Global Demand for Basket-Backed Stablecoins

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Abstract

We construct a model where a basket-backed stablecoin – a currency backed by backed by and pegged to a combination of sovereign currencies, such as Mark Carney's "synthetic hegemonic currency" or Facebook's proposal for Libra – is demanded for transaction purposes. In the model, demand for the basket derives from trade shocks which affect demand for the underlying sovereign currencies. Despite providing a justification for the basket, our model, in numerical simulations, predicts that overall demand for the basket will be low. This derives from a general-equilibrium effect of the basket currency: Demand for the basket creates pass-through demand for the underlying currencies that back it. This pass-through demand stabilizes the value of the currency for which the basket was meant to substitute, limiting demand for the basket. We calculate that this low demand from buyers would likely limit adoption by sellers. Further, we show that agents in the economy disagree about the optimal basket composition, but its welfare impacts are small.

Keywords: Digital Currencies, International Monetary System, Money Demand, Stablecoins

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1 Introduction

Since the second world war, the US dollar has dominated international trade and financial markets (Eichengreen, Mehl, and Chitu 2018). As we march into a new decade, some have begun to call for an end to that dominance. On the one hand, a multipolar world may be better served by a multipolar international monetary system, with a multipolar reserve currency. On the other hand, the extant dollar payment system faces new potential competition in the form of publicly or privately issued digital currencies based on emerging technologies, such as blockchain, which promise ease of access and lower transactions costs. The most attractive new competitors – dubbed "stablecoins" – employ various mechanisms to maintain stable values relative to some peg. While most stablecoins are pegged to the US dollar or other single sovereign currency, two proposals in the summer of 2019 called for the creation of new international currencies comprising a basket of sovereign currencies: Facebook announced plans for its new currency, the Libra stablecoin (Libra Association 2019); and Mark Carney, Governor of the Bank of England, proposed the creation of a "synthetic hegemonic currency" (Carney 2019).[1] In both cases, a stated goal of building on a basket of underlying currencies is to increase global acceptance by limiting fluctuations in the value of the basket relative to any one currency. However, the term stablecoin may be a misnomer for such an asset, since the basket's value fluctuates relative to each currency.

Regulators and elected officials from around the world have questions and concerns ranging from privacy and fraud prevention to broader effects for financial stability and monetary policy.[2] But a simpler question arises: would a basket currency actually provide substantial value relative to the current system? Under what conditions is there a transaction role for a basket-backed currency? This paper constructs a micro-founded, international monetary model to investigate these questions.

We model a two-country, two-currency economy where agents demand currency to facilitate decentralized exchange subject to search and matching frictions. Trade shocks – fluctuations in the probability of international meetings – affect money demand, leading to variations in the value of each currency. These fluctuations detrimentally affect risk averse consumers' welfare. We introduce a basket currency that is a convex combination of the two countries' currencies, which may be preferable to the constituent currencies in certain states of trade, and analyze demand for this basket currency and the resulting welfare implications.

[1] While the IMF's Special Drawing Right had hoped to fill this role, it has failed to gain prominence over its more than forty year lifespan.

[2] For a fairly comprehensive review, see G7 Working Group on Stablecoins (2019). In response to these concerns, Libra, now Diem, has altered its stablecoin proposal to also include single currency stablecoins in addition to the basket currency.

A large literature studies the potential for new currencies. These often focus on the network externalities inherent to the two-sided nature of payment systems – sellers' incentive to accept a currency depends on consumers' currency holdings and vice versa. In order to focus on *demand*, we abstract from this externality for most of our analysis, considering various exogenous scenarios for sellers' acceptance decisions. Our motivation for this abstraction is twofold. First, many technology companies already possess large user networks that make the question of acceptance less pressing. Second, as in all models of money, one equilibrium features zero adoption of the currency. Thus, we focus on obtaining an upper bound on demand, and so make generous assumptions about its acceptability.[3] In the same spirit, we make other generous assumptions: the basket is perfectly safe as it is fully backed by the underlying currencies, is costless to create and fully redeemable each period, and faces no threat of theft or other drawbacks.

The model focuses closely on the basket component of the proposed currency. Hence, the model is stylized, limited to the most parsimonious general equilibrium microfounded model of money that can allow for meaningful consideration of a basket currency. The model divides the motive to hold a currency into two components: how often a buyer can use the currency in trade, its "spendability," and its rate of return i.e. its inflation. Careful treatment of both the microfoundations of demand for currency and its general equilibrium effects are key to our ultimate conclusion, which is that, under a generous calibration, there is minimal demand for a basket currency. We show that this result is due to the fact that the basket is demanded in states of the world in which one sovereign currency's purchasing power is strictly dominated by the other currency. However, because demand for the basket implies demand for its underlying currencies, the introduction of the basket improves the purchasing power of the dominated currency and reduces demand for the basket itself. That is, the benefit of obtaining a higher rate of return than one currency is reduced as the basket itself affects this rate of return. Overall, our model shows that the introduction of the basket attenuates fluctuations in the most volatile currencies underlying the basket, reducing the welfare gains from holding the basket relative to holding the underlying currencies and making it infeasible for the basket to become the globally dominant currency. Also, because the basket currency will never dominate the sovereign currencies it comprises, we find that there are unlikely to be substantial gains in world welfare as a result of its introduction.

Finally, we use the model to compute the optimal composition of the basket. Comparing the welfare implications in partial and general equilibrium, we find that conclusions about the optimal basket composition vary drastically when considering the cases in which one country's sellers accept the basket or both countries' sellers do. When only sellers from

[3] We consider sellers' incentives to accept at the end of our analysis.

the country with a volatile currency accept the basket, the optimal basket composition is approximately 80-20 in favor of that country's currency, implying that the general equilibrium effects of the basket, which reduce volatility of the more volatile currency, outweigh the demand channel which favors pegging to the more stable currency. Instead, when the basket is accepted worldwide, the optimal basket composition trades off the reduction in volatility of the more volatile currency with the increase in volatility of the less volatile currency, resulting in an optimal basket composition that is roughly equal between the two underlying currencies. In either case, there is disagreement between buyers and sellers in different countries as to the optimal basket composition, which we discuss in detail below.

Even under optimal basket weights, buyers' demand for the basket currency is only a small fraction of global currency holdings. Because holdings are small, so are purchases financed with the basket. This, in turn, means that sellers' profits from basket sales are low, and their willingness to pay to accept the basket is small, far less than the cost of many point of sale terminals capable of processing current electronic payments. Finally, we conduct a series of robustness exercises to test the sensitivity of our results to changes in parameters and the number and size of countries making up the basket currency, and find that the qualitative results still hold in each of these exercises.

2 Literature

We base our modeling on Zhang (2014), who studies a multi-country, multi-currency model of international trade. Building on a model of endogenous acceptance due to Lester, Postlewaite, and Wright (2012), Zhang (2014) carefully analyzes the forces driving the emergence of an internationally accepted currency, and contributes to a long standing literature on international currencies starting with Matsuyama, Kiyotaki, and Matsui (1993), as further developed by Trejos and Wright (1996), Zhou (1997), Wright and Trejos (2001), and Trejos (2004). Those earlier papers of international currencies are based on search-theoretic models of money, either on Kiyotaki and Wright (1989) or Trejos and Wright (1995) which feature indivisible money and, in the former case, indivisible goods. Instead, Zhang (2014) follows the now-standard workhorse monetary model of Lagos and Wright (2005), allowing for both divisible goods and divisible money. This allows her to give meaningful consideration to, inter alia, the strategic interaction of central banks' monetary policy. In the current study, both margins of divisibility are key to making basket currencies meaningful: without endogenous prices allowed for by divisible goods, there can be no price variation driving demand for a better performing currency; without divisible currencies, a basket currency cannot meaningfully comprise fractions of sovereign currencies.

We expand on the steady-state model of Zhang (2014) by introducing trade shocks and a basket currency. Trade shocks allow for inflation and exchange rate volatility with a minimal departure from Lagos and Wright (2005). This, in turn, drives consumers' demand for a better-performing medium of exchange – the basket currency. We believe we are the first to study this particular sort of aggregate shock in such a framework, but a number of papers have considered different kinds of aggregate shocks in the new monetarist framework, especially technology shocks and money-growth shocks in the business cycle traditions of Kydland and Prescott (1982), Prescott (1986), and Cooley and Hansen (1995). These include Aruoba (2011), who performs a classic real business cycle calibration exercise in the new monetarist framework, Telyukova and Visschers (2013), who additionally consider idiosyncratic preference shocks showing that they are important for quantitative money demand, and Wang and Shi (2006) who allow for endogenous search effort in the goods market as well as search in the labor market. In particular, this endogenous search margin resembles our exogenous trade shocks, in that meeting probabilities vary from period to period, but with a different focus; Wang and Shi (2006) seek to explain the volatility of money velocity in a closed economy model. Another related model is that of Gomis-Porqueras, Kam, and Lee (2013) who consider exchange rate dynamics in an international Lagos and Wright (2005) model, but they have no meaningful notion of international currencies because all international exchange happens in frictionless markets – the medium of exchange motive only applies to domestic trade in the domestic currency.

Related to the rate of return variation of a currency analyzed in our study, several papers have considered similar mechanisms. These include Camera, Craig, and Waller (2004) and Craig and Waller (2004). But while, in these studies, a currency's value fluctuates due to exogenous shocks (e.g. one currency suffers from exogenous misappropriation), our study derives variations in money demand from shocks to the underlying trading process which in turn affect the currencies' realized inflation rates and thus rates of return. The same authors provide a further review of the early literature on international currencies in money search models (Craig and Waller 2000). See Giovannini and Turtelboom (1992) for an earlier review of the broader literature on currency substitution.

At a broader level, our work is related to the vast literatures on exchange rate risk and optimal currency areas. With respect to the former, Glen and Jorion (1993) argue that currency hedging for globally diversified portfolios improves investors' risk-return trade-off. Similar to this literature, buyers in our model demand the basket currency when another currency is expected to depreciate. Differently, demand for currencies is positive only when it is spendable due to the inflation tax. More recently, Gopinath, Boz, Casas, Díez, Gourinchas, and Plagborg-Møller (2020) show that dollar pricing has very different implications for the pass through of exchange rate shocks to terms of trade relative to exporter (producer) or importer (local) currency pricing typically assumed in the literature. Differently, our interest is in how the availability of various currencies affects payment choice and trade, and how a basket currency comprised of sovereign currencies affects these choices. The literature on optimal currency areas, following the seminal paper by Mundell (1961), studies the welfare-maximizing grouping of countries under a monetary union. Our approach is complementary to this literature, in that we compute welfare across a range of currency acceptance sets for sellers across countries. However, our focus is about incentives for adoption of a private currency, rather than imposition of a sovereign currency across countries.

3 Environment

The model adds trade shocks and a basket currency to Zhang (2014), which is itself a two-country, two-currency extension of Rocheteau and Wright (2005). Time is discrete, and each period consists of two sub-periods: a decentralized market (DM) and a centralized market (CM).

There are two countries, a large country (L) and a small country (S), with populations 2 and $2n$, respectively, where $n \in (0, 1)$. Each country's population splits equally between two permanent types – buyers and sellers. Each country has its own DM in which buyers and sellers trade. Buyers receive utility $u(q)$ from consuming a quantity q of the good produced by sellers in the DM, but cannot produce it themselves. Sellers can produce this good at a cost $c(q)$, but do not want to consume it. Sellers are immobile, but buyers may travel to meet sellers from the other country. Meetings in each DM take place stochastically and are described in detail below. In a meeting, terms of trade are settled according to proportional (Kalai) bargaining with η being the buyer's bargaining power.

In the CM, trade occurs in a Walrasian market where agents linearly produce a numeraire good, x, one-for-one with labor, h. We assume period utility for buyers and sellers, respectively, is given by

$$\mathcal{U}^{buyer} = u(q) + U(x) - h$$

$$\mathcal{U}^{seller} = -c(q) + U(x) - h$$

symmetrically across countries. We assume U, u, and c satisfy standard assumptions. Agents discount the future with factor $\beta \in (0, 1)$.

In the DM, some buyers may leave their domestic market to trade with sellers from the other country. The probability of traveling depends on the state of the world which is realized at the beginning of the DM. There are two states, trade (T) and no-trade (N), and the state evolves according to a first-order Markov process with ρ_s being the probability that the state remains s if it was s in the previous period, $s \in \{T, N\}$. Let α_s be the probability that a buyer does not travel with $\alpha_N = 1$ and $\alpha_T = \bar{\alpha} \in (0, 1)$.

Trade in the DM is subject to search frictions. The number of meetings in state $s \in \{T, N\}$ in country $i \in \{L, S\}$ is given by $\mathcal{M}_s^i = \frac{\mathcal{B}_s^i \mathcal{S}_s^i}{\mathcal{B}_s^i + \mathcal{S}_s^i}$, where $\mathcal{B}_s^i$ is the mass of buyers in the DM in country i and $\mathcal{S}_s^i$ is the mass of sellers there. In country L, $\mathcal{S}_s^L = 1$ and $\mathcal{B}_s^L = \alpha_s + (1 - \alpha_s)n$, which comprises the number of large country buyers who do not travel, α_s, and the number of small country buyers who do, $(1 - \alpha_s)n$. Similarly, in country S, $\mathcal{S}_s^S = n$ and $\mathcal{B}_s^S = \alpha_s n + 1 - \alpha_s$. Given the number of meetings, buyers and sellers match randomly so a buyer in country i and state s matches with probability $\mu_s^i = \mathcal{M}_s^i / \mathcal{B}_s^i$, while the probability for a seller is $\nu_s^i = \mathcal{M}_s^i / \mathcal{S}_s^i$.

We assume that agents lack commitment and trading is anonymous, so a medium of exchange is necessary for trade to occur in the DM. The government in each country issues an aggregate quantity M_i of its own fiat currency; we write $m_s^i \in \mathbb{R}_+$ for individual holdings. Let ϕ_s^i be the CM price of currency i in units of the CM good in state s. Below, we will use the CM good as the numeraire, so one real unit of currency i requires $1/\phi_s^i$ nominal units of the currency. Independently of the state, money supplies in the two countries grow at country specific rates, $\gamma^i = M_{i,+}/M_i$, $i \in \{L, S\}$ where $+$ denotes next-period variables. Money growth is implemented through lump-sum taxes or transfers of domestic currency to domestic buyers in the CM.

In addition to sovereign currencies, we assume that there exists a basket currency, and B will be used to denote quantities pertaining to the basket currency. The basket currency is elastically supplied in the CM by a technology which combines a real quantity of each sovereign currency and returns a unit of the basket currency. Let κ be the real weight of the large country's currency in the basket currency, so that combining κ real units of the large currency with $1 - \kappa$ real units of small currency produces 1 real unit of the basket currency. In the following CM, last period's outstanding basket currency is redeemed for the underlying basket.

As the basket is elastically supplied, and new basket currency is issued and destroyed each period, the nominal unit of the basket is immaterial, and could be set to any value. We make the restriction that the nominal unit each period is set such that the value of one nominal unit from the previous period is equal to that of one nominal unit created in the given period. The price at which households can redeem the basket depends on how the component currencies' prices evolve from one period to the next. To derive this price, suppose that there were $M_{B,-}$ nominal units of the basket outstanding last period, and therefore $\phi^B_- M_{B,-}$ real units of the basket. Dividing this quantitiy into its components, we have $\kappa\frac{\phi^B_-}{\phi^L_-}M_{B,-}$ nominal units of the large country's currency and $(1-\kappa)\frac{\phi^B_-}{\phi^S_-}M_{B,-}$ nominal units of the small country's currency. That is, each nominal unit of the basket brought from last period comprises $\kappa\frac{\phi^B_-}{\phi^L_-}$ nominal units of L and $(1-\kappa)\frac{\phi^B_-}{\phi^S_-}$ of S. The prices of these components today are ϕ^L and ϕ^S, respectively. Therefore, given our restriction, the price of the basket in the current period must be

$$\phi^B = \kappa\frac{\phi^B_-\phi^L}{\phi^L_-} + (1-\kappa)\frac{\phi^B_-\phi^S}{\phi^S_-}.$$

Rearranging, it is clear that the change in the real price of the basket is equal to the weighted changes in the real prices of its component currencies:

$$\frac{\phi^B}{\phi^B_-} = \kappa\frac{\phi^L}{\phi^L_-} + (1-\kappa)\frac{\phi^S}{\phi^S_-}. \tag{1}$$

In addition to risk over whether they travel and the probability of meeting, buyers face risk over what currencies sellers accept. An important feature of the basket is that it is a separate currency necessitating a different technology in order to accept it. Generically, write θ^i_J for the probability that a seller in country i accepts the set of currencies $J \in 2^{\{L,S,B\}}$. We assume all sellers in a country always accept that country's domestic currency, so $\theta^i_J = 0$ if $i \notin J$. Further, we assume there exists a government sector comprising some proportion of sellers in each country, and that these government sellers only accept their domestic sovereign currency. Hence, $\theta^i_{\{i\}} > 0$ for $i \in \{L,S\}$. We will take these probabilities as exogenous, but consider the incentives of private sector sellers to invest in accepting currencies other than their domestic one in section 6.4.

In summary, timing in the model is as follows. At the beginning of each period, nature draws the state of trade. Then, the DM opens, buyers may travel, and agents meet bilaterally and randomly in each country's market, terms of trade are determined – limited by a buyer's money holding and the set of currencies a seller accepts – and trade occurs. Next, the CM opens, agents' old basket currency is redeemed, agents work to produce the numeraire which they trade for currency, including newly minted basket currency, and then consume.

4 Discussion of the Model

We now provide some discussion of our assumptions on the environment before proceeding to the solution of the model. First, our choice to study trade shocks allows us to highlight the key motivation driving money demand in this class of new monetarist models: spendability.

Because decentralized, anonymous trade drives currency demand, changes in the rate at which decentralized meetings take place is the most natural margin to focus on when trying to understand when certain assets will be held as money. Second, for there to exist a motive to hold the basket currency in this model, trade shocks must be persistent and realized at the beginning of the DM. If trade shocks were not persistent, they would not have an effect on currency values (which are inherently forward looking). If trade shocks were realized in the CM, quasi-linearity would induce risk neutrality – a basket currency would be the same as an equally spendable portfolio that mimicked it. To the best of our knowledge, this paper is the first to introduce persistent trade shocks in a money search framework. Third, we assume that these shocks are symmetric, in the sense that residents of both countries trade less with one another in the no trade state, and more with one another in the trade state, for parsimony. In addition, as we think of negative trade shocks representing trade wars, which tend to be bilateral, we believe that the symmetric shocks are a good starting point, with at least qualitative empirical validity.

Second, our assumption that the two trading partners are of different sizes ($n < 1$) is necessary for trade shocks to have heterogeneous effects in the two countries, leading to demand for a more stable asset as insurance. When countries are identical, fluctuations in the level of international trade lead to equal relative currency demand, so no relative volatility. Instead, when one country is smaller than the other, a small change in currency demand by buyers in the larger country will have large effects on the smaller country's aggregate currency demand. Thus, the purchasing power of one country fluctuates more than the other only when they are different sizes. This drives demand for the basket currency, as it provides insurance against the differential effects on the two currencies across states.

Third, we assume that basket weights are based on the real value of the two currencies, instead of a fixed nominal basket. In a previous version of this paper (Baughman and Flemming 2020) we instead assumed a fixed nominal basket, in line with some comments from Facebook regarding its Libra proposal. With fixed nominal weights, however, the existence of a stationary Markov equilibrium requires that the sovereign currencies have equal long-run money growth. Assuming equal money growth, however, removes one of the primary bases of competition between currencies – differential rates of return, that is, differential inflation. Introducing real basket weights, however, creates a number of difficulties, one being that state transitions are not symmetric. That is, under nominal weights, the relative value of a currency when moving from the trade to the no trade state is equal to the inverse of that when moving from the no trade to the trade state. Under real weights, as presented here, this is not the case, and one must separately determine realized inflation under different state transitions.

5 Model Solution

We look for a symmetric (within country) Markov equilibrium in real values. That is, one where real balances, quantities, etc. depend only on agents' national identity and the trade state, and not on time. Except for the uncertainty introduced by trade shocks, and the effects of the basket currency on market clearing conditions, the value functions and first order conditions of our model are standard.

5.1 CM Value Functions

Sellers in the CM have no use for currency in the DM, so simply liquidate their holdings for the general consumption good, x. Buyers work to consume and to acquire money to carry into the next DM. The value for a buyer from country $i \in \{L, S\}$ entering the centralized market is given by $W^i(\mathbf{m}, s)$, where $s \in \{N, T\}$ is the state and $\mathbf{m} \equiv (m_L, m_S, m_B)$ is the buyer's portfolio carried from the previous period.

$$W^i(\mathbf{m}, s) = \max_{x,h,\mathbf{m}^+ \in \mathbb{R}^3_+} \left\{ U(x) - h + \beta \mathbb{E}_{s^+} \left[V^i(\mathbf{m}^+, s^+) | s \right] \right\}$$

$$s.t.\ x + \phi_s^L m_L^+ + \phi_s^S m_S^+ + \phi_s^B m_B^+ = h + \phi_s^L \left(m_L + \kappa \frac{\phi_{s^-}^{B-}}{\phi_{s^-}^{L-}} m_B \right) + \phi_s^S \left(m_S + (1-\kappa) \frac{\phi_{s^-}^{B-}}{\phi_{s^-}^{S-}} m_B \right) + T_i$$

where the tax or transfer is given by $T_i = (\gamma^i - 1)\phi^i M^i$, $+$ and $-$ denotes next and previous period values, $\mathbb{E}_{s^+}[\cdot|s]$ denotes the expectation over the state at the beginning of next period and therefore in the next DM, and V^i is the buyer's value entering the DM. Notice, in the budget constraint, old basket currency is redeemed for its components so that m_B becomes $\kappa(\phi_{s^-}^{B-}/\phi_{s^-}^{L-})m_B$ units of large currency and $(1-\kappa)(\phi_{s^-}^{B-}/\phi_{s^-}^{S-})m_B$ units of small currency.

Substituting out h from the budget constraint and differentiating yields first order conditions: demand for CM good is such that $U'(x^*) = 1$, and buyers' demand for currency $j \in \{L, S, B\}$ solves

$$-\phi_s^j + \beta \mathbb{E}_{s^+} \left[\left. \frac{\partial V^i(\mathbf{m}^+, s^+)}{\partial m_j^+} \right| s \right] \leq 0, \quad m_j^+ \geq 0 \quad \text{comp. slack.} \tag{2}$$

The envelope conditions are

$$\frac{\partial W^i(\mathbf{m}, s)}{\partial m_j} = \phi_s^j$$

for $j \in \{L, S, B\}$ where we have used our equation for the nominal value of the basket, Equation 1:

$$\phi_s^B = \kappa \frac{\phi_s^L \phi_{s^-}^{B-}}{\phi_{s^-}^{L-}} + (1-\kappa)\frac{\phi_s^S \phi_{s^-}^{B-}}{\phi_{s^-}^{S-}}.$$

These envelope conditions imply that W^i is linear in $\mathbf{m}$, a consequence of quasilinear preferences which is standard in these models and has the result that agents' portfolios leaving the CM are independent of the portfolio they entered with, hence obviating the need to keep track of distributions of money holdings which result from the search process in the DM.

5.2 DM Terms of Trade

In the DM, we assume anonymity and a lack of commitment, so necessitating a medium of exchange. Moreover, while buyers' money holdings are unrestricted, we assume sellers have an exogenous type dictating which currencies they can accept in trade. In particular, if a buyer holding the vector (m_L, m_S, m_B) of the three currencies meets a seller who accepts only the subset J, then the total value that can be transferred is limited to $\sum_{j\in J}\phi_s^j m_j$ where ϕ_s^j is the value in the next CM of currency j when the state is $s \in \{T, N\}$. Note, buyers are indifferent over which currencies to transfer because of linearity of buyers' CM value functions combined with the Walrasian CM market which guarantees that buyers and sellers value money equally in the CM.

Given this bound on transfers, terms of trade are set according to proportional (Kalai) bargaining, with the buyer's bargaining power given by $\eta \in (0,1)$. Using the linearity of the CM value function, the bargaining problem between a buyer holding $\mathbf{m}$ and a seller accepting currencies J in state s is

$$\max_{q,d} u(q) - d$$

$$\text{s.t.} \sum_{j\in J}\phi_s^j m_j \geq d = (1-\eta)u(q) + \eta c(q)$$

Write $g(q) = (1-\eta)u(q) + \eta c(q)$ for the transfer required to purchase q units, and set q^* to solve $u'(q^*) = c'(q^*)$. Then the bargaining solution is

$$(q(\mathbf{m}, s, J), d(\mathbf{m}, s, J)) = \begin{cases} (q^*, g(q^*)) & \text{if } g(q^*) < \sum_{j\in J}\phi_s^j m_j \\ (h(\sum_{j\in J}\phi_s^j m_j), \sum_{j\in J}\phi_s^j m_j) & \text{otherwise} \end{cases}$$

where we define $h(d) \equiv \min\{g^{-1}(d), q^*\}$ to be the quantity that would be purchased given d

units of transferable value.

In words, if the efficient trade is affordable, it is executed with the transfer given by g, otherwise all acceptable currencies are transferred and the quantity is given by g^{-1}. Note, this solution implies that buyers' surplus from a meeting can be written as

$$u(q(\mathbf{m}, s, J)) - d(\mathbf{m}, s, J) = \eta S(q(\mathbf{m}, s, J))$$

where $S(q) = u(q) - c(q)$ is the surplus from trading a quantity q (hence the name, "proportional bargaining").

In a given meeting, the marginal value to a buyer of an extra (CM consumption good) unit of currency j is

$$\begin{aligned} L_j(q(\mathbf{m}, s, J)) &\equiv \frac{\partial}{\partial \phi_s^j m_j} \eta S(q(\mathbf{m}, s, J)) \\ &= \eta S'(q(\mathbf{m}, s, J))(g^{-1})'(g(q(\mathbf{m}, s, J))) \\ &= \frac{\eta[u'(q(\mathbf{m}, s, J)) - c'(q(\mathbf{m}, s, J))]}{\eta u'(q(\mathbf{m}, s, J)) + (1-\eta)c'(q(\mathbf{m}, s, J))} \end{aligned} \tag{3}$$

if $j \in J$, and $L_j(q(m, s, J) = 0$ otherwise. This expression gives the liquidity premium on money, and will be used below.

5.3 DM Value Functions

Given the terms of trade described above, and using linearity of the CM value, buyers' value functions entering the DM can be written as

$$\begin{aligned} V^i(\mathbf{m}, s) = W^i(\mathbf{m}, s) + \alpha_s \mu_s^i \sum_{J \in 2^{\{L,S,B\}}} \theta_J^i \eta S(q(\mathbf{m}, s, J)) \\ + (1-\alpha_s)\mu_s^{-i} \sum_{J \in 2^{\{L,S,B\}}} \theta_J^{-i} \eta S(q(\mathbf{m}, s, J)) \end{aligned}$$

where $-i \neq i$ is the opposite country. The first term is the value of continuing to the CM, the second is the probability of not traveling and being matched to a seller accepting currencies in J times the surplus thereof, while the third is the same but for travelling.

Envelope conditions are given by

$$\frac{\partial}{\partial m_j} V^i(\mathbf{m}, s) = \phi_s^j [1 + \tilde{\Lambda}_j^i(\mathbf{m}, s)] \tag{4}$$

where

$$\tilde{\Lambda}^i_j(\mathbf{m}, s) = \alpha_s \mu^i_s \sum_J \theta^i_J L_j \left(h \left(\sum_{j \in J} \phi^j_s m_j \right) \right) \mathbf{1}_{j \in J} + (1-\alpha_s)\mu^{-i}_s \sum_J \theta^{-i}_J L_j \left(h \left(\sum_{j \in J} \phi^j_s m_j \right) \right) \mathbf{1}_{j \in J}$$

where $\mathbf{1}_{j \in J}$ is an indicator of whether currency j is accepted and L_j is given in equation (3), above.

5.4 Money Demand and CM Market Clearing

We are looking for a Markov equilibrium, where real quantities depend only on the state and national identity. To this end, we must express our equilibrium conditions in real terms. First, write real demand for currency j in state s by buyers in country i as $z^i_{j,s} = \phi^j_s m^i_{j,s}$. Second, write $(1+\pi^j_{s,s^+}) = \phi^j_s / \phi^{j+}_{s^+}$ for the realized gross inflation of currency j in a transition from state s to s^+. Notice that $m^i_{j,s}$ only appears in $\tilde{\Lambda}^i_j$ in terms of its real value, $\phi^j_s m_j$. So, write $z^i_{j,s} = \phi^j_s m^i_j$ for real balances of currency j in state s held by buyers from i, and $\mathbf{z}^i_s$ as the vector of such, define $\Lambda^i_j(\mathbf{z}^i_s, s) = \tilde{\Lambda}^i_j(\mathbf{m}, s)$.

Substituting these and the envelope condition, Equation 4, into the first order condition for money, Equation 2, we obtain

$$-1 + \beta \left[\rho_s \frac{1}{1+\pi^j_{s,s}} [1 + \Lambda^i_j(\mathbf{z}^i_s, s)] + (1-\rho_s) \frac{1}{1+\pi^j_{s,\neg s}} [1 + \Lambda^i_j(\mathbf{z}^i_s, \neg s)] \right] \leq 0. \tag{5}$$

The only remaining conditions come from market clearing for money in the CM, which will determine realized inflation, π^j_{s,s^+}. In real terms, total demand for the large currency can be written as

$$\phi^L_s M_L = z^L_{L,s} + n z^S_{L,s} + \kappa(z^L_{B,s} + n z^S_{B,s}). \tag{6}$$

A similar expression captures total demand for the small currency. Dividing this by the same expression stepping forward one period, and noting that $M^+_j / M_j = \gamma^j$, one can derive

$$1 + \pi^L_{s,s^+} = \frac{\phi^L_s}{\phi^{L+}_{s^+}} = \gamma^j \frac{z^L_{L,s} + n z^S_{L,s} + \kappa(z^L_{B,s} + n z^S_{B,s})}{z^L_{L,s^+} + n z^S_{L,s^+} + \kappa(z^L_{B,s^+} + n z^S_{B,s^+})}. \tag{7}$$

A similar expression gives realized inflation for the small currency. The basket currency is elastically supplied, being created from the component currencies. Its no-arbitrage condition, Equation 1, determines realized inflation for the basket in terms of that of the component currencies.

6 Numerical Exercise

This section explores the properties of the equilibrium described above. We parameterize the model at an annual frequency. Table 1 summarizes the standard parameter values. We calibrate the large country to match US targets, and the small country to match moments for Mexico. In terms of functional forms, we assume the standard CRRA utility function for decentralized market consumption: $u(q) = \frac{1}{1-\sigma} q^{1-\sigma}$. We normalize sellers' costs of production in the decentralized market to be $c(q) = q$. In the centralized market, we assume $U(x) = x$. This, with linear disutility of labor, implies that CM trade produces no surplus. This is a normalization with the only implication that all of our welfare statements below should be read as statements regarding DM welfare, and so regarding the portion of social surplus derived from transactions requiring cash.

Table 1: Parameter Values

	Parameter	Target	Value
β	Discount factor	Annual RIR 3.5%	.966
σ	Relative risk aversion	Standard value	.7
γ	Money growth	Annual Inflation Rate	2%
η	Bargaining power	Standard Value	.5
$\overline{\alpha}$	Trade openness	(Imports+Exports)/GDP, 2017	.6768
n	Relative size of small country	pop. Mexico/ pop. US, 2017	.3967
ρ_T	Persistence of T	trade agreements in post-war	.86
ρ_N	Persistence of NT	trade wars in post-war	.72
κ	share of L in basket	–	.5

We set the discount factor, β, to .966, corresponding to an annual interest rate of 3.5%. Other standard values are chosen for relative risk aversion (0.7), money growth (2%), and buyers' bargaining power (0.5); we explore the robustness of these choices in Section 7. The degree of trade openness, measured as $1 - \overline{\alpha}$, is set to .3232. We calibrate this parameter as the ratio of US imports and exports relative to GDP in the fourth quarter of 2017, a measure of trade relative to total output. The relative size of the small country is set to match the relative population of Mexico to the US in 2017. Persistence of the trade and no trade states are calibrated such that the simulated shock process generates the number of "trade agreements" (transition from no trade to trade) and the number of "trade wars" (transition from trade to no trade) that have occurred in the US in the post-war period. Finally, we set the weights of each currency in the basket, $\kappa = 0.5$, but explore the welfare implications of changes in these weights in Section 6.3.

The remaining parameters relate to sellers' currency acceptance probabilities, or types. We compare the relevant cases, defined by different assumptions regarding sellers' acceptance decisions, in the results below. Case 1, the national currency equilibrium, is the one in which sellers accept only their domestic currencies.[4] Case 2 is the international currency equilibrium, resembling a dollar-dominant regime, in which private sector sellers in the small country accept the large and small countries' currencies, while large country sellers accept only their own currency. Case 3 supposes the basket becomes widely used in the small country, and almost all small country sellers accept both the basket currency and their own currency, while sellers in the large country only accept their own currency. In case 4, almost all large country sellers accept the basket and their own currency, while small country sellers only accept their own currency. Case 5 is the basket-dominant equilibrium in which both countries' private sector sellers accept both the basket and their own currency. Finally, case 6 is an extension of case 5 in which all small country sellers accepting the basket also accept the large currency. We choose the acceptance probabilities to illustrate the mechanism in each case; cases 3 and 4 require a higher proportion of sellers to accept the basket because lower acceptance probabilities result in zero demand for the basket.[5] The acceptance probabilities in each case are summarized in Table 2.

Table 2: Acceptance Probabilities

	Case	$\theta^S_{\{S\}}$	$\theta^L_{\{L\}}$	$\theta^S_{\{SL\}}$	$\theta^L_{\{SL\}}$	$\theta^S_{\{SB\}}$	$\theta^L_{\{LB\}}$	$\theta^S_{\{SLB\}}$
1:	National Currencies	1	1	0	0	0	0	0
2:	International Currency	.33	1	.67	0	0	0	0
3:	S accept Basket	.01	1	0	0	.99	0	0
4:	L accept Basket	1	.01	0	0	0	.99	0
5:	S and L accept Basket	.33	.33	0	0	.67	.67	0
6:	Case 5 + S accept L	.33	.33	0	0	0	.67	.67

[4]We use case 1 as a baseline to compute partial equilibrium results in Section 6.2.

[5]If all private sector sellers in the small country accept B and their own currency, then they become perfect substitutes, causing numerical instability and the potential for multiple equilibria. Hence, we assume a small fraction of sellers in each case only accept their own currency.

6.1 Equilibrium Effects of Trade Shocks

This section demonstrates that the presence of trade shocks can lead buyers to demand the basket currency, even though it is only accepted as an almost perfect substitute for a seller's own currency. As discussed in the previous section, trade shocks both affect spendability through changes in meeting rates between buyers and sellers, and the rate of return through their effects on portfolio reallocation and aggregate demand fluctuations.

To better understand these forces, we begin by looking at the realized inflation in each case, shown in Table 3. The key mechanism of the model relies on the fact that trade shocks lead to shifts in relative demand for each currency which in turn affect agents' consumption through changes in the real value of goods that they are able to trade. When the trade state is constant, so too is money demand, implying that realized inflation is equal to the money growth rate, 2%. Instead, when the economy transitions from the no trade to trade state, the real value of each currency tends to increase due to higher demand for domestic currency from agents abroad, resulting in deflation. Conversely, when the state transitions from trade to no trade, demand for each currency tends to fall, resulting in inflation. Cases 2 and 6 are the exception to this intuition, which we discuss below. In each case, because of the size difference between the two countries, the small currency's realized inflation is usually greater in absolute value than the large currency's.

Table 3: Realized Inflation (%)

		Large	Small	Basket
1:	National Currencies, T to NT	7.36	11.7	9.49
1:	National Currencies, NT to T	-3.09	-6.87	-5.02
2:	International Currency, T to NT	6.71	-3.63	1.28
2:	International Currency, NT to T	-2.50	7.95	2.46
3:	S accept Basket, T to NT	9.80	11.2	10.5
3:	S accept Basket, NT to T	-5.24	-6.43	-5.84
4:	L accept Basket, T to NT	8.11	8.82	8.46
4:	L accept Basket, NT to T	-3.76	-4.39	-4.08
5:	S and L accept Basket, T to NT	7.61	11.7	9.63
5:	S and L accept Basket, NT to T	-3.32	-6.87	-5.13
6:	Case 5 + S accept L, T to NT	6.71	-3.63	1.28
6:	Case 5 + S accept L, NT to T	-2.50	7.95	2.46

The associated currency demand is shown in Table 4 and is expressed in units of the large currency (dollars). To do so, we divide currency holdings by the equilibrium value in the CM of the large currency in the trade state, ϕ_T^L, in each case.[6] The units of the entries in Table 4 are annual US M1 held by the public. Though these balances may seem large, they should be interpreted as the sum of individual cash holdings and bank reserves.

Table 4: Buyers' Money Holdings (Thousands of Dollars)

	Case	z_L	z_S	z_B	$\hat{z}_L$	$\hat{z}_S$	$\hat{z}_B$
1:	National Currencies; No Trade	9.04	3.36	0	3.16	9.24	0
1:	National Currencies; Trade	8.41	4.60	0	6.12	7.82	0
2:	International Currency; No Trade	9.04	0	0	4.02	5.89	0
2:	International Currency; Trade	8.69	0	0	6.16	5.56	0
3:	S Accept Basket; No Trade	9.16	3.10	0	4.08	9.21	0
3:	S Accept Basket; Trade	8.35	3.69	0.96	5.97	7.04	0.80
4:	L Accept Basket; No Trade	7.74	1.41	1.35	0	9.08	3.55
4:	L Accept Basket; Trade	8.39	4.82	0	6.07	7.90	0
5:	S and L Accept Basket; No Trade	8.33	2.63	1.10	2.35	8.45	1.29
5:	S and L Accept Basket; Trade	7.20	3.34	1.88	4.82	6.55	1.97
6:	Case 5 + S accept L; No Trade	9.04	0	0	4.02	5.89	0
6:	Case 5 + S accept L; Trade	8.69	0	0	6.16	5.56	0

6.1.1 The National Currency Model

The national currency equilibrium studies the case in which sellers only accept their domestic currencies. In order to trade with any seller a buyer may meet, she must hold both currencies. As per the intuition in the previous paragraphs, buyers hold relatively more (less) of their domestic (the foreign) currency in the no trade state and vice versa in the trade state. As a result, inflation is positive (negative) when transitioning to the no trade (trade) state for all currencies.

6.1.2 The International Currency Model

In this case, a share of small country sellers, government sellers, only accept the small currency, while the remaining share, private sellers, accept both the large and small currency. Table 4 shows that large country buyers hold nearly the same amount of their own currencies

[6] To compute ϕ_T^L, equation (6) implies that we take a stand on the value of M_L. Thus, we set M_L as M1/population in the United States in 2017: \$11,128. Our normalization implies that $z_L + n\hat{z}_L = 11,128$ in the trade state.

across states, since they are highly likely to meet a seller who accepts their own currency in both states of trade. Further, large country buyers hold none of the small currency since the cost of holding the currency due to the inflation tax exceeds the expected benefit when meeting a small country government seller. Differently, small country buyers face a non-trivial decision. In the trade state, they are more likely to meet large country sellers, all of whom accept the large currency, so they hold significantly more of the large currency in that state. While many small country sellers accept the large currency, a number do not, so the share of meetings where only the small currency is accepted increases for small country buyers in the no trade state, leading them to demand more of the small currency. In turn, demand for the small currency is driven solely by small country buyers, resulting in inflation when transitioning from the no trade to the trade state.

6.1.3 One Country's Sellers Accept the Basket

Turning to the first case in which the basket is accepted by some sellers, case 3, small country buyers may be able to spend the basket in both states of the world, while large country buyers may only spend the basket when the economy is in the trade state. Differently, buyers in both countries agree on the rate of return motive: when some small country sellers accept the basket, it is useful to hold the basket to protect against the high inflation in the small country when transitioning into the no trade state. This can be seen in Table 3: the basket experiences less inflation than the small currency when transitioning from trade to no trade. It follows that the basket is preferred to the small currency by both buyers in the trade state, but for different reasons. When transitioning into the no trade state, the relative inflation of the small currency implies that, by holding the basket, small country buyers can purchase more consumption goods in the DM, increasing their utility and smoothing consumption relative to the trade state. For large country buyers, when the economy transitions into the no trade state, they no longer have the spendability motive to hold the basket as they never meet small country sellers. However, large country buyers still prefer to hold the basket in order to trade it on the centralized foreign exchange market, again receiving higher consumption than they would if holding the small currency. Indeed, Table 4 shows that both buyers hold the basket only in the trade state, suggesting that the rate of return motive dominates. Overall, the basket makes up 7.3% of the large country buyer's portfolio and 5.8% of the small country buyer's portfolio in the trade state.

The opposite pattern is observed in case 4, in which only a share of large country sellers accept the basket. Here, the spendability motive is always present for large country buyers, but only present in the trade state for small country buyers. Instead, the rate of return motive is present for both buyers in the no trade state: when transitioning from the no trade to trade state, the large currency appreciates by less than the small currency, as seen in Table 3. This is because, due to the larger size of the large currency, the increase in demand for the small currency from large country buyers is larger than the increase in demand for the large currency from small country buyers. Again in this case, the rate of return motive dominates as all buyers only hold the basket in the no trade state, shown by their portfolio allocations in Table 4. Differently, small country buyers hold the basket in the state in which they cannot spend it, as they meet no large country sellers in the no trade state. It is only in the periods following a transition to the trade state that small country buyers benefit from holding the basket instead of the large currency. In this case, the basket makes up 12.9% of large country buyer's portfolio, but over 28% of the small country buyer's portfolio, while worldwide basket demand is 17% of total currency demand in the no trade state. Basket demand by small country buyers is far larger in case 4 than is demand by large country buyers in case 3 due to the difference in size of the two countries whence the expected spendability of the basket is higher.

Moving from case 2 to case 3, large country buyers' currency holdings increase by 42%. Thus, buyers can purchase more in the decentralized market, in particular with small country sellers, raising the welfare of both parties. Though welfare is not shown here, the model predicts that transitioning from the international currency equilibrium to the equilibrium in which the small country's sellers accept the basket currency can improve world welfare in the decentralized market by 0.6%. To put this number in context, Lagos and Wright (2005) put decentralized trade at approximately 10% of GDP. Hence, because of quasi-linearity, our model suggests that overall world welfare would improve by approximately .06% if the basket currency were widely accepted by private sector sellers in the small country. As we discuss below, such a small change in welfare reflects winners and losers among agents in the two countries.

6.1.4 Both Countries' Sellers Accept the Basket

In the case in which a share of sellers in both countries accept the basket, the spendability motive is always present, as buyers can spend the basket in both the trade and no trade states. Similarly, the rate of return motive for both buyers is present in both states: in the no trade state, buyers value the basket as it performs better than the large currency when the state transitions to trade, while in the trade state, it's rate of return outperforms the small currency when the state transitions to no trade. Table 3 shows the values for realized inflation in this case. Because buyers hold the basket in both states, fluctuations in currency demand for both the large and small countries' currencies are relatively small compared to cases 3 and 4. However, the sovereign currencies' values remain volatile. When both countries' sellers may accept the basket, basket demand is between 9.1% and 15.1% of buyers' portfolios, depending on the buyers' location and the state of trade. In this case, world demand for the basket is 9.6% of total currency demand in the no trade state, and 15% of total currency demand in the trade state.

6.1.5 Small Country Sellers Accept All 3 Currencies

Finally, in case 6, we explore the effect of adding the large country's currency to case 5, that is, we assume that a share of small country sellers accept all three currencies, and a share of large country sellers accept their domestic currency and the basket. In this case, results are identical to the international currency case. Even when a large share of sellers in both countries accept the basket, no buyers choose to hold it. Intuitively, the basket is attractive to buyers because it performs better than one of the two currencies when the state transitions. At the same time, the other sovereign currency always performs better than the basket during the same state transition, and is thus preferable when sellers accept all three currencies. In other words, with trade shocks, the basket is only useful when a better currency is unavailable to spend with some sellers. In this case, the basket and the large currency are perfect substitutes when meeting most small country sellers, and therefore all buyers will choose to use the large currency in the trade state.

6.2 Partial Equilibrium Effects of Trade Shocks

To understand why demand for the basket is low even when a majority of both countries' sellers accept it, we must take a step back and study buyers' decisions in partial equilibrium. In the previous section, relative currency demand and portfolio choices are jointly determined: buyers choose their portfolios taking as given the rate of return benefits of the basket relative to the two countries' currencies, but their decisions themselves determine the relative currency demand and therefore the realized inflation of each currency. Intuitively, the basket is a combination of the two countries' currencies, thus, as demand for the basket increases, demand for each currency that makes up the basket also increases. If demand differs across states, this money demand effect will change the realized inflation of each currency across states, affecting buyers' portfolio allocations as well as the composition of the basket itself, due to the real portfolio weights. In this section we disentangle the effect of demand for the basket given each currency's realized inflation from the effect of basket demand itself on the realized inflation of its component currencies.

To do so, we fix the realized inflation for the large and small countries' currencies at their equilibrium levels in the national currency case (case 1). We then solve for the equilibria in cases 2 through 6, allowing realized inflation for the basket to adjust, and compare currency demand in each case. The results are shown in Table 5.

Table 5: Buyers' Money Holdings, Partial Equilibrium (Thousands of Dollars)

	Case	z_L	z_S	z_B	$\hat{z}_L$	$\hat{z}_S$	$\hat{z}_B$
2:	International Currency; No Trade	9.07	0	0	3.16	7.81	0
2:	International Currency; Trade	8.67	0	0	6.21	4.20	0
3:	S Accept Basket; No Trade	9.04	3.36	0	3.16	9.24	0
3:	S Accept Basket; Trade	8.41	0	4.73	6.12	0.90	6.96
4:	L Accept Basket; No Trade	0	3.36	9.14	0	9.24	3.94
4:	L Accept Basket; Trade	8.41	4.60	0	6.12	7.82	0
5:	S and L Accept Basket; No Trade	8.31	2.62	1.10	2.23	8.44	1.31
5:	S and L Accept Basket; Trade	7.21	3.34	1.87	4.84	6.55	1.96
6:	S Accept Basket and L; No Trade	9.07	0	0	3.16	7.81	0
6:	S Accept Basket and L; Trade	8.67	0	0	6.21	4.20	0

Notes: Partial equilibrium holds realized inflation constant at their general equilibrium values in Case 1 (National Currency). Dollar values are computed using the CM price of the large currency in the trade state in the International Currency equilibrium.

A key takeaway from Table 5 is that buyers' holdings of the basket currency in cases 3 and 4 are far higher than in general equilibrium (shown in Table 4). When holding the basket increases expected consumption without affecting the realized inflation of the component currencies across states – because we fix those values – buyers' demand increases in the state where the rate of return motive is present. In the case in which small country sellers accept the basket, large country buyers' portfolio share in the basket increases from 7.3% to 36% and small country buyers' share increases from 5.8% to 50% in the trade state. Total basket demand in the trade state increases from 6.9% to 40% of global money holdings. In the opposite case, in which large country sellers accept the basket, total basket demand increases from 17% to 60% of global money holdings in the no trade state. This is the basis for our claim that the general equilibrium effects of the basket currency limit adoption of the basket currency – in partial equilibrium, basket demand is much higher. In case 5, in which both countries' sellers may accept the basket, there is little change in buyers' basket demand in partial relative to general equilibrium. Because the rate of return motive is present in both states, there is a natural tension between holding the basket against one of the two currencies, leaving portfolio allocations largely unaffected. Finally, because of the ability to spend both sovereign currencies in the small country in case 6, there is no demand for the basket, even in partial equilibrium.

To sum up, although proposals for basket currencies may claim that they can become systemically important and improve the welfare of users above what any national currency can achieve, this section shows that demand for the basket is generally small. The reasons for this are twofold. First, because the basket's value always fluctuates between the values of the two sovereign currencies, it provides a better rate of return to buyers when at least one country's sellers accept it in addition to their own currency. However, this benefit is only useful when the state transitions, which we calibrate to be very infrequent (once every 14 years). Second, the basket demand has a moderating effect on the relative fall in one of the two currencies' rates of return: the higher is demand for the basket in one state of the world, the higher is demand for its underlying currencies, and the smaller is the difference in the rate of return of the basket relative to the worse performing currency. In addition, with real basket weights, the basket must be rebalanced when the state of trade changes: when the state transitions from trade to no trade, the small currency loses value, and therefore more of it must go into each unit of the basket. This demand from maintaining the real weights of the basket has a counterbalancing effect on inflation for the small currency. Conversely, when the state transitions from no trade to trade, less of the small currency must go into the basket, since it experiences more deflation than the large country.

Finally, it should not be assumed that ignoring the general equilibrium effects of a basket currency is sufficient for making robust conclusions about the basket as long as enough sellers in both countries accept it. As we will show in the next section, although the portfolio allocations in the benchmark calibration do not significantly change from partial to general equilibrium when both countries' sellers accept the basket, the welfare implications for buyers and sellers change substantially once we take into account general equilibrium price effects. Thus, it is imperative to take into account how even minor volatility in basket demand affects the prices and purchasing power of its component currencies to make normative conclusions.

6.3 Welfare-Maximizing Basket Weights

One can think of buyers' holdings of each currency as forming an endogenous basket – a portfolio comprising a share, $\tilde{\kappa}$, of the large currency and a complementary share, $1-\tilde{\kappa}$, of the small currency. In general, $\tilde{\kappa}$ will differ for buyers in different countries due to heterogeneous meeting rates. Thus, the welfare-maximizing weights of each currency in the basket will be different depending on which country's welfare is being maximized.

In this section we compare world welfare across basket weights κ. Recall that $\kappa = 0$ ($\kappa = 1$) implies that the basket is made up of 100% of the small (large) currency. By changing the composition of the basket currency while keeping acceptance probabilities constant, we affect its rate of return without affecting its spendability. To build intuition for the comparative statics, we compare the partial equilibrium to the general equilibrium results. We begin with the case that small country sellers accept the basket currency before turning to the case in which both countries' sellers accept. The case in which sellers from the large country accept the basket is qualitatively the mirror image of the case in which small country sellers accept, and is omitted for brevity.

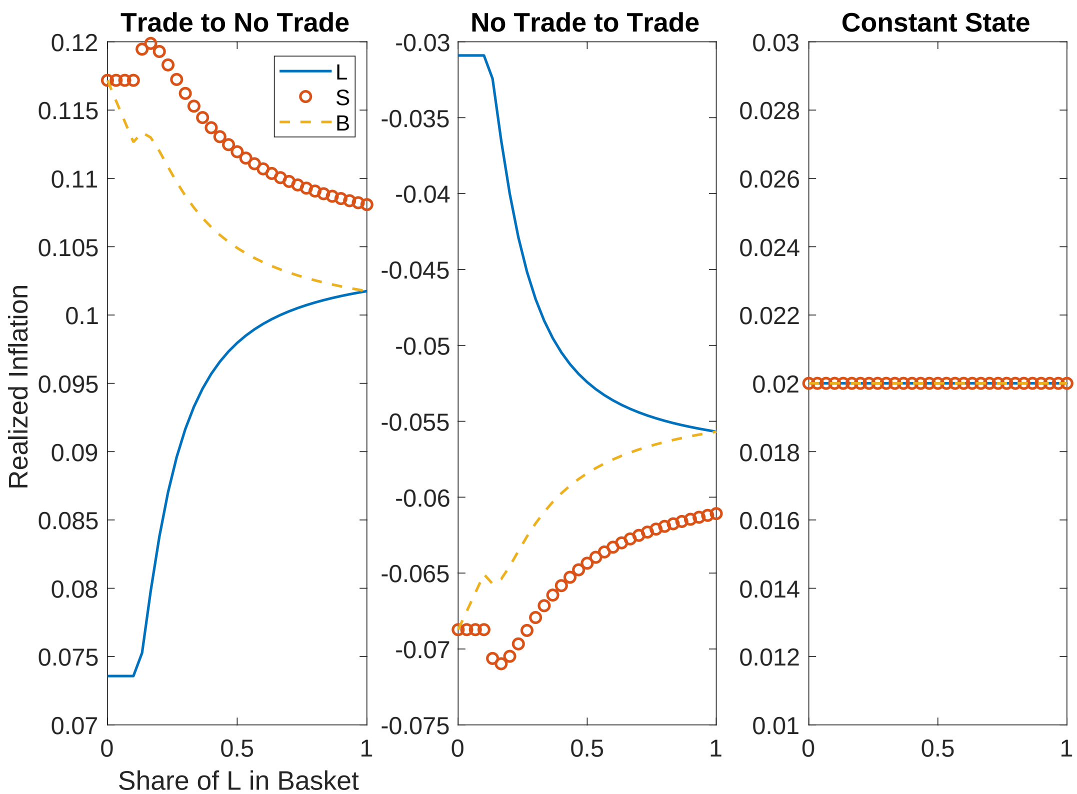
6.3.1 Small Country Sellers Accept the Basket

Figure 1 shows realized inflation in general equilibrium as a function of basket weights. When the state remains constant (right panel), realized inflation in both currencies, and in turn the basket, is equal to the money growth rate, here 2%. When the state transitions from trade to no trade (left panel), all three currencies experience inflation, as demand falls with the probability of trade. Because of differences in size, falls in demand by large country buyers have a larger effect on the small currency, leading to higher inflation after the transition to the no trade state. Conversely, when the state transitions from no trade to trade (middle panel), the currencies experience deflation as demand rises. Again because of its smaller size, the small currency experiences the highest deflation, while the large currency experiences the lowest deflation. In both figures, as κ increases, the value of the basket currency approaches the value of the large currency, and thus realized inflation for the basket (dashed line) approaches realized inflation for the large currency (solid line).

Realized inflation is determined by buyers' real money holdings, which are shown in Figure 2. Starting in partial equilibrium (left column), as κ increases, buyers in both countries fully replace their holdings of the small currency with the basket in the trade state because the basket experiences lower inflation when the state transitions to no trade. Buyers in the small country replace their holdings of their own currency with the basket for a higher value of κ because of the relatively high probability they face of meeting a government seller in their own country. The more similar is the basket to the home currency, the less inflation it experiences, and the higher rate of return it provides. In the trade state, because the small currency appreciates while the basket depreciates, buyers will never hold the basket.

In general equilibrium, the change in portfolio composition as a function of κ is very different. As shown in the right column of Figure 2, buyers from both countries only shift some of their holdings of the small currency into holdings of the basket in the trade state. Further, the value of κ at which this portfolio reallocation occurs for both countries' buyers is identical, indicating that the change in realized inflation dominates the effect of buyers' meeting probabilities for different sellers. As can be seen in Figure 1, as the basket becomes

Figure 1: Realized Inflation, Small Country Sellers Accept Basket



more similar to the large currency, realized inflation in the small country also falls. The reason is that demand for the basket in the trade state creates demand for both currencies in that state, increasing realized inflation of the large currency and decreasing realized inflation for the small currency. Because buyers' incentives to hold the basket in place of the small currency depend on the relative rates of return of the two currencies, an increase in κ leads to an improvement in the small currency's rate of return in general equilibrium, and in turn a decline in buyers' demand for the basket.

Figure 2: Real Money Holdings, Small Country Sellers Accept Basket

The resulting changes in DM welfare are shown in Figure 3. To illustrate the effect of changes in the basket composition, we normalize welfare in each equilibrium by its level in the international currencies case. The left hand column shows total welfare in partial and general equilibrium as a function of the basket weights; the right hand column shows the same for each agent type.

In partial equilibrium, sellers in the small country are significantly better off, as trade with both private and government sellers increases due to higher aggregate holdings of both the small currency and the basket. For large country sellers, currency holdings are somewhat lower than in the international currencies equilibrium, resulting in lower welfare. On the buyers' side, both small and large buyers can trade more when meeting small country sellers, by holding more of the currencies these sellers accept, and thus experience higher welfare in proportion to the rates at which they meet these sellers. Changes in κ have little effect on welfare, as the basket replaces buyers' holdings of the small country's currency, which only negatively affects trade with small country government sellers, but positively affects trade with private sellers due to the basket's increasing rate of return relative to the small currency.

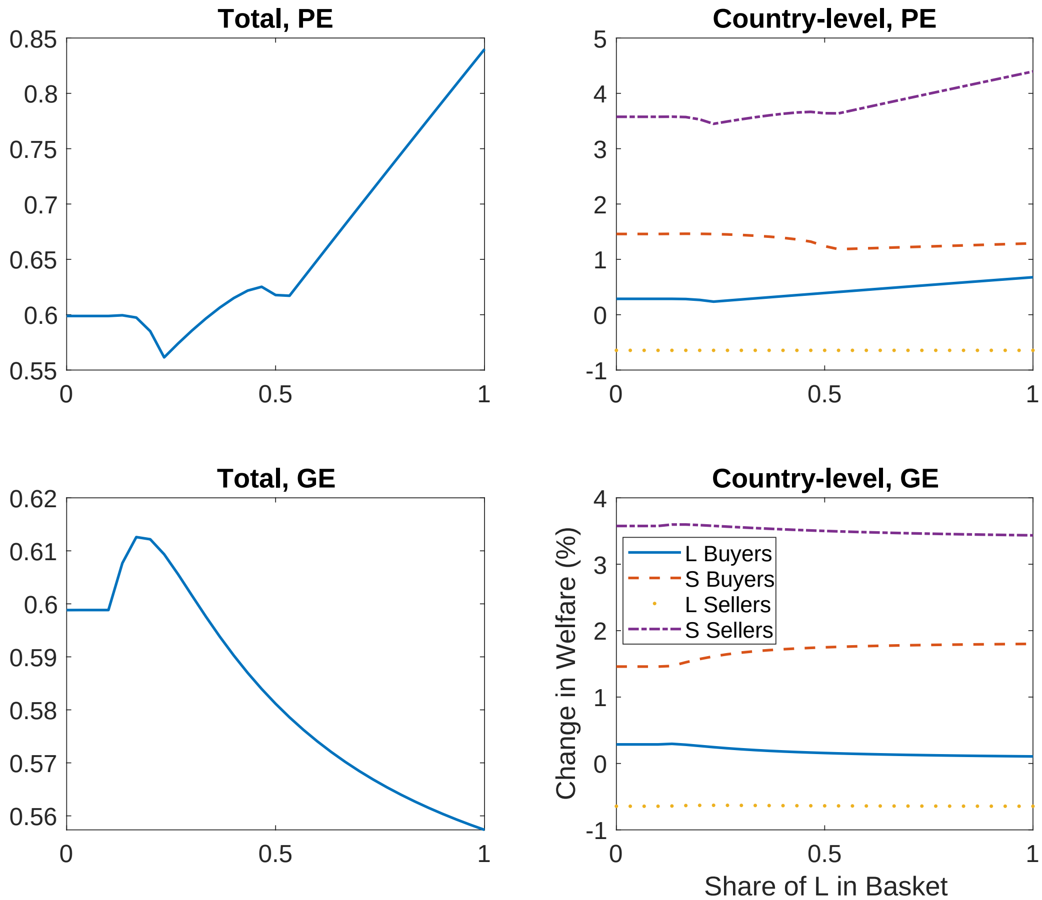
In general equilibrium, shown in the bottom right panel of Figure 3, welfare depends both on changes in the level of trade and in the relative rates of return of the three currencies. As basket demand increases, the change in welfare follows the changes in realized inflation, thus the price effect dominates the trade effect. In particular, the large currency experiences a decrease (increase) in its relative rate of return dominance in the trade (no trade) state, and vice versa for the small currency. Because more trade occurs in the trade state, the reduction in the value of the large currency due to higher expected inflation leads to a decline in welfare of large country buyers as a function of κ, and the opposite for small country buyers. Small country sellers benefit the most because of higher trade, whereas large country sellers are worse off due to lower large country currency demand, similarly to partial equilibrium discussed above.

Looking at world welfare in the left panels of Figure 3, taking into account the general equilibrium effects largely reverses the results for the optimal composition of the basket. In partial equilibrium, the basket provides the best relative rate of return the less it resembles the foreign currency, thus $\kappa = 1$ is optimal. In general equilibrium, the relative size of the home country implies that home welfare has a larger effect on world welfare, reducing the benefits of a high value of κ and resulting in an optimal basket weight of $\kappa = .2$.

6.3.2 Both Countries' Sellers Accept the Basket

Turning to the case in which a share of both countries' sellers accept the basket, Figure 4 shows the resulting realized inflation as a function of κ. Similar to the previous case, for low levels of κ, the basket is very similar to the small currency, and thus provides little benefit in the trade state against inflation in that currency if the state changes, but a large benefit relative to the lower deflation of the large currency in the no trade state. Figure 5 shows that in partial equilibrium, buyers hold less of the basket in the no trade state but more in the trade state as κ increases. This is because the basket performs better than the large (small) currency when transitioning to trade (no trade), thus as the large currency's share in the basket increases, its benefits in terms of relative appreciation fall (rise). In general equilibrium, basket demand in the two states follows a similar, but more muted, pattern, due

Figure 3: Welfare, Small Country Sellers Accept Basket



to a relative decrease in the benefit of holding the basket relative to the worse-performing currency once we allow realized inflation to adjust to changes in buyers' demand.

In terms of welfare, Figure 6 again illustrates the differences in the solution for the optimal basket allocation when considering partial and general equilibrium. In partial equilibrium, the optimal basket is roughly $\kappa = .4$, that is, 40% of the real value of the basket is comprised of units of the large currency, and 60% in units of the small currency, whereas in general equilibrium the optimal basket share is roughly $\kappa = .5$. However, the magnitude of these effects is very small, thus, changes in the portfolio composition have negligible effects on welfare in this case.

To understand these results, we begin in partial equilibrium, shown in the first row of Figure 6. Recall that buyers want to hold the basket in the state of the world it is expected to perform better than a given currency. Thus, the basket is useful in the trade (no trade) state to hedge against the high realized inflation (low realized deflation) of the small (large)

Figure 4: Realized Inflation, Both Sellers Accept Basket

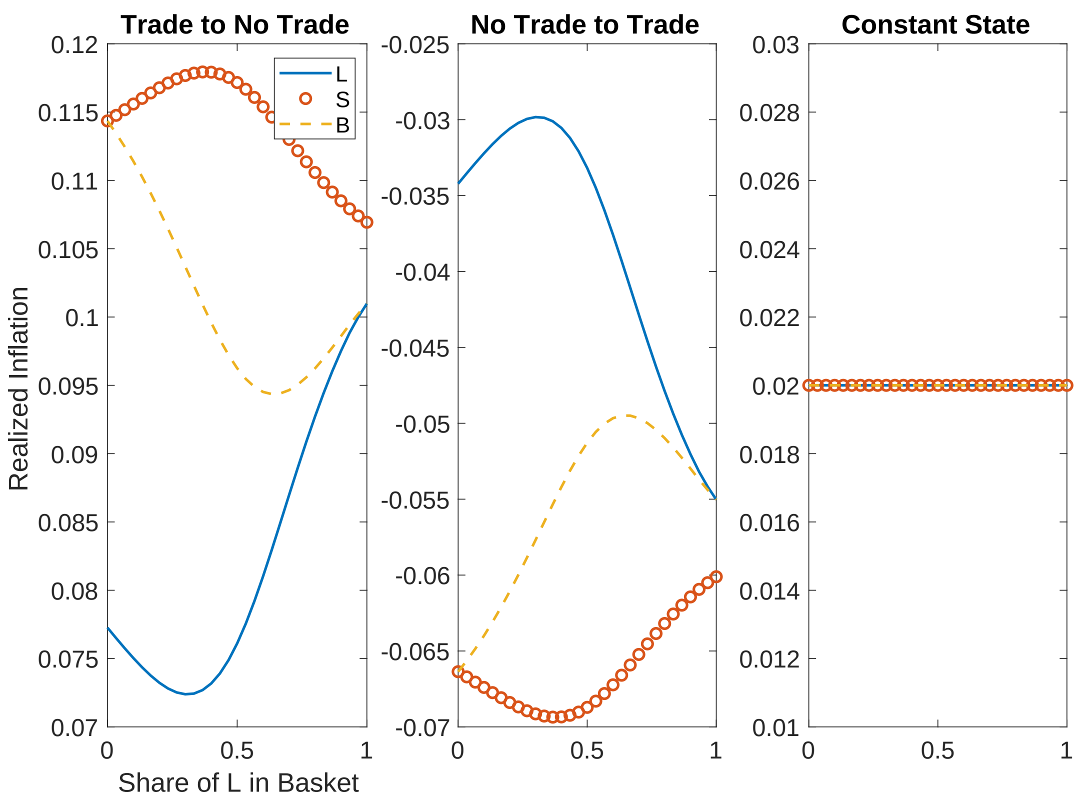
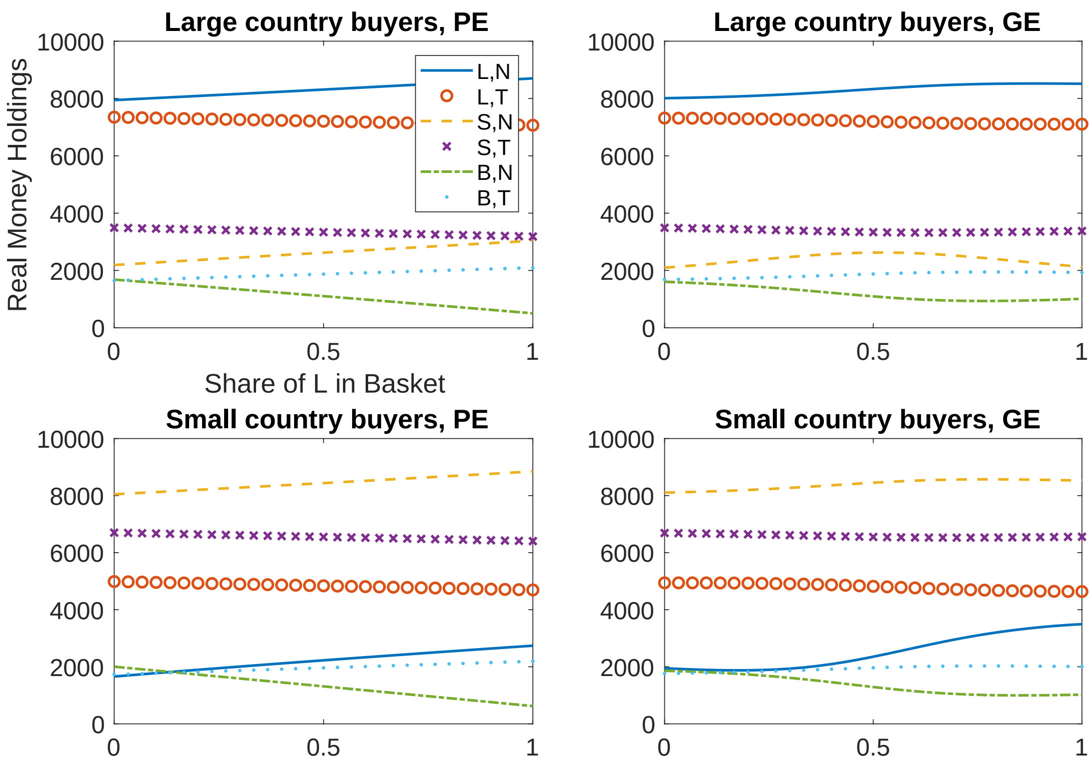


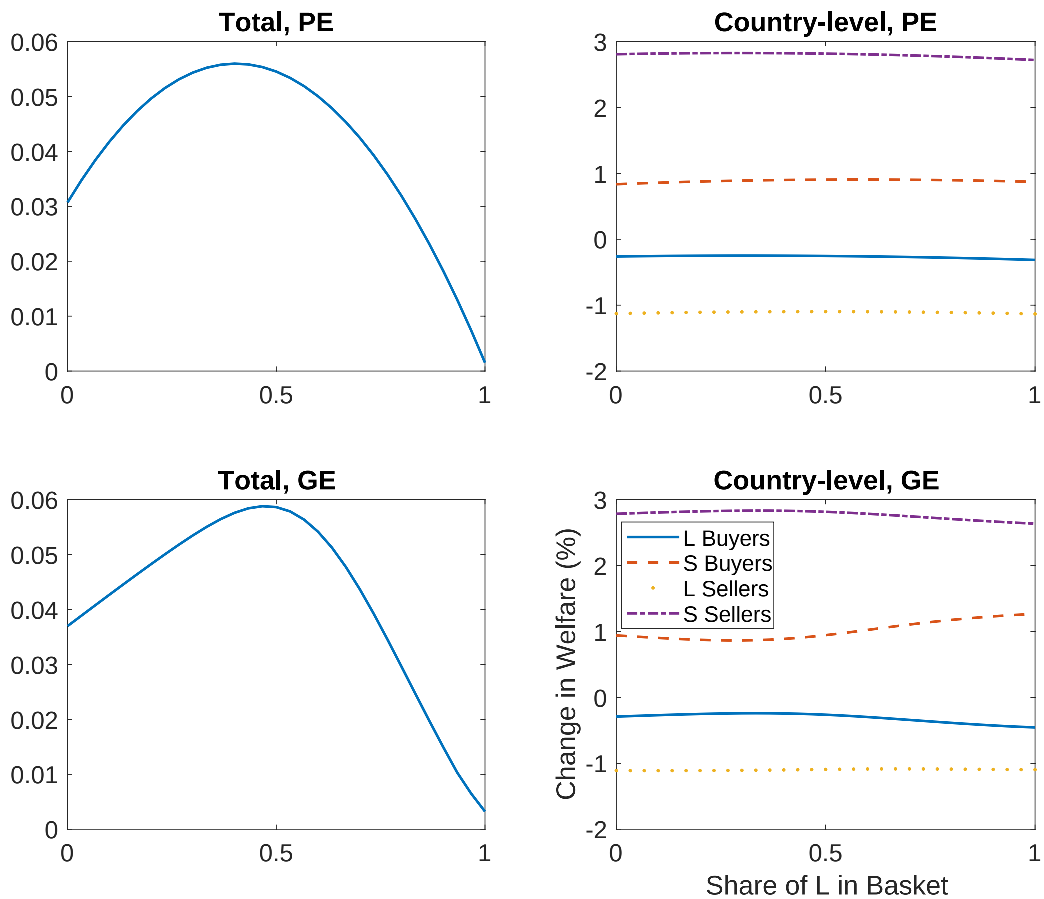
Figure 5: Real Money Holdings, Both Sellers Accept Basket



currency. This leads to negligible changes in individual agents' welfare as a function of κ. However, the level of welfare gains relative to the international currency case can be substantial. In particular, small country sellers' welfare increases by nearly 3% relative to the international currency case, because of a large increase in trade with large country buyers. Differently, large country sellers are worse off in partial equilibrium as the use of the large country's currency falls relative to the international currencies case. For small country buyers, welfare rises somewhat relative to the international currencies case because their holdings of their own currency rise significantly, increasing trade with local sellers, while for large country buyers welfare is only slightly lower, as their portfolios shift to holding other currencies besides their own, which they cannot always spend.

In general equilibrium, shown in the second row of Figure 6, the welfare patterns are very similar, due to the stable demand for the basket across the two states of trade, and its ability to be spent with both countries' sellers. Summing up, in partial equilibrium, large country buyers prefer a lower κ than small country buyers because, due to matching frictions, they use the basket more often as a hedge against the relatively low rate of return in the large currency. At the same time, a higher value of κ is preferable to hedge against

Figure 6: Welfare, Both Sellers Accept Basket



the relatively high realized inflation in the small currency. Because of the difference in size of the two countries, we find that the optimal value of κ in partial equilibrium is 0.4. In general equilibrium, the effects of the basket on the component countries' realized inflation drives the welfare effects: for low values of κ, increasing the weight in the large currency has a destabilizing effect on the realized inflation of the small currency, and vice versa for the large currency. For high values of κ, these effects are reversed. The general equilibrium welfare-maximizing value of κ at roughly 0.45 trades off these effects on the volatility of the underlying currencies.

6.4 Potential for Basket Adoption

Although we take sellers' currency acceptance decisions as given, we can examine sellers' welfare in the cases above to test whether sellers would be likely to accept the basket were they given the choice. We hold all parameters constant at their values shown in Tables 1 and 2.[7] To more easily interpret the incentives for sellers to accept the basket, we transform welfare, which is naturally measured in units of CM labor, into units of the home currency, that is, 2017 USD. As in Tables 4 and 5, we divide sellers' welfare in units of CM hours by the equilibrium value in the CM of the large currency in the trade state, ϕ_T^L, in each case. We then subtract the welfare of sellers who do not accept the basket from the welfare of sellers who do accept the basket, giving us sellers' willingness to pay to accept the basket, conditional on being in a given equilibrium (cases 2 through 6). Table 6 displays the results. These results convey the willingness to pay for an individual seller to accept a given currency, and therefore takes a partial equilibrium point of view similar to the exercises we conduct above.[8]

Table 6: Sellers' Implied Willingness to Pay to Accept the Basket

Case	L, no trade	L, trade	S, no trade	S, trade
2: International Currency (accept L)	0	0	861	1,751
3: S Accept Basket	-	-	0	240
4: L Accept Basket	154	0	-	-
5: S and L Accept Basket	73	189	126	489
6: Case 5 + S accept L	0	0	0	0

Notes: Willingness to pay is denominated in 2017 USD, and is computed as the difference in sellers' welfare in CM hours, divided by the equilibrium value of home currency, ϕ_T^L. Entries for equilibria in which it is assumed sellers cannot accept the basket are omitted.

The first row of the table shows the results for the international currency equilibrium, where we report the value of accepting the large currency. In this equilibrium, large country sellers always accept their own currency, thus their welfare gain from accepting the large currency is zero. Differently, small country sellers who accept the large currency are significantly better off in both states than sellers who do not accept the large currency: small country sellers would be willing to pay \$861 in the no trade state and \$1,751 in the trade state to be able to accept the large currency. The second row of the table shows the results in the equilibrium in which small country sellers accept the basket. In this case, small country sellers who do not accept would be willing to pay \$240 in the trade state, but nothing in the no trade state to accept the basket currency. This is because buyers hold the basket only in the trade state, thus sellers' welfare in the no trade state is unaffected by their decision to accept the basket. Symmetrically, when some large country sellers accept the basket, those

[7] Results allowing for the optimal weights found in the previous section are largely unchanged and are available upon request.

[8] The results shown in sections 6.2 and 6.3 compute the total welfare of sellers, whereas in this section we consider the two types of sellers – private and public – separately.

who do not accept would be willing to pay \$154 in the no trade state in order to accept, again because this is the state of the world in which buyers hold the basket currency. Finally, when some sellers in both countries accept the basket, large country sellers would be willing to pay \$73 and \$189 to accept the basket in the no trade and trade states, respectively. Similarly, small country sellers would be willing to pay \$126 and \$489 to accept the basket in the no trade and trade states. The reason both sellers are willing to pay more in the trade state is that buyers hold more basket currency in this state since the rate of return motive against devaluations of the small currency is stronger. Finally, in the case in which small country sellers accept both the basket and large currency, no sellers would be willing to pay to accept the basket because no buyers hold it. Comparing sellers' willingness to pay to the annual cost of maintaining a modern point-of-sale system suggests that the results in Table 6 may be too low to warrant adoption.[9]

7 Sensitivity Analysis

This section examines the robustness of our numerical results. We perform several exercises. First, we vary key parameters in the two country model and compare the predictions in terms of realized inflation and money demand. Second, we extend our model to allow for 5 countries and a 5-currency basket.

7.1 2 Country Model

We study the sensitivity of the results to several parameters in the same two cases considered in Section 6.3: case 3 (small country sellers accept the basket) and case 5 (both countries' sellers accept the basket). The parameters we vary are as follows: risk aversion σ, persistence of the trade shocks ρ_T and ρ_N, buyers' bargaining power η, and the small currency's money growth rate γ_S. Tables 7 and 8 contain the results from increasing each parameter by 10% (in the final robustness check, γ_S is set to 1.0464 to match average inflation in Mexico between 2000 and 2019).

When risk aversion increases, buyers hold more money to better smooth consumption. Specifically, buyers increase their holdings of the other country's currency significantly both when only small country sellers accept the basket and when both countries' sellers accept. Domestic currency holdings also increase, as the marginal benefit of holding money in the DM increases. When only small country sellers accept the basket, buyers hold the basket only in

[9]As of February 2020, the average cost of, for example, a Square Retail POS terminal is \$720, excluding the fixed and variable costs per transaction. See https://squareup.com/us/en/point-of-sale/retail.

Table 7: Realized Inflation (change in % points from baseline calibration)

	Large	Small	Basket
$\sigma = 0.77$; S Accept Basket; T to NT	0.11	0.12	0.11
$\sigma = 0.77$; S Accept Basket; NT to T	-0.10	-0.10	-0.10
$\sigma = 0.77$; S & L Accept Basket; T to NT	0.11	0.07	0.09
$\sigma = 0.77$; S & L Accept Basket; NT to T	-0.10	-0.06	-0.08
$\rho_T = 0.95$, $\rho_N = 0.79$; S Accept Basket; T to NT	4.54	6.96	5.72
$\rho_T = 0.95$, $\rho_N = 0.79$; S Accept Basket; NT to T	-3.76	-5.51	-4.66
$\rho_T = 0.95$, $\rho_N = 0.79$; S & L Accept Basket; T to NT	4.32	6.96	5.58
$\rho_T = 0.95$, $\rho_N = 0.79$; S & L Accept Basket; NT to T	-3.73	-5.46	-4.64
$\eta = 0.55$; S Accept Basket; T to NT	-0.31	0.31	-0.31
$\eta = 0.55$; S Accept Basket; NT to T	0.27	0.26	0.26
$\eta = 0.55$; S & L Accept Basket; T to NT	-0.44	-0.22	-0.33
$\eta = 0.55$; S & L Accept Basket; NT to T	0.40	0.18	0.29
$\gamma_S = 1.0464$; S Accept Basket; T to NT	-0.18	8.21	3.81
$\gamma_S = 1.0464$; S Accept Basket; NT to T	0.15	-1.86	-0.88
$\gamma_S = 1.0464$; S & L Accept Basket; T to NT	-0.10	5.99	2.75
$\gamma_S = 1.0464$; S & L Accept Basket; NT to T	0.09	-0.10	-0.01

Notes: σ, ρ_T, ρ_N, and η are increased by 10% relative to their values in the baseline calibration. γ_S is increased from 1.02 to 1.0464. All other parameters are the same as Table 1. Percentage point changes are computed as the difference between the realized inflation in each case and the baseline parameterization in the relevant case (case 3 or 5).

the trade state as in the baseline calibration. They increase their holdings of the basket in the trade state to smooth consumption. Differently, when both countries' sellers accept, higher risk aversion leads buyers to decrease their holdings of the basket, reallocating to higher holdings of the sovereign currencies to smooth consumption when meeting government sellers in their own country. Overall, the relatively large changes in sovereign currency demand result in only mildly more volatile realized inflation: due to higher risk aversion, buyers have relatively similar sovereign currency demand across states.

By increasing the persistence of trade shocks, the economy is less likely to transition across states. This reduces demand for the basket currency due to a lower expected value from the higher rate of return it achieves relative to the sovereign currencies when the state transitions. Because agents are more likely to remain in the current state of trade, buyers hold more of the foreign currency in the trade state since they are highly likely to travel. In the no trade state, small country buyers decrease their holdings of the large currency far more than large country buyers do for the small currency because of the difference in size of the two countries: small country buyers are far more likely to meet a large country seller if the state transitions than are large country buyers to meet a small country seller. Thus, an increase in persistence has a stronger effect on small country buyers' holdings of the large currency. Large country buyers slightly increase their holdings of the small currency even in the no trade state because of the large deflation the small currency experiences if the state transitions. Overall, the shift in currency holdings when persistence increases leads to more volatility in the values of the currencies, as measured by their realized inflation.

Turning to the sensitivity of the model to changes in buyers' bargaining power, an increase in η leads buyers to get more of the surplus from a given trade. This leads to offsetting income and substitution effects when making their portfolio choices. On the one hand, by receiving more of the surplus, a given amount of money will give buyers more of the DM good, so they can hold less money and achieve the same utility. On the other hand, each unit of money buys more of the DM good. Given our parameter values, an increase in bargaining power in both cases we consider leads to higher demand for the foreign currency by buyers in each country, and lower demand for their own currency and the basket. Though the percentage changes in money demand are quite high, as in the cases in which we vary risk aversion, realized inflation does not change much in response. The reason is that buyers in the two countries reallocate their portfolios in different ways, offsetting one another in the determination of (aggregate) realized inflation.

Finally, we increase money growth in the small currency to 4.64% to match the average inflation in Mexico between 2000 and 2019. Increasing the cost of holding the small currency to be more than double that of the large country results in the expected shifts in buyers' portfolios: large country buyers shift more of their balances out of the small currency and into the basket, since only a share of the small currency's inflation is passed through to that currency. In the case in which only small country sellers accept the basket, only small country buyers hold the small currency in the no trade state, when there is a relatively high probability of meeting a government seller who only accepts that currency. Instead, in both states for large country buyers and in the trade state for small country buyers, all of the small currency is exchanged for the basket. In the case where both sellers accept the basket, the increase in money growth in the small country leads to similar, if smaller changes in portfolio composition. The difference in this case is that large country buyers decrease their holdings of the basket in the no trade state in favor of holding more of their own currency, since the inflation rate for the basket increases with γ_S. As a result, the effect of an increase in γ_S on realized inflation is to increase the volatility of the small currency as well as the basket, with little effect on the realized inflation of the large currency.

Table 8: Buyers' Money Holdings (% change from baseline calibration)

Parameter(s)	z_L	z_S	z_B	$\hat{z}_L$	$\hat{z}_S$	$\hat{z}_B$
$\sigma = 0.77$; S Accept Basket; No Trade	26.6	71.2	0	57.5	26.6	0
$\sigma = 0.77$; S Accept Basket; Trade	30.8	64.9	10.4	43.1	37.1	0.2
$\sigma = 0.77$; S & L Accept Basket; No Trade	29.9	85.8	-5.33	96.8	29.2	-0.86
$\sigma = 0.77$; S & L Accept Basket; Trade	35.5	74.4	-0.43	53.0	39.7	-0.13
$\rho_T = 0.95$, $\rho_N = 0.79$; S Accept Basket; No Trade	1.15	2.62	0	-19.7	3.08	0
$\rho_T = 0.95$, $\rho_N = 0.79$; S Accept Basket; Trade	0.36	19.8	-7.99	8.49	-1.96	11.93
$\rho_T = 0.95$, $\rho_N = 0.79$; S & L Accept Basket; No Trade	2.76	6.29	-14.9	-41.3	3.19	-3.03
$\rho_T = 0.95$, $\rho_N = 0.79$; S & L Accept Basket; Trade	0.99	23.4	-6.24	10.0	0.34	-4.39
$\eta = 0.55$; S Accept Basket; No Trade	-5.12	11.4	0	3.32	-5.17	0
$\eta = 0.55$; S Accept Basket; Trade	-4.20	9.71	-17.1	-0.72	-3.25	-7.31
$\eta = 0.55$; S & L Accept Basket; No Trade	-4.58	15.1	-11.0	20.2	-4.45	-12.5
$\eta = 0.55$; S & L Accept Basket; Trade	-2.31	12.8	-15.6	2.93	-1.54	-14.2
$\gamma_S = 1.0464$; S Accept Basket; No Trade	-0.10	-100	∞	-1.52	-87.4	∞
$\gamma_S = 1.0464$; S Accept Basket; Trade	0.05	-100	278	0.18	-100	823
$\gamma_S = 1.0464$; S & L Accept Basket; No Trade	0.98	-100	-11.5	-9.72	-5.91	19.0
$\gamma_S = 1.0464$; S & L Accept Basket; Trade	-6.96	-93.6	46.6	-4.36	-15.4	18.9

Notes: σ, ρ_T, ρ_N, and η are increased by 10% relative to their values in the baseline calibration. γ_S is increased from 1.02 to 1.0464. All other parameters are the same as Table 1. Percentage changes are computed as the ratio of the realized inflation in each case and the baseline parameterization in the relevant case (case 3 or 5).

7.2 5 Country Model

In this section we extend our model to study its robustness to incorporating five countries and a five-currency basket. The choice of five countries is to match the original proposal for the Libra stablecoin, which was a basket made up of US dollars, euros, Japanese yen, British pounds, and Singapore dollars. Basket weights in this section are chosen close to the original shares proposed by Libra and are shown in Table 9.[10] Relative populations are calibrated to match the population in each country in 2017. All other parameters are identical to those

[10] We set the share of the basket made up of Singapore dollars to be 3%, and the share of British pounds to 15%. In Libra's original proposal, these shares were 7% and 11%, respectively. Due to the small relative population of Singapore, basket demand in our model results in extremely high volatility in the Singapore dollar the larger is its share in the basket. In practice, the Monetary Authority of Singapore operates a managed float regime for the Singapore dollar, limiting its volatility against the currencies of its major trading partners.

in Table 1.

Table 9: Five Country Basket Shares

	USD	EUR	JPY	GBP	SGD
Real share	0.5	0.18	0.14	0.15	0.03

For brevity, we study a subset of the cases in the two country model, corresponding to cases 1, 3, and 5. Case 3 corresponds to nearly all sellers in the smallest country accepting the basket, and case 5 corresponds to the case in which a large share (67%) of sellers in all five countries accept both their own currency and the basket.

Table 10: Realized Inflation (%)

		USD	EUR	JPY	GBP	SGD	Basket
1:	National Currencies, T to NT	0.72	0.73	0.62	0.60	0.58	0.68
1:	National Currencies, NT to T	3.30	3.29	3.40	3.42	3.44	3.33
3:	Singapore accepts Basket , T to NT	0.38	0.61	0.37	0.10	0.07	0.37
3:	Singapore accepts Basket , NT to T	3.65	3.41	3.65	3.94	3.96	3.66
5:	All accept Basket, T to NT	8.42	3.77	6.80	10.9	21.4	8.02
5:	All accept Basket, NT to T	-4.04	0.26	-2.59	-6.16	-14.3	-3.77

Tables 10 and 11 contain the results for realized inflation and buyers' money holdings, respectively. Starting with the national currencies case, all buyers hold only their own currency because the inflation cost of holding other countries' currencies is too high relative to their probability of traveling to meet any one country's sellers. Because the probability of trade with a seller accepting the buyer's own currency is higher in the no trade state, all buyers hold more currency in that state, resulting in higher (lower) inflation when transitioning from the no trade to trade states (trade to no trade states). Results are similar for all countries but Singapore in the case in which nearly all (99%) of Singaporean sellers accept the basket. In this case, buyers in the larger countries hold their own currencies, and more so in the no trade state. Differently, Singaporean buyers reallocate their portfolio in the no trade state to hold a small share of the basket, since the basket experiences less inflation when transitioning to the trade state, as shown in Table 10.

Finally, when a large share of all sellers accept the basket, the results change. Buyers in the largest country, the euro area, slightly change their portfolios relative to the national currencies case, as a result of the change in realized inflation for euros driven by other countries' buyers' demand for the basket. All other countries' buyers exhibit some demand for the basket in the state of the world in which the basket's rate of return is superior to their domestic currency. As can be seen in the last two rows of Table 10, the basket inflates less than all currencies except the euro and Yen when transitioning from the trade to no trade states, giving rise to demand for the basket in the US, UK, and Singapore in the trade state. Differently, buyers in Japan demand the basket in the no trade state, since it deflates more than the yen when transitioning back to the trade state. Demand from buyers in the euro area is zero because of the large size and small share of euros in the basket: in partial equilibrium (omitted for brevity), euro area buyers demand a large amount of the basket in the trade state, since the basket inflates less when transitioning to no trade (see first row of Table 10). Instead, when realized inflation responds to changes in demand for the currencies underlying the basket, euro area buyers would want to hold the basket in the no trade state (see last row of Table 10), but this would decrease the rate of return motive for other countries' buyers to hold the basket, in turn reducing its rate of return motive for euro area buyers. Overall, when we extend the model to allow for a five-country basket as in the original proposal for the Libra stablecoin, we find low basket demand from buyers due to the same general equilibrium mechanism in our baseline model, through the basket's effect on the realized inflation of the underlying currencies.

8 Conclusion

In this paper we develop a new monetarist model of international trade to consider global demand for basket-backed stablecoins. In the model, money is valued as a medium of exchange in decentralized meetings, and trade shocks – variation in the number of international meetings – affect currency demand. Fluctuations in money demand lead to fluctuations in the price levels of sovereign currencies which reduce the welfare of risk-averse consumers. We introduce a basket currency – a convex combination of the underlying sovereign currencies – with the potential to attenuate such fluctuations. Our model highlights two motives that affect demand for the basket currency: the spendability motive and the rate of return motive.

We calibrate the model to standard parameters and find that there is a small portfolio share allocated to the basket currency in all of the equilibria that we study. We show that this result is due to the fact that demand for the basket, which is made up of the two countries' currencies, increases demand for those sovereign currencies themselves. In the model, buyers demand the basket when they expect it to deliver a higher rate of return than a given sovereign currency, but higher demand for the basket leads to higher demand, and therefore a better rate of return, of the underlying currencies. In other words, the

Table 11: Buyers' Money Holdings (Thousands of Dollars)

Buyer Location	Case	own currency	B
US	National Currencies, No Trade	11.27	0
US	National Currencies, Trade	11.13	0
euro area	National Currencies, No Trade	11.27	0
euro area	National Currencies, Trade	11.13	0
Japan	National Currencies, No Trade	11.26	0
Japan	National Currencies, Trade	11.11	0
UK	National Currencies, No Trade	11.26	0
UK	National Currencies, Trade	11.10	0
Singapore	National Currencies, No Trade	11.25	0
Singapore	National Currencies, Trade	11.10	0
US	Singapore accepts Basket, No Trade	11.25	0
US	Singapore accepts Basket, Trade	11.14	0
euro area	Singapore accepts Basket, No Trade	11.27	0
euro area	Singapore accepts Basket, Trade	11.14	0
Japan	Singapore accepts Basket, No Trade	11.25	0
Japan	Singapore accepts Basket, Trade	11.12	0
UK	Singapore accepts Basket, No Trade	11.23	0
UK	Singapore accepts Basket, Trade	11.13	0
Singapore	Singapore accepts Basket, No Trade	11.09	0.14
Singapore	Singapore accepts Basket, Trade	11.12	0
US	All accept Basket, No Trade	11.31	0
US	All accept Basket, Trade	10.30	0.35
euro area	All accept Basket, No Trade	11.41	0
euro area	All accept Basket, Trade	10.99	0
Japan	All accept Basket, No Trade	11.55	0.04
Japan	All accept Basket, Trade	10.79	0
UK	All accept Basket, No Trade	11.74	0
UK	All accept Basket, Trade	10.08	0.83
Singapore	All accept Basket, No Trade	12.52	0
Singapore	All accept Basket, Trade	8.62	2.40

Notes: Buyers' real money holdings, expressed in thousands of dollars (currency of country 1). Holdings of currencies not shown are zero.

benefit of insuring against declines in the purchasing power of a given currency is reduced when the basket itself affects this purchasing power. In the most generous case we study, in which roughly two-thirds of both countries' sellers accept the basket, the basket currency accounts for 9.6% of world currency demand when trade openness is low, and 15.1% of world currency demand when trade openness is high. Our model shows that although the basket may have the potential to become systemically important and globally demanded, general equilibrium effects on the relative values of the component currencies when the level of trade changes make it such that the basket never dominates either of the component currencies. At the same time, the introduction of the basket leads the more volatile sovereign currency to become more stable, substantially increasing currency holdings and trade, though welfare gains are minimal due to differential effects on buyers and sellers in the two countries.

We show that the optimal basket composition varies significantly depending on which countries' sellers accept payment in the basket currency. This result follows from rate of return dominance: when one currency is expected to depreciate when a trade shock is realized, buyers would prefer to pay that country's sellers using the basket. We show that these incentives are drastically reduced in general equilibrium, when currency demand affects expected rates of return on both the basket and component currencies, reducing the rate of return motive. Because of these price effects, we find that changes in the basket composition have little effect on overall welfare, holding sellers' strategies constant. Extending the model to a five-currency basket, as originally proposed for the Libra stablecoin, delivers similar qualitative predictions.

Finally, we use the model to compute sellers' willingness to pay to accept the basket in each equilibrium we study. Because of the low demand for the basket by buyers, even when many other sellers accept, the difference in sellers' welfare by accepting or not accepting the basket is small, implying a low willingness to pay. Our estimates suggest that there must be significant benefits in addition to those we study here in order to achieve widespread adoption of basket-backed stablecoins.

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