NBER WORKING PAPER SERIES

INTERNATIONAL SANCTIONS AND DOLLAR DOMINANCE

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Working Paper 31024
http://www.nber.org/papers/w31024

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 2023, Revised January 2025

We thank Franck Portier (editor), three anonymous referees, and participants at the Joint CEPR & Kiel Institute Conference on Geoeconomics for insightful comments and suggestions. The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of Minneapolis, the Federal Reserve System, or the National Bureau of Economic Research.

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NBER Working Paper No. 31024
March 2023, Revised January 2025
JEL No. E42, F31, F32, F34, F41, P48

ABSTRACT

We propose a simple monetary model to investigate the implications of international financial sanctions for the preeminence of the US dollar in the international financial system. We show how the anticipation of financial sanctions can reduce the US dollar convenience yield and the holdings of US dollar assets. We also evaluate the implications for welfare and show that they are generally detrimental for all countries.

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1 Introduction

The rise in geopolitical tensions triggered by Russia's invasion of Ukraine is altering the landscape of the international monetary system. One emerging question is whether the threat of international sanctions could dilute the preeminence of the dollar as foreign countries reconsider the composition and location of their foreign assets. For example, Janet Yellen, US Treasury Secretary, argued that[1]

> *....There is a risk when we use financial sanctions that are linked to the role of the dollar that over time it could undermine the hegemony of the dollar....*

In this paper, we provide a framework to understand how the deployment of international sanctions could undermine the preeminence of the dollar and examine the welfare implications.

We propose a simple monetary model of a reserve currency with two key ingredients. First, we assume that dollar assets provide a special liquidity value. Second, we assume that there is a cost of issuing safe dollar assets. These two ingredients imply that dollar assets command a premium in equilibrium, in line with the observation that the US obtains an "exorbitant privilege" from its status as reserve currency (Gourinchas and Rey, 2007). In this environment, we study the implications of the anticipation of financial sanctions that reduce a foreign country's return on dollar assets holdings in the event of an international conflict.[2]

Our analysis starts from two frictionless cases, each of which abstracts from one of our key assumptions: either issuing assets is costless for US investors, or there is no special liquidity value from holding dollar assets. We demonstrate that in these two cases, sanctions have no impact on the dollar's exchange rate. We then show that in our model, in expectation of financial sanctions, a foreign country reduces its holdings of dollar reserves. Ultimately, the effects on the dollar exchange rate depend on monetary policy. To the extent that monetary policy is not tightened sufficiently, we show that sanctions weaken the value of the dollar vis-a-vis other currencies. In terms of welfare, we show that the effects are generally detrimental for both countries. Specifically, the US incurs losses due to a diminished premium on U.S. dollar assets, which reduces its exorbitant privilege.

Motivating empirical evidence. Figure 1 illustrates a gradual yet steady decline in the share of foreign reserves held in US dollars. This share exceeded 70% at the start of the

[1]The quote is taken from an interview with CNN from April of 2023. See also Eichengreen (2022), Brunnermeier, James and Landau (2022) and 'How the Ukraine war could boost China's global finance ambitions" by Hudson Lockett, *Financial Times*, March 7, 2022. For an overview of the policy discussions, see Weiss (2022).

[2]For example, in the aftermath of the invasion of Ukraine, Russia's holdings of dollar reserves in the US were frozen.

21st century but has since fallen to below 60%. At the same time, the role of the Renminbi and other currencies has increased, especially in the last 15 years. While we do not observe a sharp move away from the US dollar in the quarters immediately following the Russian sanctions (triggered by its invasion of Ukraine), cautionary comments from Yellen and others point to the possibility that this and future rounds of sanctions may contribute to a reduced role of the US dollars in official reserves. In particular, there are concerns that China may shift its portfolio away from US dollar assets in anticipation of potential sanctions. Relatedly, the incoming second Trump administration has threatened to impose tariffs on BRIC nations should they transition from the dollar to the Renminbi.[3]

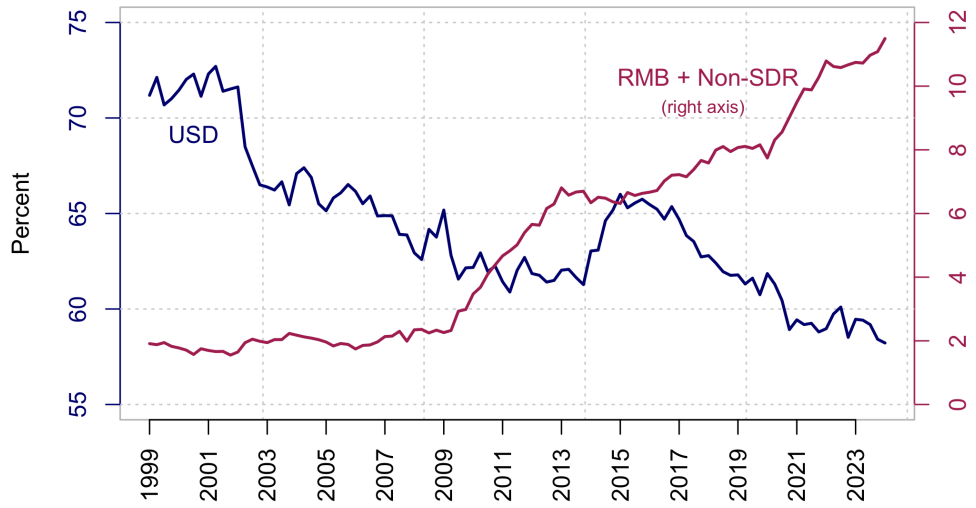

Figure 1: **Currency composition of FX reserves**. Quarterly data on the currency composition of official reserves is from the IMF (COFER). Currencies that are part of the IMF's Special Drawing Rights (SDR) basket are the US dollar, the euro, the Japanese yen, the British pound, and the Chinese renminbi (RMB), the latter since October 2016. All other reserve currencies are referred to as non-SDR currencies.

Literature. Our paper is related to the literature on reserve currencies. A theme in this literature is understanding the foundations and implications of the hegemony of the US dollar in the global financial system (e.g., Farhi and Maggiori, 2018, Gopinath and Stein, 2021, Bianchi, Bigio and Engel, 2021, Gourinchas, Rey and Govillot, 2020, Kekre and Lenel,

[3]In recent work, Choi, Kirpalani and Perez (2022) estimate that the demand elasticity for US government bonds has increased since 2015, suggesting reduced US market power (and hence, a lower convenience yield). While they do not show that this is related to sanctions, it is suggestive that the convenience yield can potentially respond to this and other international events.

2021, Choi, Kirpalani and Perez, 2022, Jiang, Krishnamurthy and Lustig, 2020, Corsetti, Eichengreen, Vives and Zettelmeyer, 2023). A contribution of our paper is to study the role of international sanctions and how they impact the US dollar reserve status. Bahaj and Reis (2022) and Clayton, Dos Santos, Maggiori and Schreger (2022) focus instead on the emergence of a new reserve currency, motivated by the internationalization of the Renminbi.

Our paper is also related to a burgeoning literature on international sanctions, including Lorenzoni and Werning (2022), Itskhoki and Mukhin (2022), Sturm (2022), Bianchi and Sosa-Padilla (2022), and Ghironi, Kim and Ozhan (2023). Unlike these studies, we examine the impact of the anticipation of financial sanctions and primarily focus on their impact on the sanctioning country.

2 Model

We consider a two-period deterministic model. The world economy features two countries of equal measure. We think of one country as the United States, the sanctioning country that has a reserve currency, and the other country as China, the sanctioned country that invests in the reserve currency. There are also residents in the rest of the world, who trade real assets at a rate R^*. The baseline model features a single tradable good and assumes that the law of one price holds.

We define the nominal exchange rate, e, as yuan per dollar; therefore, a decrease in e corresponds to a depreciation of the dollar relative to the yuan. We denote by P the price of the tradable good in terms of dollars and P^* the price in terms of yuans. The central bank in China is assumed to keep the price level constant, which we normalize to one (i.e., $P_t^* = 1$). By the law of one price, this implies that $P_t e_t = 1$. We assume that the central bank in the US sets the nominal rate, i, in period $t = 1$ and has an objective for the exchange rate in period $t = 2$ of e_2. We take this objective as given to focus on the determination of e_1.[4]

2.1 Supply of dollar assets

The US is populated by a continuum of agents that issue safe dollar assets, B, with a nominal return i, and trade real assets, k, with a return R^*, in units of consumption. The intermediation is subject to portfolio costs, which are discussed below. We think of agents in the US as a consolidation of households, financial intermediaries, and the government. For simplicity, we refer to them as investors. We assume that investors value consumption only

[4]See Section 3.4 for a discussion on this.

in period $t = 2$. An investor who issues B units of nominal bonds today can invest $\frac{B}{P_1}$ in real assets, and this operation delivers $B\left[\frac{P_2}{P_1}R^* - (1+i)\right]$ dollars tomorrow. In addition, issuing bonds is costly for investors. In particular, we assume that investors face $\frac{\omega}{2}\left(\frac{B}{P_1}\right)^2$ portfolio costs tomorrow, in units of consumption. The investor's problem consists of choosing a portfolio to maximize the discounted tomorrow's (real) profits. Let $R \equiv (1+i)\frac{P_1}{P_2}$, $b \equiv \frac{B}{P_1}$ and W be the investor's value. The problem can be written as

$$W = \max_b \beta\left[b\left(R^* - R\right) - \frac{\omega}{2}b^2\right]. \tag{1}$$

Optimization yields a supply for real dollar assets that is downward-sloping in the return R (and thus upward-sloping in the price):

$$b = \frac{1}{\omega}\left(R^* - R\right). \tag{2}$$

The parameter ω determines the elasticity of the supply of US assets. When $\omega = 0$, this represents a case in which there is a perfectly elastic supply of US assets.[5]

2.2 Demand for dollar assets

Households' preferences in China are represented by

$$c_1^* + \beta u(c_2^*) + v\left(\frac{B^*}{P_1}\right),$$

where c^* denotes consumption and $u(\cdot)$ is an increasing and strictly concave utility function. The function v represents the utility from holdings of dollar assets in the US financial system and captures the non-pecuniary value from holding a reserve currency asset.[6] We make the following assumption about this function:

Assumption 1. *We assume that $v(\cdot)$ satisfies $v' \geq 0, v'' < 0$, $v'(0) = \infty$, and that it has a satiation point (that is, $v(x) = v(\bar{x})$ for $x \geq \bar{x}$).*

Chinese households receive a real endowment y^* in periods $t = 1, 2$ and trade real assets

[5] Another possible microfoundation for a supply curve that is downward-sloping in the return may come from the government behaving as a monopolist of the safe asset, as in Farhi and Maggiori (2018). See also Bianchi and Lorenzoni (2021) and Choi et al. (2022).

[6] See Bianchi et al. (2021) for a model where the convenience yield of dollar assets is endogenous.

k^* and US dollar bonds $B^* \geq 0$. Their flow budget constraints are

$$c_1^* = y^* - \frac{B^*}{P_1} - k^*$$
$$c_2^* = y^* + \frac{B^*}{P_2}(1+i)(1-\lambda) + R^* k^*.$$

We assume that as a result of international sanctions, a fraction $\lambda \in [0,1]$ of the dollar assets are confiscated in period $t = 2$. Consolidating the two flow budget constraints, defining $b^* \equiv \frac{B^*}{P_1}$ and denoting China's value by W^*, we can write the problem of households in China as

$$W^* = \max_{c_1^*, c_2^*, b^* \geq 0} c_1^* + \beta u(c_2^*) + v\left(b^*\right) \tag{3}$$

$$\text{subject to}$$

$$y^* - c_1^* + \frac{y^* - c_2^*}{R^*} - b^* \left(1 - \frac{R(1-\lambda)}{R^*}\right) \geq 0.$$

The last term on the left-hand side of the intertemporal budget constraint reflects the losses from investing in an asset that has a lower return than the real asset.

Taking first-order conditions, and assuming an interior solution, we obtain

$$v'\left(b^*\right) = 1 - \frac{R(1-\lambda)}{R^*}. \tag{4}$$

Using that $v'' < 0$, (4) gives us a demand for dollar assets that is upward-sloping in the return R (and so downward-sloping in the price).[7] Moreover, an increase in λ reduces the demand for dollar assets, for given returns.

Discussion on sanctions. We modeled the financial sanctions as a confiscation of dollar assets. Notice that implicit in (2) is that US investors do not take control of the seized assets. We think this is the realistic case, as assets seized are more likely to be taken over by governments and used to finance war reparations. Sanctions could alternatively involve a freeze of assets as opposed to a reduction in the pecuniary return, as in Bianchi and Sosa-Padilla (2022).[8] What is crucial for our main analysis is that sanctions open a wedge between the return on dollar assets perceived by China and the cost of issuing debt by the US. Moreover, we also note that while here we study a deterministic model, we expect our

[7] Notice that a bounded solution of (3) requires $R(1-\lambda) < R^*$.

[8] See also Bianchi and Lorenzoni (2021) and Clayton et al. (2022) for an analysis of ex-post capital controls on real assets.

results to also hold in a more general stochastic environment where with some probability, the country faces sanctions in the event of an international conflict.

2.3 Equilibrium

Given government policies $\{i, e_2\}$, a competitive equilibrium is a set of allocations $\{c_1^*, c_2^*, k, k^*, B, B^*\}$, an exchange rate e_1, and price levels $\{P_1, P_2\}$ such that

1. agents in the US and China maximize their utility,
2. the market for US dollar assets clears. That is, $B = B^*$.
3. prices satisfy the law of one price: $P_t e_t = 1$ for $t = 1, 2$.

In Lemma 1 (formally stated in the appendix) we show that in equilibrium, there is a convenience yield on dollar bonds (i.e., $R < R^*$) and that China holds positive US dollar bonds (i.e., $b^* > 0$). Intuitively, in this economy, households in China place a special value on dollar assets. The Inada condition on $v(\cdot)$ and the fact that the marginal cost of producing assets is zero at $b = 0$ for US investors imply that the equilibrium must feature positive trade of dollar assets. The lower return of dollar asset relative to real asset reflects its non-pecuniary value.

Figure 2 illustrates the equilibrium by presenting the supply and demand of dollar assets, as represented respectively by (2) and (4).

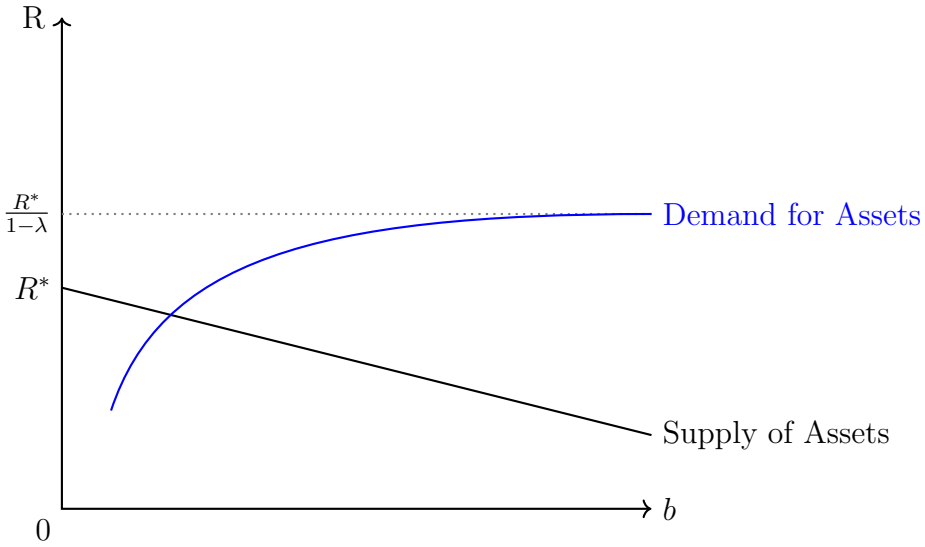

Figure 2: Illustration of the equilibirum

3 An Increase in International Sanctions

The goal is now to explore the effects of international sanctions by performing a comparative static with respect to λ. We first consider two frictionless versions where international sanctions play no role in the determination of the nominal exchange rate. After that, we turn to our baseline model in which the expectation of sanctions will depreciate the dollar and reduce the issuance of dollar assets.

3.1 Frictionless versions

We start the analysis by considering two "frictionless cases," one in which the dollar assets do not feature a non-pecuniary value for China, and another one in which the cost of issuing dollar assets for US investors is zero.

Non-special dollar assets. Suppose that dollar assets do not provide a non-pecuniary return (i.e., $v(x) = 0$ for all x). One way to think about this case is that there are no deeper frictions that justify why dollar assets may be special. Lemma 2 in the appendix proves that in this case, an increase in the sanction λ has no effects on the exchange rate or the quantity of assets traded.

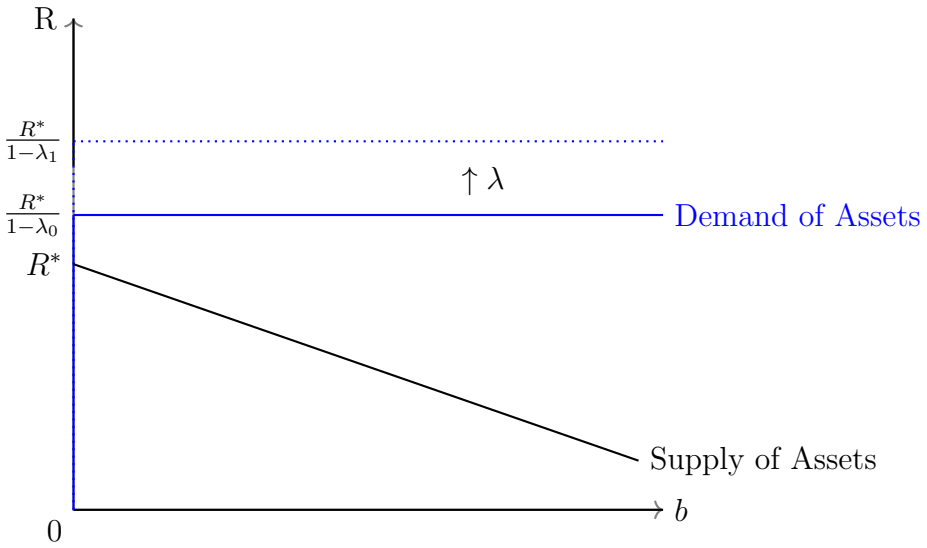

Figure 3: The effects of an increase in λ when $v = 0$

Intuitively, if dollar assets have no special value, households in China are not willing to hold dollar assets unless the return is the same as the real assets. At the same time, the US is not willing to produce dollar assets unless there is a spread. This case is illustrated in

Figure 3. We can see that the demand for US assets has an inverted L shape that intersects at zero with the supply of assets. An increase in λ shifts the demand for assets but has no consequences for the equilibrium.

No costs from issuing safe assets. The second frictionless version we study is when $\omega = 0$. This corresponds to the case in which US investors provide an infinitely elastic supply of dollar assets. In the appendix, we use Lemma 3 to establish that in this case, sanctions have no effects on the exchange rate.

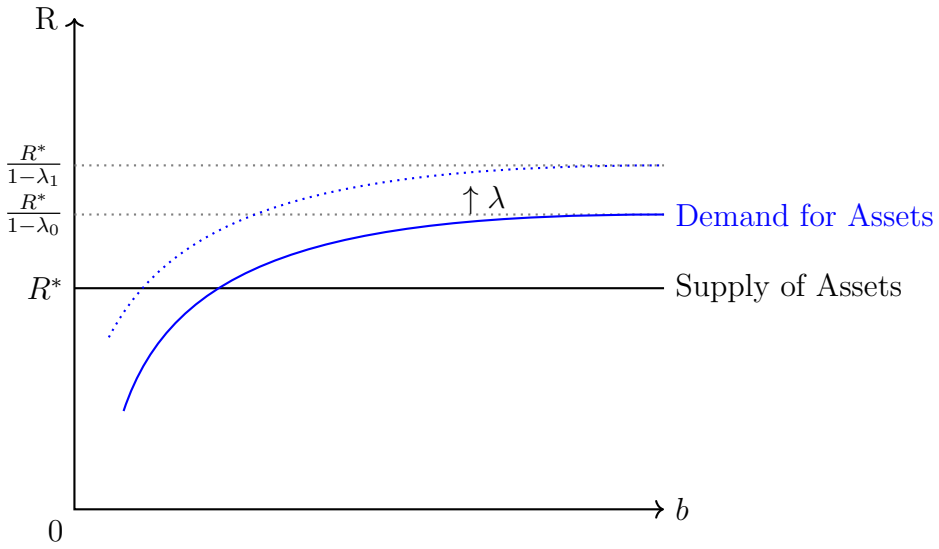

Figure 4: The effects of an increase in λ when there are no costs from issuing assets

The intuition for this result is that if there is no cost of producing dollar assets, their return must be pinned down by the return of real assets. As a result, sanctions cannot have any impact on the exchange rate. See Figure 4 for an illustration.

3.2 The Weakening of the Dollar

Having examined frictionless cases where sanctions have no impact on the value of the dollar, we now consider the general case in which dollar assets have a special value, $v > 0$, and there is a decreasing supply of assets by the US, $\omega > 0$. We show that R rises in response to an increase in expected sanctions and that the amount of dollar assets traded in equilibrium falls. We formalize this result below.

Proposition 1. *Suppose Assumption 1 holds and $\omega > 0$. An increase in λ increases R, decreases $R(1-\lambda)$, depreciates the dollar, and lowers b^*.*

Proof. See appendix. □

These results are illustrated in Figure 5. We can see that as λ increases, the demand for dollar assets is reduced for any R. In equilibrium, we end up with a higher return R, a weaker dollar, and a lower amount of dollar assets.

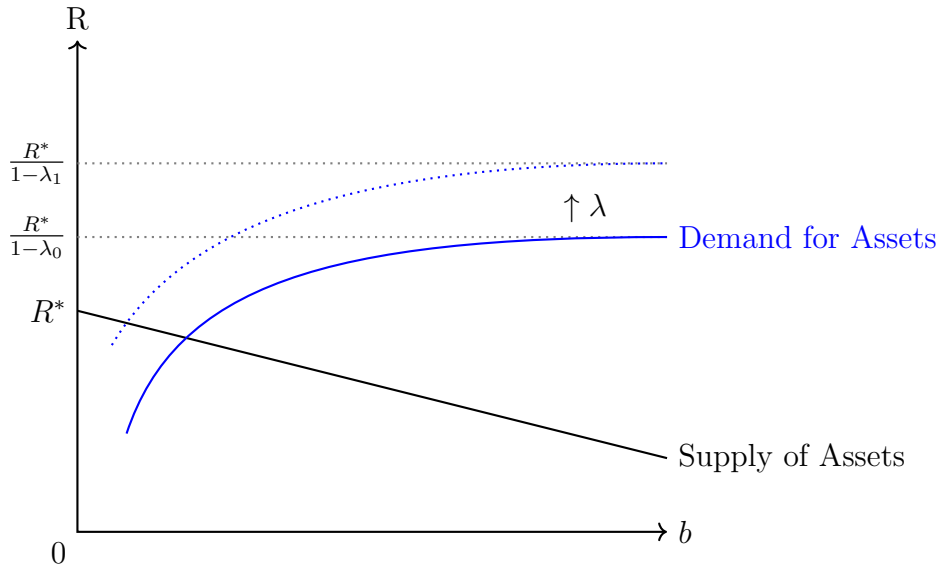

Figure 5: General case: the weakening of US dollar

3.3 Welfare Implications

The results on China's welfare can be assessed by totally differentiating (3) with respect to λ. Applying the envelope condition, we obtain

$$\frac{dW^*}{d\lambda} = \frac{b^*}{R^*}\left(\frac{dR(1-\lambda)}{d\lambda}\right) < 0 \tag{5}$$

where the sign follows from Proposition 1. That is, an increase in λ reduces the return obtained by Chinese investors on their dollar assets. Recall that even though R goes up in equilibrium, the overall return $R(1-\lambda)$ decreases, and so the net effect is a reduction in welfare.

Similarly, for the US welfare, we differentiate (1) and obtain

$$\frac{dW}{d\lambda} = -\beta b\frac{dR}{d\lambda} < 0 \tag{6}$$

That is, the increase in R implies a reduction in the convenience yield, causing lower rents from intermediation. Because US investors have a negative position in dollar assets, the

increase in the interest rate on these assets causes a reduction in US investors' welfare.

3.4 Discussion

Optimal monetary policy. In our simple model, we have kept for simplicity i, e_2 fixed. However, as the welfare analysis above shows, the only variable relevant for welfare is R. That is, alternative assumptions of how monetary policy is conducted would not alter welfare. On the other hand, alternative monetary policies would affect the extent of the depreciation. In fact, the central bank could defend the value of the dollar by raising i. In a richer environment with wealth effects and non-tradables, we conjecture that the higher cost of US dollar liabilities would lead the central bank to let the nominal exchange rate depreciate to stabilize demand.

Initial positions. Our analysis abstracted from initial asset positions. Given the simple form of preferences, it is worth highlighting that the convenience yield would not be affected in our simple model. However, a depreciation resulting from sanctions would reallocate wealth from China to the US. A natural question is how this affects our welfare analysis in the previous section. For a given nominal interest rate i, indeed, there would be a positive welfare effect for the US (and a negative one for China). However, to the extent that the central bank chooses the nominal interest rate and therefore e_1, the marginal welfare effect for the US remains given by (6). Intuitively, by an envelope argument, since the central bank is optimizing, a change in e_1 due to a marginal change in λ is second-order.[9]

Relationship with sovereign default. As we discussed above, a crucial difference between the sanctions as modeled here and partial default in the sovereign debt literature is that in the latter when a government defaults on its creditors, this relaxes its budget constraint (despite the costs it faces from defaulting). Here, when a country sanctions another one, this does not raise its resources. Notice that if the losses for the sanctioned country were gains for the sanctioning country, the nominal return would adjust so that there would be no real effects of sanctions. However, we see that in practice seized assets are used for reconstruction after wars and are not appropriated by the issuer of the dollar assets, which justifies our modeling choice.

[9]This analysis suggests that in the presence of a zero lower bound, the anticipation of sanctions could be welfare improving for the US. The benefits that result from weakening its reserve currency status align with the arguments in Caballero, Farhi and Gourinchas (2021).

Duration of sanctions. For simplicity, we have considered a two-period model. In an infinite horizon setup, the duration of sanctions would affect their impact on the US dollar. In particular, our analysis takes as given the exchange rate in the second period. In a fully dynamic model, expectations of sanctions at $t = 3, 4, \ldots$ would impact the exchange rate in period $t = 2$, and thus through the interest parity condition affect the exchange rate in the initial period. Moreover, the effects of sanctions are likely to depend on the maturity of the portfolios and the costs of adjusting those portfolios. We think that extending the model to a fully dynamic one and incorporating uncertainty are important areas for future research.

4 Conclusions

In this paper, we articulate a channel by which international financial sanctions could weaken the preeminence of the US dollar. To conclude, let us highlight that while our analysis isolates a mechanism by which financial sanctions can weaken the preeminence of the US dollar, it does not rule out other mechanisms by which sanctions may contribute to strengthening the dollar. One could argue, for example, that the imposition of sanctions may deter belligerence in the future and strengthen the dollar. Further analysis and quantification of these channels warrant future research.

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A Appendix

Lemma 1 (Convenience yield)**.** *Suppose Assumption 1 holds. In equilibrium* $R < R^*$ *and* $b^* > 0$ *for any* λ*.*

Proof. Suppose, by contradiction, that $R \geq R^*$. Then, using (2), this implies $b < 0$. But using (4) and $v' \geq 0$, this implies that $b^* \geq 0$. Thus, market clearing cannot hold, implying that $R < R^*$. In addition, this result and (4) imply that in equilibrium $b^* > 0$. □

Lemma 2. *Suppose that* $v(x) = 0$ *for all* x*. Then, an increase in the sanction* λ *has no effects on the exchange rate or the quantity of assets traded.*

Proof. We first show that if $v(x) = 0$ for all x, we have that $R = R^*$. Suppose that $R < R^*$. Then, from (2), we know that US investors would be willing to issue assets, $b > 0$. However, from the problem in (3), it follows that if $v(x) = 0$, then $b^* = 0$. Thus, market clearing cannot hold. We can also rule out $R > R^*$. If $R > R^*$, (2) implies that US investors would like to save in dollar assets. Since China cannot issue dollar assets, we reach a contradiction.

Having argued that $R = R^*$, we then note that this implies from (2) that $b = 0$ for any λ. Finally, to see that there are no effects on the exchange rate, we use the definition of R and the law of one price to see that $R = \frac{(1+i)e_2}{e_1}$. Since R is invariant to λ and the central bank is assumed to keep i and e_2 constant, then e_1 remains constant. □

Lemma 3. *Suppose* $\omega = 0$*. Then, an increase in* λ *has no effect on the exchange rate.*

Proof. We show that if $\omega = 0$, then $R = R^*$ for any λ. From the arguments above, we can rule out $R > R^*$. Suppose $R < R^*$. Then, from (2), it follows that asset issuances are infinite in the US. From (4), it follows that b^* is finite, thus, the contradiction. Finally, the argument that the exchange rate is unaffected follows the same logic as the one in the proof of Lemma 2. □

Proof of Proposition 1.

Proof. Replacing (4) in (2), we obtain that

$$v'\left(\frac{1}{\omega}(R^* - R)\right) = \frac{R^* - R(1-\lambda)}{R^*}$$

Totally differentiating, we obtain

$$\frac{dR}{d\lambda} = \frac{R}{-v''(b^*)\frac{R^*}{\omega} + (1-\lambda)} > 0 \tag{7}$$

Using that $R = (1+i)\frac{e_2}{e_1}$, and recalling that the US central bank is assumed to keep i and e_2 constant, it then follows that e_1 falls. Using (7) in addition to (2) and market clearing, we obtain that b^* falls. Finally, to show that $R(1-\lambda)$ must fall, we note that:

$$\begin{aligned}\frac{dR(1-\lambda)}{d\lambda} =& \frac{dR}{d\lambda}(1-\lambda) - R \\ =& R\left[\frac{1}{1 - v''(b^*)\frac{R^*}{\omega(1-\lambda)}} - 1\right] < 0\end{aligned}$$

□