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INTERNATIONAL SANCTIONS AND DOLLAR DOMINANCE

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ABSTRACT

This paper investigates the implications of international financial sanctions for the reserve currency status of the US dollar. We propose a simple model of a reserve currency, demonstrate how the anticipation of financial sanctions can weaken the dollar's status, and evaluate the welfare implications.

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1 Introduction

The rise in geopolitical tension triggered by Russia's invasion of Ukraine is altering the landscape of the international monetary system. One emerging question is whether the US dollar will maintain its status as the preeminent reserve currency as international financial sanctions threaten to push foreign countries to rethink how and where they hold their foreign assets.[1] In this paper, we offer a formal framework to evaluate this concern. In particular, we ask, will the deployment of international sanctions contribute to the demise of the dollar? If so, through what mechanism? And what are the welfare implications?

We propose a simple 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. The combination of these two ingredients implies 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 a frictionless case where either issuing assets is costless for US investors or there are no pecuniary value from holding dollar assets. We show that in these two cases, sanctions have no impact on the dollar's exchange rate. We then show that in our baseline model, sanctions do weaken the dollar. In particular, we show that in expectation of financial sanctions, a foreign country reduces its holdings of dollar reserves and this leads to a weakening of the dollar exchange rate. Intuitively, financial sanctions offset the liquidity value of US dollar assets and make it less attractive for the foreign country to keep its reserves in dollars. To the extent that monetary policy is not tightened sufficiently in response, we demonstrate that sanctions will ultimately weaken the value of the dollar vis a vis other currencies. Finally, in terms of welfare, we argue that the reduction of the premia in US dollar assets generates a welfare reduction for US investors. However, we also argue that a depreciation of the dollar also reduces the real cost of existing liabilities and this effect may end up improving US's welfare.

Literature. We are related to the literature on reserve currencies, which has examined the foundations and the consequences of the hegemony of the US dollar (e.g., Farhi and

[1] See, for example, Eichengreen (2022), Brunnermeier et al. (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] In the aftermath of the invasion of Ukraine, Russian's holdings of dollar reserves in the US were frozen.

Maggiori, 2018, Gopinath and Stein, 2021, Bianchi, Bigio and Engel, 2021, Gourinchas, Rey and Govillot, 2020, Kekre and Lenel, 2021, Choi, Kirpalani and Perez, 2022, Jiang, Krishnamurthy and Lustig, 2020, among many others). A contribution of our paper is to provide a simple monetary model of how future sanctions can impact international real holdings of dollar assets and the dollar exchange rate. 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) and Itskhoki and Mukhin (2022), who focus on the role of trade sanctions on the exchange rate, and Sturm (2022) and Bianchi and Sosa-Padilla (2022), who study the optimal design of trade and financial sanctions, respectively.

2 Model

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

We assume that the central bank in the US sets the nominal rate i and the exchange rate in period 2 to e_2. We define the exchange rate as yuan per dollar, so a decrease in e indicates a depreciation of the dollar. We denote by P the price of the good in terms of dollars and P^* the price in terms of yuans. The central bank of China is assumed to keep $P_t^* = 1$. By the law of one price, this implies that $P_t = \frac{1}{e_t}$.

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 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 for simplicity that investors value consumption only in period 2. An investor that issues B units of bonds today can invest in $\frac{B}{P_1}$ real assets, which deliver $B\left[\frac{P_2}{P_1}R^* - (1+i)\right]$ dollars tomorrow. In addition, issuing bonds is costly for investors. In particular, investors face $\frac{\omega}{2}\left(\frac{B}{P_1}\right)^2$ portfolio costs tomorrow. The investor's problem consists of choosing the

portfolio to maximize tomorrow's profits. The problem can be written as

$$\max_b \; b\left(R^* - R\right) - \frac{\omega}{2} b^2,$$

where $R \equiv (1+i)\frac{P_1}{P_2}$ and $b \equiv \frac{B}{P_1}$.

Optimization yields a downward-sloping supply for real dollar assets:

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

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.[3]

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, strictly concave utility function. The function v represents the utility from holdings dollar assets and captures the non-pecuniary value from holding a reserve currency asset.[4] We make the following assumption:

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

Chinese households receive a real endowment y^* in periods $t = 1, 2$ and trade real assets $k^* \geq 0$ and US dollar bonds $B^* \geq 0$. Their flow budget constraints are

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

We assume that as a result of international sanctions, a fraction $\lambda \in [0,1]$ of the dollar assets are confiscated in period $t = 2$. The sanctions could also involve a freezing of assets as opposed to a reduction in the pecuniary return, as in Bianchi and Sosa-Padilla (2022).[5] What

[3] Another possible microfoundation for a downward-slopping supply curve may come from the government behaving as a monopolist of the safe asset, as in Farhi and Maggiori (2018). See also Choi et al. (2022).

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

[5] See also Bianchi and Lorenzoni (2021) for the analysis of ex-post capital controls when exchange rate flexibility is costly. Clayton et al. (2022) proposes a model of reputation and ex-ante and ex-post capital controls on real financial assets to explain the strategy of internalization of China's capital markets.

is crucial for our 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.[6] Moreover, we also note that while we consider a deterministic model, we have in the background a stochastic environment where with some probability, the country faces sanctions in the event of an international conflict. We expect our results to be very similar to that case.

Consolidating the two flow budget constraints and defining $b^* \equiv \frac{B^*}{P_1}$, we can write the problem of households in China as

$$\max_{c_1, c_2, b^*} c_1^* + \beta u(c_2^*) + v\left(b^*\right) \tag{2}$$

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, we obtain

$$v'\left(b^*\right) = 1 - \frac{R(1-\lambda)}{R^*}. \tag{3}$$

Using that $v'' < 0$, (3) gives us an upward-sloping demand for dollar assets in the return R (and so downward-sloping in the price).[7] Moreover, an increase in λ reduces the demand for dollar assets given returns.

2.1 Equilibrium

Given government policies $\{i, e_2\}$, a competitive equilibrium is a set of allocations $\{c_2, c_1^*, c_2^*\}$, portfolios $\{k, k^*, B, B^*\}$, 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 assets clears:
$$b = b^*$$

3. prices satisfy the law of one price: $P_t e_t = 1$ for $t = 1, 2$.

[6] In other words, the assets confiscated do not appear in US investors' budget constraint. One way to interpret this could be that the assets seized are used for reparations in a third country.

[7] Notice that a bounded solution of (2) requires $R(1-\lambda) < R^*$.

We now argue that in equilibrium, there is a convenience yield on dollar bonds $R^* > R$ and that China holds positive US dollar bonds (i.e. issued by US investors) in equilibrium.

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

Proof. Suppose $R \geq R^*$. Then, we know from (1) that $b \leq 0$ and from (3) that $b^* > 0$. Thus, market clearing cannot hold, implying that $R < R^*$. In addition, this result and (3) imply that in equilibrium $b^* > 0$. □

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 would feature positive trade of dollar assets. The fact that dollar assets feature a lower return than real assets reflects its non-pecuniary value. Figure 1 illustrates the equilibrium by presenting the supply and demand of dollar assets, as represented respectively by (1) and (3).

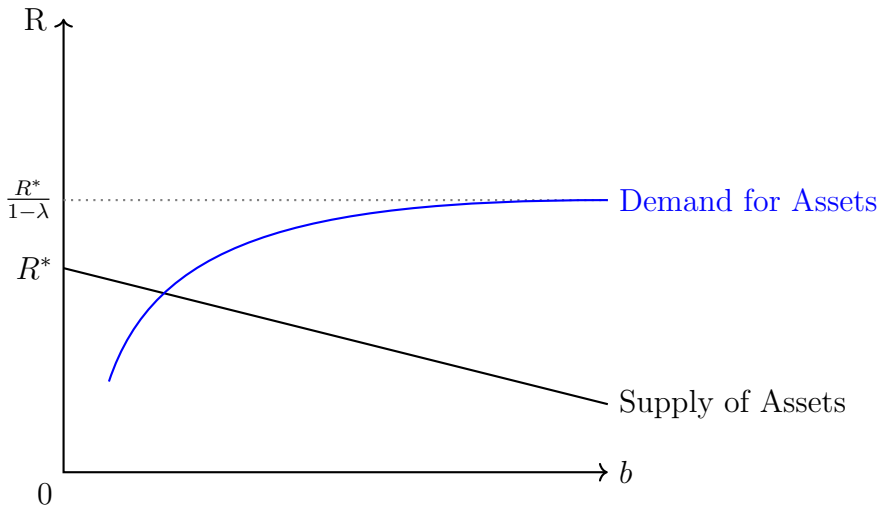

Figure 1: Illustration of Equilibirum

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 a frictionless version where international sanctions play no role in affecting the 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 version

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

Non-special dollar assets. Suppose that dollar assets do not provide a non-pecuniary return (i.e., $v(x) = 0$). One way to think about it is that there are no deeper frictions that justify why dollar assets may be special.

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 (1), we know that households would be willing to issue assets, $b > 0$. However, from (2), it follows that if $v(x) = 0$, then $b = 0$. Hence, a contradiction. We can also rule out $R > R^*$. If $R \geq R^*$, (1) 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 (1) 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. □

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 2. We can see that the demand for US assets follows 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.

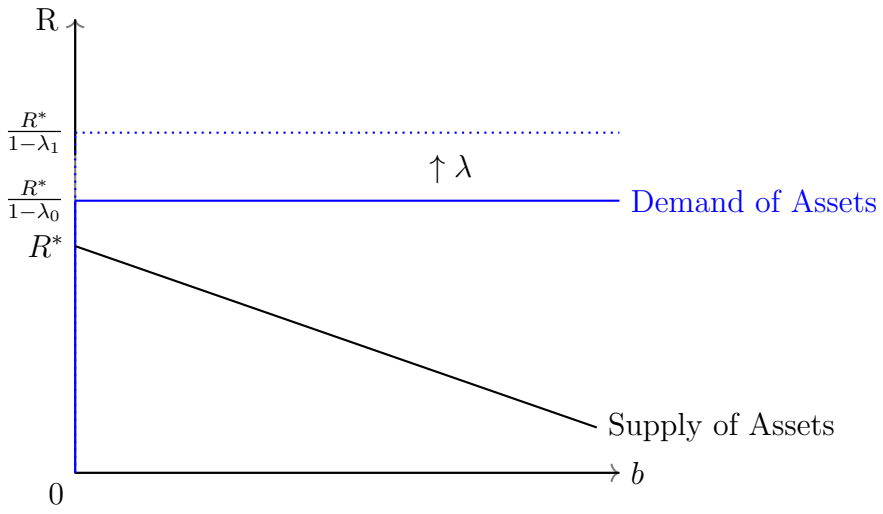

Figure 2: The effects of an increase in λ when $v = 0$

No costs from issuing safe assets. The second frictionless case is when $\omega = 0$. This corresponds to the case in which US investors provide an infinitely elastic supply of dollar assets. The following lemma establishes that in this case, sanctions have no effects on the exchange rate.

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, asset issuances are infinite in the US from (1) . From (3), it follows that b^* is finite, thus, the contradiction. Finally, the argument that the exchange rate is unaffected follows from the same argument in the proof of Lemma 2. □

Intuitively, if there is no cost from producing dollar assets, the return must be pinned down by the return of real assets. As a result, sanctions can have no impact on the exchange rate.

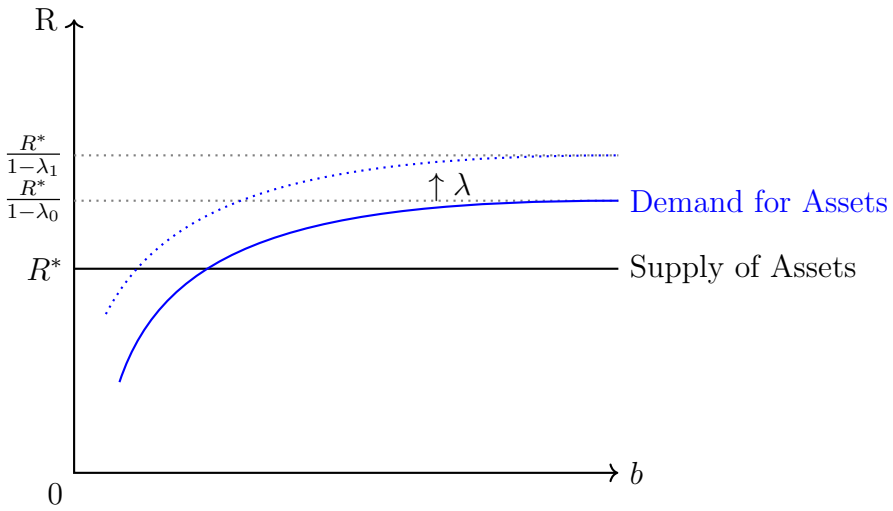

Figure 3: The effects of an increase in λ when there are no costs from issuing assets

3.2 The Weakening of the Dollar

Consider now 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 now show that R increases in response to an increase in expected sanctions and that there is a fall in the amount of dollar reserves. 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. Replacing (3) in (1), we obtain that

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

Totally differentiating, we obtain

$$\frac{\partial R}{\partial \lambda} = \frac{R}{-v''(b^*)\frac{R^*}{\omega} + (1-\lambda)} > 0 \tag{4}$$

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 (4) in addition to (1) and market clearing, we

obtain that b^* falls. Finally, to show that $R(1-\lambda)$ must fall, we note that:

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

□

These results can best be appreciated graphically, as in Figure 4. We can see that as λ goes up, the demand for dollar assets is reduced for any R. In equilibrium, we end up with a higher return R and a weaker dollar.

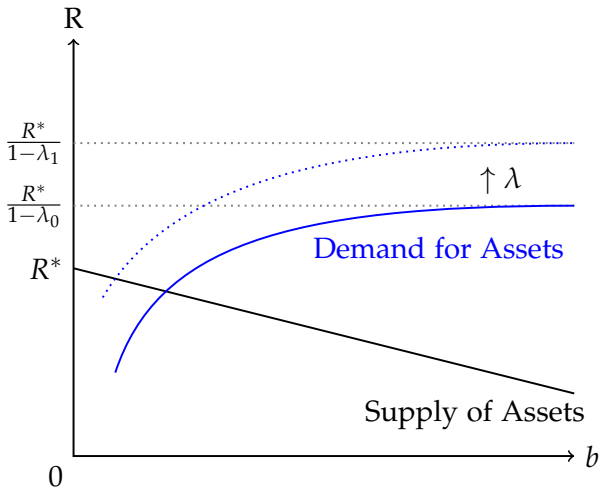

Figure 4: General case: the weakening of US dollar

3.3 Discussion

Monetary policy. The depreciation of the US dollar was obtained under the assumption that the nominal interest rate i is kept constant by the central bank in the US. This raises the question of whether a response by the central bank in the US would undo the dollar depreciation. In particular, if the central bank were to raise i, this would offset the dollar depreciation. However, we argue that the assumption that the US does not raise the nominal interest rate and offset the depreciation pressure can be justified by extending the model to allow for non-tradable goods and an inflation target by the central bank. The key idea is that the increase in the real interest rate at which the US borrows generates a negative wealth effect which necessarily leads to a reduction in demand for domestic goods and a *real*

exchange rate depreciation in the US. Therefore, it follows that for the central bank to avoid deflation, it must let the nominal exchange rate depreciate.

Welfare implications. The final question we tackle is about the implications of sanctions for welfare. Regarding China's welfare, it is clear that an increase in λ reduces the return on dollar reserves. Even though R goes up in equilibrium, the overall return $R(1-\lambda)$ decreases and so the net effect is a reduction in welfare.

For the US, the increase in R implies a reduction in the convenience yield, causing lower rents from intermediation. Because US investors are net borrowers, the increase of the interest rate at which they borrow causes a reduction in US investors' welfare.

At the same time, it is worth highlighting that we assume that US investors are starting from zero debt positions. When households start with positive dollar liabilities, the depreciation of the dollar dilutes the US investors' liabilities.[8] We highlight that this effect translates into a positive welfare effect if the US were to be in a liquidity trap. If the US were constrained in its ability to depreciate the currency, the effect of sanctions will relax those constraints and have a positive welfare effect. These benefits that result form weakening its reserve currency status resonate with the arguments in Caballero, Farhi and Gourinchas (2021).

4 Conclusions

In this paper, we articulate a channel by which international financial sanctions could weaken the dollar as a reserve currency. To conclude, let us highlight that while our analysis isolates a mechanism by which financial sanctions can weaken the dollar as a reserve currency, 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. The further analysis and quantification of these channels warrant for future research.

[8] Extending the model with initial nominal liabilities B_0, we can show formally that the overall welfare effect of a marginal change in λ is given by $\frac{dR}{d\lambda}(RB_0e_1 - \beta b)$.

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