be more dependent on foreign value added in production of exports. Note that the currency manipulators (red triangles) are distributed throughout this scatter plot, but the relationship is also strongly positive. This positive relationship does not hold for indirect value added (`dvx/exp`) and export-dependence (Figure 2b). It is because of this difference in relationships that I test H2 using the combined global production network index (`gpn/exp`) as well as the separate components (`fva/exp` and `dvx/exp`). Also, due to the distribution of both being right-skewed, I log-transform these variables.

[Insert Figure 2a and 2b here]

Empirical Model and Control Variables

To test the first hypothesis (H1), which stems from the theoretical predictions of international exposure to exchange rate movements found in Frieden (2014), I estimate the following fixed effects model with clustered standard errors:

$$\ln(\texttt{forex/gdp})_{i,t} = \alpha_t + \alpha_i + \beta_1 \ln(\texttt{exp/gdp})_{i,t-1} + \beta \texttt{controls}_{i,t-1} + \varepsilon_{i,t}, \quad (1)$$

where β_1 is the coefficient of interest on export dependence lagged one year, α_i and α_t are country and year fixed effects, $\varepsilon_{i,t}$ are the standard errors clustered by country, and $\texttt{controls}_{i,t-1}$ is a vector of several control variables, also lagged one year. These control variables include the amount of outward foreign direct investment as a share of GDP, ln(`fdi_out/gdp`), which controls for holders of foreign debt who lose from a currency depreciation due to the decreased value of the their investment (predict coefficient: +); the amount of domestic savings as a share of GDP, ln(`save/gdp`), which is often associated with a depreciated currency (predict coefficient: +); the financial openness of the country as reported by Karcher and Steinberg (2013), `ckaopen`,[7] which controls for a country's ability to control the level of the exchange rate (predict coefficient: −); and finally, the level of democracy as reported by Marshall, Gurr and Jaggers (2019), `polity`, which may preclude a country from engaging in currency manipulation (predict coefficient: −). When I change

[7]This data is only available through 2010 and thus I simply use the 2010 measure for all years through 2018. The inclusion of this variable does not have any impact on the point estimates or standard errors. I also used the original measure `kaopen`from Chinn and Ito (2006), which has the same null effect.

the outcome measure to $\widehat{\texttt{xr}}$, I expect all of the coefficients to reverse in direction: a country more dependent on exports as a share of GDP will intervene more in foreign exchange markets (+), which will lead to a more depreciated exchange rate (−).

To test the second hypothesis (H2) that reliance on global production networks will moderate the effect of export dependence, I include an interaction term in the model:

$$\ln(\texttt{forex/gdp})_{i,t} = \alpha_t + \alpha_i + \beta_1\texttt{D} + \beta_2\texttt{X} + \beta_3\texttt{D} \times \texttt{X} + \beta\texttt{controls}_{i,t-1} + \varepsilon_{i,t}, \qquad (2)$$

where $\texttt{D}$ is the treatment variable, $\ln(\texttt{exp/gdp})_{i,t-1}$, $\texttt{X}$ is the moderator variable, $\ln(\texttt{gpn/exp})_{i,t-1}$ (as well as $\ln(\texttt{fva/exp})_{i,t-1}$ and $\ln(\texttt{dvx/exp})_{i,t-1}$), and β_3 captures the interaction of the two. The controls remain the same as in Equation 1, as do the country and year fixed effects, and clustered standard errors by country. Recalling from H2, I expect the interaction term to be negative, providing evidence that global production networks moderate the relationship of export dependence on foreign exchange intervention. As before, I expect the sign to reverse when the outcome variable is $\widehat{\texttt{xr}}$. Summary statistics of all variables are provided in Table 1. All data and replication materials available on Harvard Dataverse (link to be included after blind review process).

[Insert Table 1 here]

4 Empirical Results

How does export dependence affect currency outcomes? Will a greater dependence on exports as a share of GDP lead to greater (and more intense) foreign exchange intervention as well as a depreciated exchange rate? The results for H1 are presented as coefficient plots in

Figure 3, where each plot displays the relationship between `exp/gdp` and the three outcome variables (full regression tables are included in the online appendix). Independent variables are lagged one year and all models include country and year fixed effects, with standard errors clustered by country. Figure 3a (N=1,172; 72 countries) illustrates a strong positive relationship between `exp/gdp` and `forex/gdp`, providing support for the *tradability* hypothesis that more export-dependent states will engage in more currency manipulation via foreign exchange intervention. All control variables have a negligible relationship with foreign exchange intervention, which is the case in all models and with all outcome variables. Figures 3b (N=1,172; 72 countries) and 3c (N=968; 68 countries) illustrate the relationship between export-dependence and `forex_intensity` and $\widehat{\texttt{xr}}$, respectively; neither relationships are statistically different from zero. This statistically insignificant relationship between the main variables of interest and $\widehat{\texttt{xr}}$ is consistent in all models, which I attribute to (a) the relatively limited data range—recall data ends in 2016 for this variable, as compared to 2018 for the foreign exchange measures—, and (b) the noisiness found in measures of exchange rates. Recall that an exchange rate is not only affected by foreign exchange intervention, but also by conditions that are less easily controlled by the state, for example, hot capital flows.

[Insert Figure 3 here]

With the baseline model providing support that countries with a greater dependence on exports will intervene more in foreign exchange markets, I turn to the inclusion of the moderating variable, global production networks. Again, I predict that the relationship between export dependence and foreign exchange intervention will weaken at higher levels of global production network reliance. Hence, I expect the interaction of the treatment (D) and moderating variable (X) to be negative for foreign exchange intervention and positive for the exchange rate estimate. Figure 4a illustrates that indeed the relationship between `exp/gdp` (D) and `forex/gdp` (Y) is moderated by global production network dependence, `gpn/exp` (X)—i.e., the interaction term `gpn/exp*exp/gdp` is negative and statistically significant at the 0.95 level. The components of the interaction term are also negative: although `exp/gdp` is not statistically significant like `gpn/exp`, it is worth noting the shift from strongly positive in Model 3a to weakly negative in Model 4a. In Figure 4b the interaction term also has a negative point estimate that is statistically distinguishable from zero at the 0.95 percentile, but the components are only weakly negative. Figure 4c shows a weak relationship between the treatment and moderating variable on the exchange rate estimate.

[Insert Figures 4 and 5 here]

Linear interaction models are notoriously difficult to interpret from the point estimates, but the political science literature has provided useful visual heuristics for interpreting the marginal effects. Using the `inter.binning` command in the `interflex` package in (Hainmueller, Mummolo and Xu, 2019), I present the marginal effects plots for each model, as well as the binning estimator that allows the effect of the treatment variable (`exp/gdp`) on Y to be nonlinear at different levels of the moderating variable (here, `gpn/exp`): tercile 1 'L', tercile 2 'M', tercile 3 'H'. The distribution of the moderating variable is plotted at the bottom of each figure to illustrate that each moderator has common support. Figure 5a presents the marginal effect of export-dependence on foreign exchange intervention, moderated by global production network reliance. As predicted, at low levels of global production network reliance ('L'), there is still a positive relationship between export-dependence and foreign exchange intervention. However, this relationship weakens and becomes statistically indistinguishable from zero as global production network reliance increases. Along with the statistically significant point estimate in Figure 4a, this allows me to reject the null hypothesis that there is no interactive effect between the moderator (`gpn/exp`) and treatment (`exp/gdp`). Also of import is that the non-linear binning estimators (L/M/H) tend to align with the linear marginal effects in grey, thus supporting the choice in a linear multiplicative model (Pepinsky, 2018). The non-linear binning estimators do not align with the linear marginal effects, however, in Models 5b and 5c.

With support for H2 that global production networks moderate the relationship between export-dependence and foreign exchange intervention, I turn to investigating if the foreign value added component (`fva/exp`) of the production network or the indirect value added component (`dvx/exp`) is driving this relationship. I predict that the moderating relationship between global production networks and export-dependence is being driven by the foreign value added component, rather than the indirect value added. Recall that the foreign value added in exports measures the amount of imported inputs used in the exported goods. This relates directly to the theoretical model, namely, that imported inputs become more expensive when the currency is depreciated. The theoretical model does not explicitly take into account the role of indirect value added, i.e., the intermediate inputs exported to foreign countries, as this should follow the same predictions as export-dependence.

In Models 6a–6c, I perform the same analysis with country-year fixed effects and standard errors clustered by country, but now I use as my moderating variable foreign value added as a share of exports (`fva/exp`); models 8a–8c use indirect value added (`dvx/exp`) as the moderating variable. Starting with foreign value added, we see in Figure 6a that indeed the relationship between `exp/gdp` and `forex/gdp` is moderated by `fva/exp`. The interaction of the treatment and moderator is negative and statistically distinguishable from zero at the 0.95 percentile. This relationship disappears when using `forex_intensity` or $\widehat{\texttt{xr}}$ as the outcome variables. Similar to Model 4a, the marginal effects plot for Model 6a (see Figure 7a) shows a strong positive relationship between export-dependence and foreign exchange intervention when a country does not depend on foreign inputs in production, but this relationship weakens as the dependence on foreign inputs increases. This relationship is indistinguishable from zero across all levels of the moderator when the outcome variable changes to `forex_intensity` and $\widehat{\texttt{xr}}$ (see Figures 7b and 7c).

[Insert Figures 6 and 7 here]

Turning to indirect value added, we see a similar relationship as with the foreign value added. As before, the interaction of the treatment and moderator is negative and statistically distinguishable from zero at the 0.95 percentile (see Figure 8a). These results reject my hypothesis that indirect value added works differently in the production network than foreign value added; both have a negative moderating effect on export-dependence. Even more surprising is that this relationship is even stronger in Model 8b with `forex_intensity` as the outcome variable; recall that there was a null effect when foreign value added was used as the moderator (Model 6b). This difference is clear when comparing the marginal effects plots between the two models: in Figure 9b the marginal effects are downward sloping, with the intensity of foreign exchange intervention strong at low levels of indirect value added and decreasing as indirect value added makes up a higher ratio of total exports; this relationship is absent in Figure 7b with foreign value added as the moderating variable. I explore some potential explanations for this relationship in the discussion section that follows, as well as provide some potential transmission mechanisms for global production networks in currency politics.

[Insert Figures 8 and 9 here]

5 Discussion

The evidence supports the main hypotheses that increased reliance on global production networks moderates the impact of export dependence on currency manipulation. However, this relationship is not robust to different measures of foreign exchange intervention (e.g., intensity of intervention) or measures of exchange rate level. The results are interesting nonetheless, as they provide a partial explanation for the disappearing manipulators. What is missing, and what could help square the circle on this puzzle, is the transmission mechanism from production network dependence to currency outcomes.

The argument put forth is quite similar to arguments in the latter decades of the 20^{th} century, when scholars argued that international capital openness would severely limit domestic economic policy options. This interdependence of financial markets could in fact lead to a convergence of macroeconomic policies (see e.g., Garrett and Lange, 1991; Andrews, 1994; Milner and Keohane, 1996). The empirical evidence, however, did not support such predictions, leaving states mostly autonomous in their national economic policy decisions (Bearce, 2009). While I do not test monetary policy or exchange rate convergence explicitly in this analysis, the theoretical argument herein closely parallels the macroeconomic convergence arguments of the 1990s. A potential transmission mechanism of production network dependence to currency outcomes could come from monetary convergence at the regional, or network, level. As states become more interdependent, their exchange rate policy may converge with that of their production network. This prognosis seems all the more likely given the results for indirect value added, which were contrary to what the theoretical model predicted.

In the theoretical model, I brushed aside the treatment of international exposure and exchange rate pass-through as they did not address the main puzzle of the paper—the case of the disappearing currency manipulators—since they predicted exchange rate stability rather than level. At second glance, perhaps this is not just a story of exchange rates appreciating from their depreciated level, but also a story of exchange rate stability. This would explain the surprising findings we find with indirect value added; it seems entirely likely that these firms reliant on imported inputs would also be involved in the export of domestic inputs (see, e.g., Bernard et al., 2007). These firms may not only prefer a less depreciated exchange rate, but also one that is stable, i.e., predictable. A deeper treatment of these elements of the model coupled with rich data on firm-level production networks, would be helpful in addressing these issues.

Another contending explanation for the disappearance of currency manipulators is a shift in these countries' internal economies: from export-led to consumption-based. This story would certainly hold for a country like China that has undergone a transformation in the previous decade. However, it does not address more developed economies like Japan and Sweden, which are not undergoing an economic transformation. Given the differences in country production profiles, democratic institutions, and consumption/saving habits, the argument put forth in this paper provides a unique explanation for the surprising trajectory of these export-dependent economies: the end of currency manipulation.

Studying the relationship between trade patterns and currency manipulation is particularly relevant in contemporary global politics. As production networks were severely interrupted recently due to the novel coronavirus pandemic, political leaders across the advanced economies have argued for reshoring many parts of the production process. In fact, Japan earmarked $2.2billion of its recent stimulus package to fund the reshoring of Japanese production from China back to Japan. The consequences of this reshoring would certainly mean fewer disruptions in the production network after an exogenous, external shock, but it would also certainly lead to efficiency losses, higher prices for consumers, decreased competitiveness, and a potential return to beggar-thy-neighbor currency manipulation.

6 Conclusion

Between 2000 and 2017, eight export-dependent countries engaged in currency manipulation in order to gain a competitive edge in international trade. This beggar-thy-neighbor policy led to massive trade imbalances throughout the global economy, and provoked the inward-looking protectionist policies of the Trump administration. Fortunately, the practice of depreciating one's currency to improve terms-of-trade has largely fallen by the wayside, with no currency manipulators remaining since 2018. This paper sought to explain this puzzle of the disappearing manipulators. I attributed this change in currency policy to a change in production patterns over the same time period. Countries became more intertwined in global production networks, which, I argue, decreased the trade benefits of running a depreciated exchange rate. I tested this theory using panel data between 2000 and 2018 (across 70+

countries) and illustrated a statistically significant relationship between global production network reliance and foreign exchange intervention—the primary tool for depreciating one's exchange rate. Currency manipulation is a costly venture. As the benefits wane due to changing production patterns, the costs of maintaining such a policy (both politically and economically) become too high, leading to a change in policy. Indeed, deeper integration rather than increased protectionism seems to be the winning recipe for dealing with the beggar-thy-neighbor currency policies against which many protectionists argue.

References

Ahmed, Swarnali, Maximiliano Appendino and Michele Ruta. 2015. "Depreciations Without fs? Global Value Chains and the Exchange Rate Elasticity of Exports." *World Bank Policy Research Working Paper* (7390).

Amiti, Mary, Oleg Itskhoki and Jozef Konings. 2014. "Importers, Exporters, and Exchange Rate Disconnect." *The American Economic Review* 104(7):1942–78.

Andrews, David M. 1994. "Capital mobility and state autonomy: toward a structural theory of international monetary relations." *International Studies Quarterly* 38(2):193–218.

Bearce, David. 2009. *Monetary divergence: domestic policy autonomy in the post-Bretton Woods era*. University of Michigan Press.

Bergsten, C Fred and Joseph E Gagnon. 2017. *Currency Conflict and Trade Policy: A New Strategy for the United States*. Columbia University Press.

Bernard, Andrew B, J Bradford Jensen, Stephen J Redding and Peter K Schott. 2007. "Firms in International Trade." *Journal of Economic perspectives* 21(3):105–130.

Blanchard, Emily J, Chad P Bown and Robert C Johnson. 2017. "Global Value Chains and Trade Policy." Working paper.

Blanchard, Emily and Xenia Matschke. 2015. "US multinationals and preferential market access." *Review of Economics and Statistics* 97(4):839–854.

Broz, J Lawrence and Jeffry A Frieden. 2006. "The political economy of exchange rates." *The Oxford handbook of political economy* pp. 587–598.

Casella, Bruno, Richard Bolwijn, Daniel Moran and Keiichiro Kanemoto. 2019. "Improving the analysis of global value chains: the UNCTAD-Eora Database." *Transnational Corporations* 26(3):115.

Cheng, Kevin, Gee Hee Hong, Dulani Seneviratne and Rachel van Elkan. 2016. "Rethinking the Exchange Rate Impact on Trade in a World with Global Value Chains." *International Economic Journal* 30(2):204–16.

Chinn, Menzie D and Hiro Ito. 2006. "What matters for financial development? Capital controls, institutions, and interactions." *Journal of development economics* 81(1):163–192.

Cohen, Benjamin J. 2018. *Currency Statecraft: Monetary Rivalry and Geopolitical Ambition*. University of Chicago Press.

Couharde, Cécile, Anne-Laure Delatte, Carl Grekou, Valérie Mignon and Florian Morvillier. 2017. EQCHANGE: A World Database on Actual and Equilibrium Effective Exchange Rates. Working Papers 2017-14 CEPII.

Egan, Patrick JW. 2017. "The Political Economy of Exchange Rates in an Era of Global Production Chains." *International Interactions* 43(3):507–536.

Eichengreen, Barry J. 1992. *Golden Fetters: The Gold Standard and the Great Depression, 1919-1939*. Oxford University Press.

Faccio, Mara. 2006. "Politically connected firms." *American economic review* 96(1):369–386.

Freund, Caroline and Martha Denisse Pierola. 2012. "Export Surges." *Journal of Development Economics* 97(2):387–395.

Frieden, Jeffry A. 1991. "Invested Interests: The Politics of National Economic Policies in a World of Global Finance." *International Organization* 45(4):425–451.

Frieden, Jeffry A. 2014. *Currency Politics: The Political Economy of Exchange Rate Policy*. Princeton University Press.

Gagnon, Joseph E. 2011. *Flexible exchange rates for a stable world economy.* Peterson Institute.

Garrett, Geoffrey. 1998. "Global markets and national politics: collision course or virtuous circle?" *International organization* 52(4):787–824.

Garrett, Geoffrey and Peter Lange. 1991. "Political responses to interdependence: what's "left" for the left?" *International Organization* 45(4):539–564.

Gopinath, Gita, Emine Boz, Camila Casas, Federico J Díez, Pierre-Olivier Gourinchas and Mikkel Plagborg-Møller. 2020. "Dominant currency paradigm." *American Economic Review* 110(3):677–719.

Hainmueller, Jens, Jonathan Mummolo and Yiqing Xu. 2019. "How much should we trust estimates from multiplicative interaction models? Simple tools to improve empirical practice." *Political Analysis* 27(2):163–192.

Hausmann, Ricardo, Lant Pritchett and Dani Rodrik. 2005. "Growth accelerations." *Journal of economic growth* 10(4):303–329.

Jensen, J Bradford, Dennis P Quinn and Stephen Weymouth. 2015. "The influence of firm global supply chains and foreign currency undervaluations on US trade disputes." *International Organization* 69(4):913–947.

Johns, Leslie and Rachel L Wellhausen. 2016. "Under one roof: Supply chains and the protection of foreign investment." *American Political Science Review* 110(1):31–51.

Karcher, Sebastian and David A Steinberg. 2013. "Assessing the causes of capital account liberalization: How measurement matters." *International Studies Quarterly* 57(1):128–137.

Kenen, Peter. 1969. "The theory of optimum currency areas: an eclectic view." *Monetary problems of the international economy* 45(3):41–60.

Kim, In Song. 2017. "Political Cleavages Within Industry: Firm-Level Lobbying for Trade Liberalization." *American Political Science Review* 111(1):1–20.

Kirshner, Jonathan. 1997. *Currency and coercion: the political economy of international monetary power*. Princeton University Press.

Knight, Sarah Cleeland. 2010. "Divested Interests: Globalization and the New Politics of Exchange Rates." *Business and Politics* 12(2):1–28.

Koopman, Robert, William Powers, Zhi Wang and Shang-Jin Wei. 2010. Give Credit Where Credit is Due: Tracing Value Added in Global Production Chains. Technical report National Bureau of Economic Research.

Krueger, Anne. 1998. "Why trade liberalisation is good for growth." *The economic journal* 108(450):1513–1522.

Leblang, David. 2003. "To devalue or to defend? The political economy of exchange rate policy." *International Studies Quarterly* 47(4):533–559.

Levy-Yeyati, Eduardo, Federico Sturzenegger and Pablo Alfredo Gluzmann. 2013. "Fear of Appreciation." *Journal of Development Economics* 101:233–247.

Manger, Mark S. 2009. *Investing in protection: The politics of preferential trade agreements between north and south*. Cambridge University Press.

Marshall, Monty G, Ted Robert Gurr and Keith Jaggers. 2019. "Political Regime Characteristics and Transitions, 1800-2018." *Polity IV Project: Home Page* 17.

McKinnon, Ronald I. 1963. "Optimum currency areas." *The American economic review* 53(4):717–725.

Melitz, Marc J. 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71(6):1695–1725.

Milner, Helen V and Robert O Keohane. 1996. Internationalization and domestic politics: A Conclusion. In *Internationalization and domestic politics*. Cambridge University Press pp. 243–58.

Mundell, Robert A. 1961. "A Theory of Optimum Currency Areas." *The American Economic Review* 51(4):657–665.

Ollivaud, Patrice, Elena Rusticelli and Cyrille Schwellnus. 2015. "The Changing Role of the Exchange Rate for Macroeconomic Adjustment." *OECD Economics Department Working Papers* (1190).

Osgood, Iain. 2016. "Differentiated products, divided industries: firm preferences over trade liberalization." *Economics & Politics* 28(2):161–180.

Osgood, Iain. 2018. "Globalizing the supply chain: Firm and industrial support for US trade agreements." *International Organization* 72(2):455–484.

Pepinsky, Thomas B. 2018. "Visual heuristics for marginal effects plots." *Research & Politics* 5(1):2053168018756668.

Rodrik, Dani. 2008. "The real exchange rate and economic growth." *Brookings papers on economic activity* 2008(2):365–412.

Salamon, Lester M and John J Siegfried. 1977. "Economic power and political influence: The impact of industry structure on public policy." *American Political Science Review* 71(3):1026–1043.

Steinberg, David. 2015. *Demanding devaluation: Exchange rate politics in the developing world*. Cornell University Press.

Wacziarg, Romain and Karen Horn Welch. 2008. "Trade liberalization and growth: New evidence." *The World Bank Economic Review* 22(2):187–231.

Walter, Stefanie. 2008. "A new approach for determining exchange-rate level preferences." *International Organization* 62(3):405–438.

Wheatley, Jonathan and Peter Garnham. 2010. "Brazil in 'Currency War' Alerts." *Financial Times* .

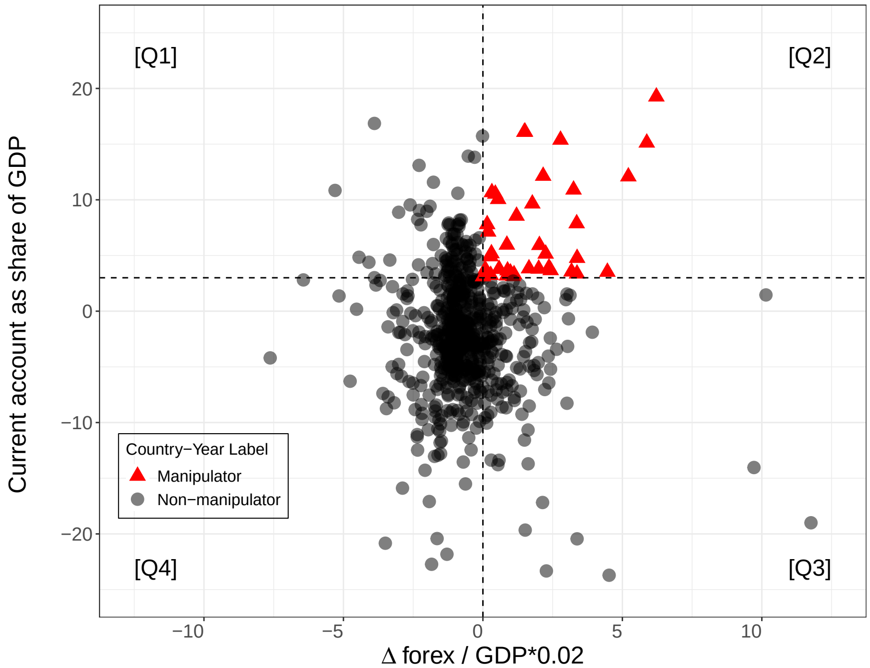
7 Tables

Table 1: Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Max
Outcome Variables					
forex/gdp	1,421	0.16	0.13	0.0002	0.93
forex_intensity	1,421	−0.49	1.59	−7.62	11.76
$\widehat{\texttt{xr}}$	1,289	−0.09	0.53	−4.24	1.70
Predictor Variables					
exp/gdp	1,403	0.23	0.15	0.013	1.09
gpn/exp	1,422	0.50	0.13	0.25	0.94
fva/exp	1,422	0.23	0.11	0.044	0.58
dvx/exp	1,422	0.27	0.10	0.09	0.82
Control Variables					
fdi_out/gdp	1,422	1.51	3.84	−18.84	52.31
ckaopen	1,404	0.71	1.50	−1.82	2.42
save/gdp	1,379	16.59	15.33	−141.97	51.71
polity	1,417	5.65	4.97	−9.0	10.0

8 Figures

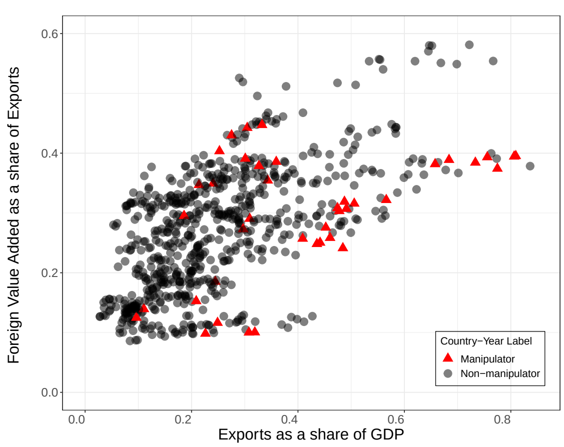
Figure 1: Currency Manipulator Criteria



Notes: triangles in Q2 delineate currency manipulators, Δ forex > 2% of GDP and current account > 3% of GDP. The x-axis is centered on zero, where positive values mean Δ forex is greater than 2% of gdp.

Figure 2: Export Dependence and Moderating Variables

(a) Export dependence and imported inputs



(b) Exported inputs and export dependence

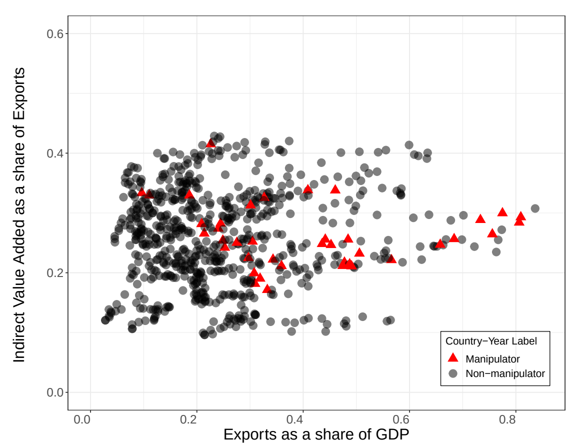


Figure 3: Coefficient Plots: D = `exp/gdp`

(a) Y = `forex/gdp` (b) Y = `forex_intensity` (c) Y = $\widehat{\texttt{xr}}$

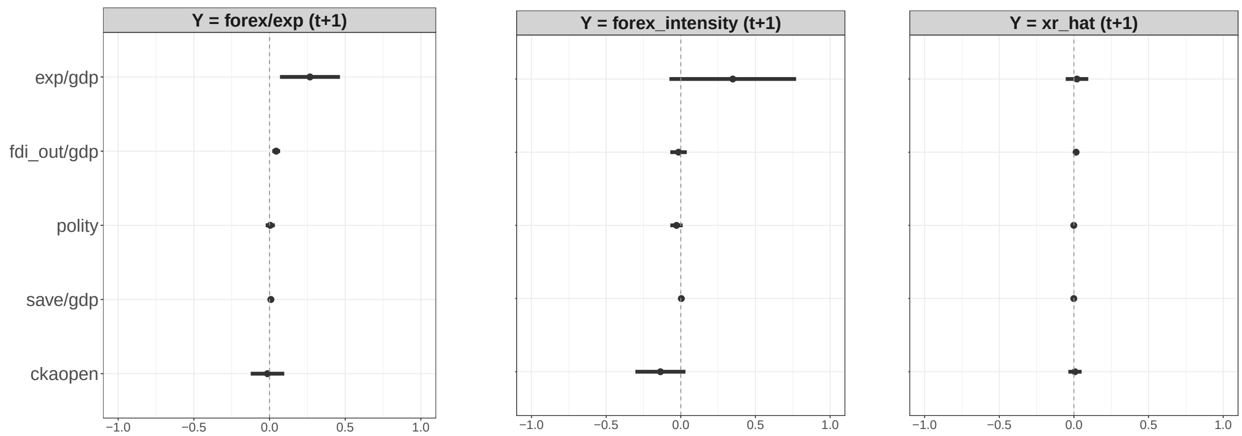


Figure 4: Coefficient Plots: D = exp/gdp, X = gpn/exp

(a) Y = forex/gdp (b) Y = forex_intensity (c) Y = $\widehat{\texttt{xr}}$

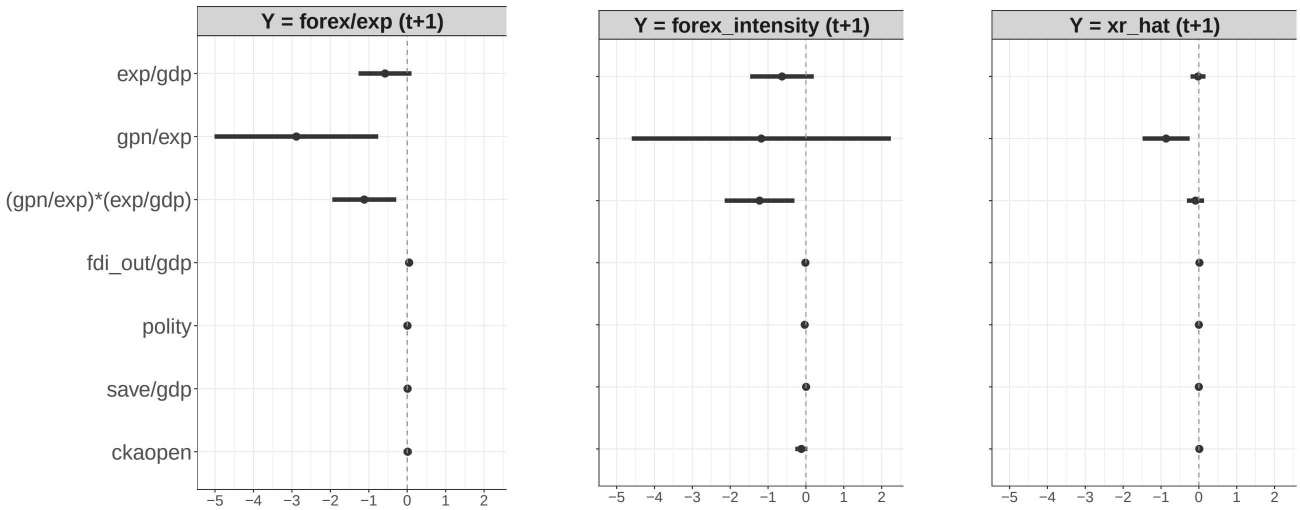
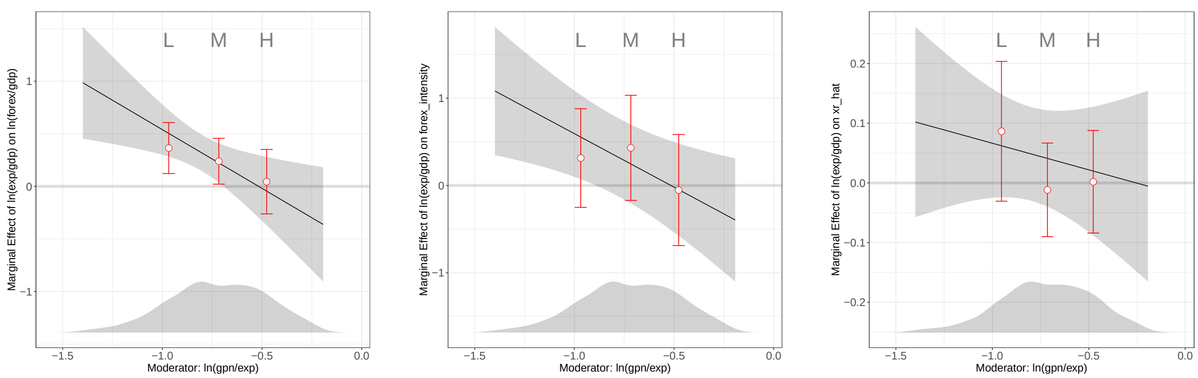


Figure 5: Conditional marginal effects: ln(exp/gdp) on Y moderated by ln(gpn/exp)

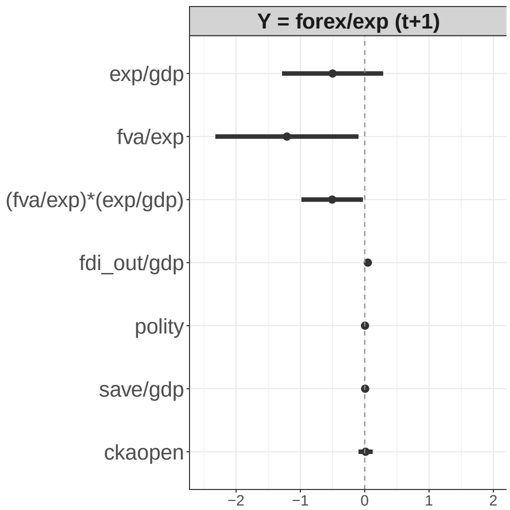
(a) Y = forex/gdp (b) Y = forex_intensity (c) Y = $\widehat{\texttt{xr}}$



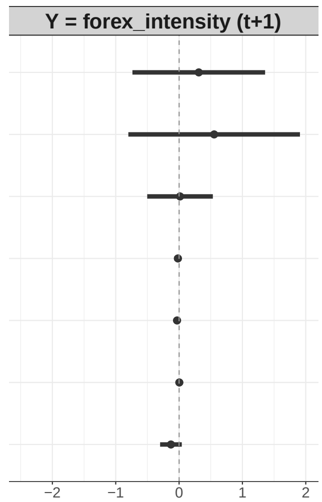
Note: density plots at bottom of each figure for the moderator variable. The outcome variable (Y) changes between plots, with the grey-shaded area displaying the interactive marginal effect of exp/gdp on Y, moderated by gpn/exp. The three dot-and-whisker plots show the same marginal effects using a binning estimator as in Hainmueller, Mummolo and Xu (2019), where three estimates of the marginal effect of D on Y are plotted, labeled L, M, and H, for low, medium, and high values of X.

Figure 6: Coefficient Plots: D = `exp/gdp`, X = `fva/exp`

(a) Y = `forex/gdp`



(b) Y = `forex_intensity`



(c) Y = $\widehat{\texttt{xr}}$

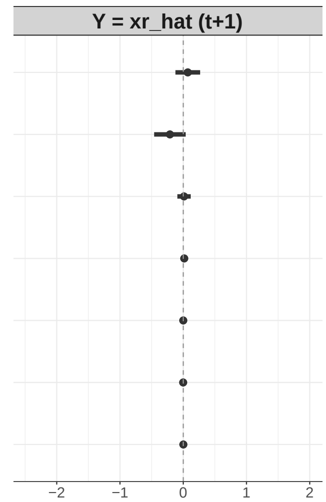
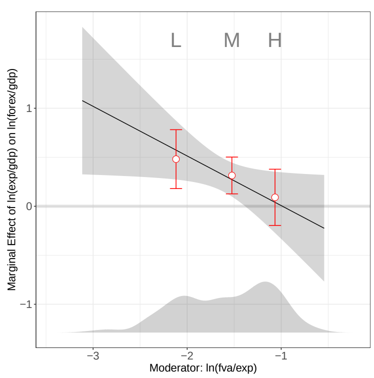
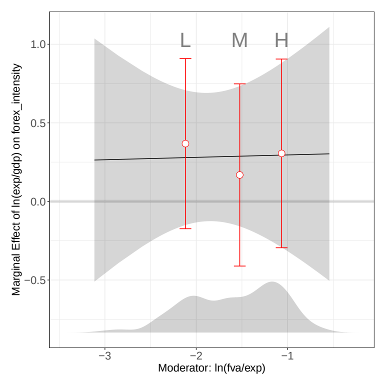


Figure 7: Conditional marginal effects: ln(`exp/gdp`) on Y moderated by ln(`fva/exp`)

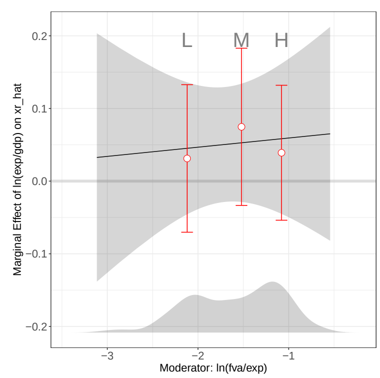
(a) Y = `forex/gdp`



(b) Y = `forex_intensity`



(c) Y = $\widehat{\texttt{xr}}$



Note: density plots at bottom of each figure for the moderator variable. The outcome variable (Y) changes between plots, with the grey-shaded area displaying the interactive marginal effect of `exp/gdp` on Y, moderated by `gpn/exp`. The three dot-and-whisker plots show the same marginal effects using a binning estimator as in Hainmueller, Mummolo and Xu (2019), where three estimates of the marginal effect of D on Y are plotted, labeled L, M, and H, for low, medium, and high values of X.

Figure 8: Coefficient Plots: D = `exp/gdp`, X = `dvx/exp`

(a) Y = `forex/gdp` (b) Y = `forex_intensity` (c) Y = $\widehat{\texttt{xr}}$

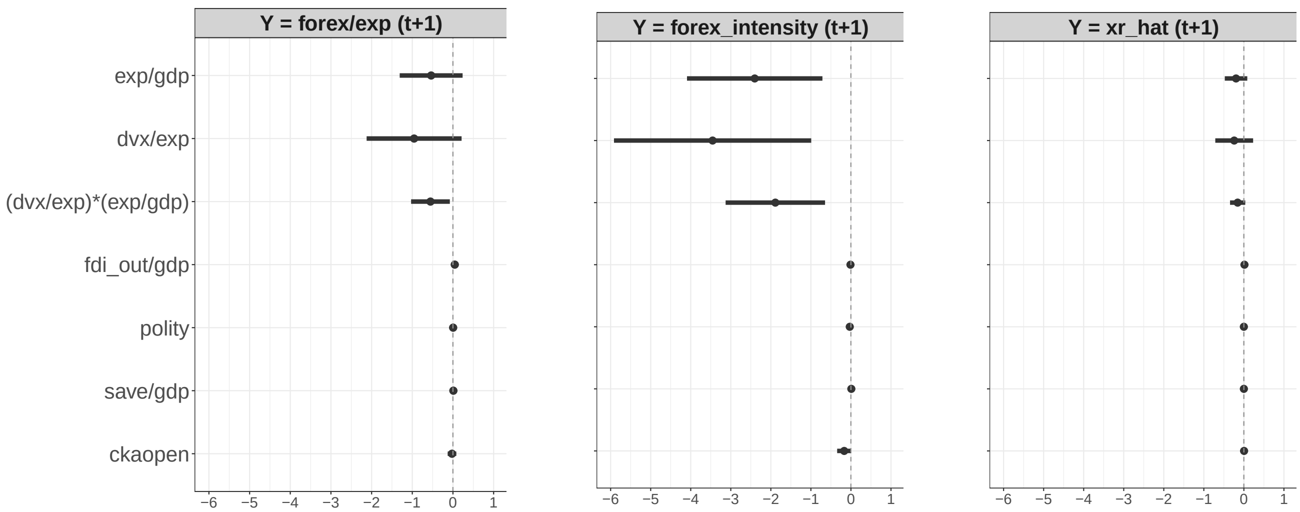
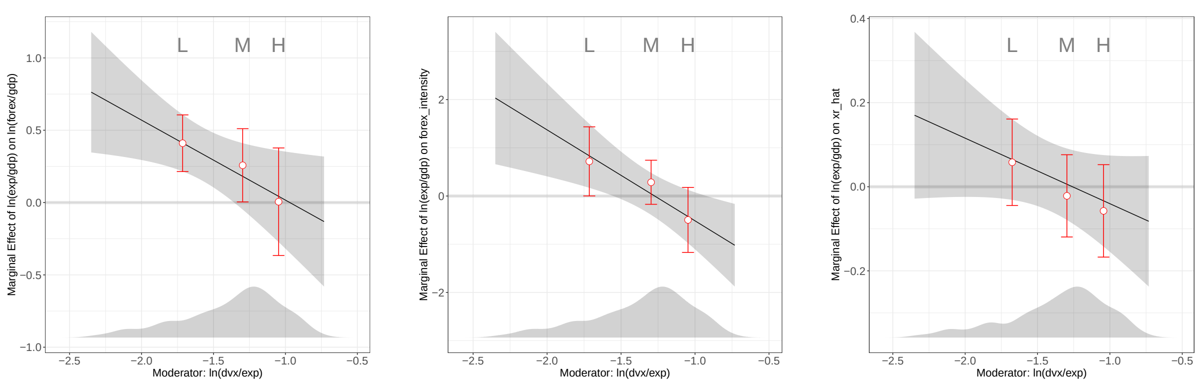


Figure 9: Conditional marginal effects: ln(`exp/gdp`) on Y moderated by ln(`dvx/exp`)

(a) Y = `forex/gdp` (b) Y = `forex_intensity` (c) Y = $\widehat{\texttt{xr}}$



Note: density plots at bottom of each figure for the moderator variable. The outcome variable (Y) changes between plots, with the grey-shaded area displaying the interactive marginal effect of `exp/gdp` on Y, moderated by `gpn/exp`. The three dot-and-whisker plots show the same marginal effects using a binning estimator as in Hainmueller, Mummolo and Xu (2019), where three estimates of the marginal effect of D on Y are plotted, labeled L, M, and H, for low, medium, and high values of X.