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## Commentary

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In these remarks I restrict my attention to the model with divisible output. That model, which is used to examine the possible roles of two fiat currencies in a two-country world, is true to some general principles that I like. Neither the physical environment of the model nor the equilibrium concept dictates in an obvious way that one currency has a special role in one of the countries and the other currency has a special role in the other country. Countries are defined by exogenous pairwise meeting patterns. A given resident of a country is encountered more frequently by other residents than by nonresidents, and countries may differ in the overall rates at which their residents meet people. A potential role for quid pro quo trade involving outside assets is implied by specialization in consumption and production of nonstorable goods and by either anonymity or private information about individual trading histories. The only assets are indivisible fiat currencies, and the currency-creation rule and the assumption that consumption must precede production imply among other things, that total currency holdings for an individual in a steady state cannot exceed one unit. The equilibrium concept is implied by rational expectations and the bargaining rule that potential consumers in single-coincidence meetings (all meetings are either no-coincidence meetings or single-coincidence meetings) make take it or leave it offers. Obviously, none of these assumptions ties a particular currency to a particular country.

If the populations of the two countries were constant and there were fixed stocks of two fiat currencies, red currency and blue currency, then, although nothing exogenous identifies a currency with a country, there might be equilibria and steady

states where the currencies and countries are matched in some way. We certainly expect that there would be at least one equilibrium where they are not matched—an equilibrium in which people ignore the color of currency. In this model, a common growth rate of the population is assumed and a fraction of the new residents of each country begin with one unit of a particular currency. This assumption produces some connection between currencies and countries. For example, it precludes the existence of a steady state in which residents of one country hold only the currency issued by the other country.

Although I like the general strategy taken by Alberto Trejos and Randall Wright, I would approach certain details differently. First, the decision to consider only equilibria “where trade always occurs if a buyer with Currency *i* meets a seller from Country *i*” is not innocuous. Second, I do not like the assumption that consumption must precede production. Third, I think that they should devote more attention to a discussion of the role played by the indivisibility of currency and the bound on individual holdings—assumptions that seem to be adopted only to make the model more tractable.

### CURRENCY *i* IS ALWAYS USED TO BUY FROM RESIDENTS OF COUNTRY *i*

Trejos and Wright look only at steady states in which anyone with Country *i* currency is willing to use it to buy from residents of Country *i*. A consequence is that they ignore a potential steady state in which people ignore the color of currency, but residents of the rich country (in terms of meeting frequencies) do not buy from residents of the poor country. As the authors point out, if the residents of one country meet potential traders at a higher rate than do residents of the other country, then the latter are, *ceteris paribus*, willing

to produce less than the former for a unit of currency. If this difference is sufficiently large, then there is no steady state with two international currencies in which the effective single currency is used to buy from residents of both countries. For such parameters, however, I suspect that there is a steady state in which people ignore the color of currency, no rich-country resident with either currency buys from a poor-country resident, and any poor-country resident buys from residents of both countries. In such a steady state, no poor-country resident holds rich country currency, whereas rich-country residents hold all of their own currency and some—maybe most—of the poor country's currency. If there were no growth, then such a steady state would have residents of the poor country holding no currency and engaging in no trade. When such a steady state exists, there may be other steady states, which Trejos and Wright call no-international-currency steady states. In these steady states, the two currencies play distinct roles and the residents of the poor country get to use their own low-valued currency and consequently do better than they do when there is effectively one currency.

We know from results the authors present that such steady states exist for some parameters, namely those with low rates of meetings across countries. Thus this model seems to have implications that resemble those of the optimal currency area literature even though prices in this model are flexible. This model, however, has its own inflexibility—the indivisibility of currency. We do not know whether the preceding results and conjectured results would survive if the authors made currency considerably more divisible than it is in the current model. Certainly, the restriction that Currency *i* is used to buy from residents of Country *i* is much weaker if currency is divisible.

### CONSUMPTION MUST PRECEDE PRODUCTION

Next, I want to comment on the assumption that consumption must precede

production. I feel somewhat responsible for this assumption because Aiyagari and I<sup>1</sup> introduced it in work that explored the model in Kiyotaki and Wright (1989), a model with indivisible goods and fiat objects, all of which are storable. In that model, storable goods are a form of productive capital because they can be consumed subsequently by someone. The storage capacity assumption in the original formulation implies therefore that free disposal of fiat objects increases productive capital, which seems objectionable.

In the current model, because goods are not storable, a storage capacity assumption does not have that implication. Moreover, because goods are divisible in the current model, the assumption that consumption must precede production gives rise to an unappealing discontinuity. Subsequent to production, consumption of any positive amount allows future production of any desired amount, but zero consumption precludes future production. Finally, as Trejos and Wright note, it matters which route is taken to get an upper bound on total currency holdings. If they directly assume an upper bound, as I think is preferable in this model, then trade is possible in single-coincidence meetings in which the consumer has one of the currencies and the producer has the other.

### INDIVISIBILITY AND A BOUND ON INDIVIDUAL HOLDINGS

Indivisibility and a bound on individual holdings play important roles. They play a crucial role for the policies that Trejos and Wright discuss at some length, policies that determine the fraction of newborn who start with a unit of currency. These policies determine the per capita nominal stocks of the two currencies. Absent indivisibility and a bound on individual holdings, there would be neutrality for such policies. That is, the set of steady states would be invariant in real terms to the policies. Therefore, all the findings pertaining to the policies are due to the indivisibility and to the bound. Moreover,

<sup>1</sup>See Aiyagari and Wallace (1992).

the indivisibility and the bound play different roles for the policies studied.

An upper bound, specified in nominal terms as in this model, gives rise to the possibility that increases in the amount of currency reduce trade and welfare because such increases raise the fraction of people who are holding maximum wealth and who therefore will not produce. An indivisibility, also specified in nominal terms, gives rise to the possibility that increases in the amount of currency are beneficial because the larger the amount of currency, the less important is a given indivisibility. Given the role played by those assumptions for the policies studied, Trejos and Wright should either defend those assumptions on grounds other than tractability or should pay much less attention to the policies. If the authors do not want to defend the indivisibility of currency and the bound on individual holdings, then they should emphasize results that are potentially robust to departures from those assumptions. Some of the multiplicity results may be robust. The policy implications studied are not.

## CONCLUSION

I conclude with the question I mentioned at the outset: What connects a particular fiat currency to a particular country? It seems obvious that if we want any equilibrium to display connections between particular currencies and countries, then we must impose policies that give rise to the connections. As noted above, a policy of this sort exists in this model: New residents of each country start with a particular currency. That is, a mysterious entity in the model, the government, is issuing a particular currency to residents of a particular country. One could strengthen this policy in the following way: One could have this mysterious entity involved in a variety of transactions and have it, as a matter of policy, favor one currency in its transactions.<sup>2</sup> Because models of the sort presented by Trejos and Wright have scope for the possibility that transactions of others influence the

value of currency to everyone, we may find that fairly innocuous policies of this sort end up implying the connections between currencies and countries that we often see.

## REFERENCES

- Aiyagari, S. Rao, and Neil Wallace. "Fiat Money in the Kiyotaki-Wright Model," *Economic Theory* (Vol. 2, 1992), pp. 447–64.
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- Kiyotaki, Nobuhiro, and Randall Wright. "On Money as a Medium of Exchange," *Journal of Political Economy* (August 1989), pp. 927–54.

<sup>2</sup>For one such specification, see Aiyagari and Wallace (1995).