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I. INTRODUCTION

This essay sketches a possible and hopefully plausible interpretation of the development of the Euro-dollar market within the broader context of the international monetary system. It does not contribute any new statistical or institutional material to the growing body of literature dealing with this most fashionable of international financial topics, but attempts to focus attention on some of the features of the Euro-dollar market most relevant to economic theory and policy.

The Euro-Dollar Market

Though most readers will be familiar with the operation of the Euro-dollar market, a very brief survey of some of its features may serve as a useful introduction to the issues raised in this paper.

The Euro-dollar market is part of the Euro-currency market. At least three features characterize Euro-currency operations: institutions operating in the market acquire claims and issue liabilities in a currency other than that of their country of residence; these assets and liabilities are usually short-term in nature; and all transactions involve the intermediation of banks. The main currencies which banks operating in the market accept (borrow) and place (lend) are the United States dollar, the British pound sterling, the Swiss franc, the German mark, the Dutch guilder, the French franc, and the Italian lire. The market area extends farther than the Euro-currency label implies, though the main centers—such as London, Zurich, or Frankfurt—are located in Europe. The Euro-dollar instrument is a foreign-currency deposit at a bank. Rates on call, seven-day, one-, three-, and six-month deposits are usually quoted.

For our purposes, it will be sufficient to define a Euro-dollar deposit as any dollar deposit at a non-American bank. The source of this deposit can be (1) a claim previously held on the United States, (2) an asset denominated in a foreign currency, or (3) a Euro-dollar deposit received by another bank. "Original lenders" can be defined as those institutions, both financial and nonfinancial, which make a Euro-dollar deposit by transferring a dollar deposit held in the United States to the Euro-dollar market or by exchanging foreign currency for dollars in the foreign-exchange market. "Intermediaries" are commercial banks that relend to another commercial bank the dollars they have received on

deposit from an original lender. "Final borrowers" can be defined as those economic agents who receive a dollar loan from a Euro-dollar intermediary but do not relend it to another intermediary. Under this definition, a commercial bank which receives a Euro-dollar deposit and uses it to make a nondollar loan or to increase its reserves acts as a final borrower; so does a nonbank borrower who receives a dollar loan from a non-American bank and does not redeposit it in the Euro-dollar market.

These definitions suggest that Euro-dollar transactions can be viewed as a series of chains along which the deposit of an original lender is transferred to a final borrower via the intermediation of commercial banks. Original lenders in the Euro-dollar market are usually large corporations —especially international corporations—commercial banks, and central banks. Intermediaries are of course mainly commercial banks, while final borrowers of every economic and institutional hue borrow in the market.

As an example, suppose a German exporter transfers a dollar deposit in New York to a German bank. The latter may relend the deposit to an Italian bank, which, in turn, lends it to an Italian importer who uses it to settle a debt to an American exporter. The German exporter is the original lender; the German and Italian banks as intermediaries have accepted and placed the dollar deposit; and the Italian importer is the final borrower.

The Euro-currency market has developed at a rapid pace since the 1958 return to convertibility of the major Western currencies. The Bank for International Settlements has estimated the net size of the Euro-*dollar* market (the net stock of Euro-dollars) at approximately $13 billion at the end of 1966. Since Euro-dollar transactions represent fully 80 to 85 per cent of total Euro-currency transactions, one would guess the net size of the Euro-currency market to have stood at $15 to $16 billion at the end of 1966.

Two examples will suffice to indicate the market's importance for individual countries. At the end of March 1963, the liabilities of Italian banks in convertible foreign currencies to nonresidents amounted to $1,947 million, while their foreign-currency claims on nonresidents stood at $1,420 million. In other words, the Italian banking system had borrowed $527 million in the Euro-currency market on a net basis and converted this amount into lire assets. Other things equal, the reserve base of the Italian banking system would have been $527 million smaller had the banks not had access to the Euro-currency market.

In the United Kingdom, at the end of March 1965, foreign-currency liabilities represented some 36 per cent of total current accounts and deposits of accepting houses and overseas banks, and some 14 per cent of the banking system's total current accounts and deposits. Though

most of these liabilities were matched by foreign-currency assets, the *net* (foreign-currency) liability position of the British banking system (to nonresidents) stood at its highest level, increasing by £147 million over the previous quarter, an amount more than sufficient to finance a £96 million deficit on the current and long-term capital accounts of the balance of payments.

Outline of the Essay

So much for background. Two questions need to be asked: first, what general phenomena does the Euro-dollar market reflect; and, second, what is the significance of the market, broadly viewed, for economic theory and policy?

The essay's approach to these questions is to analyze, first, some of the salient features of recent international movements of short-term capital in general, and of Euro-dollar transactions in particular: the widespread use of third currencies in financial transactions among countries; the predominance of certain currencies, such as the dollar, in these transactions; the predominance of certain types of assets (in particular, claims on banks) as international credit instruments; and the very high interest elasticity that international demand and supply functions of short-term capital have exhibited in recent years. Institutional descriptions of—and attempts at measuring—these phenomena have been offered in the literature. This essay's approach is more analytical. It discusses, first, the nature of currency preferences (beyond preferences for certain patterns of risk and return on asset portfolios); second, the concentration of such preferences on one or two particular currencies; third, the gains that accrue to a country from the "vehicle" use of its currency; and, fourth, the relation between third-currency denomination of claims and debts and capital mobility.

This first part of the analysis will be carried out in the next two sections of the essay. Thus, section II will examine the nature of currency preferences and the economic rationale for the use of vehicle currencies; Euro-dollar transactions will be viewed as but one example of such vehicle-currency use. Section II will also argue that gains accrue to both the government and private residents of a country which issues a vehicle currency. Section III will discuss the link between capital mobility and the existence of certain types of assets—for instance, Euro-dollar deposits—which make better vehicles for international movements of capital than others. At the same time, section III will argue that the issue of such international vehicle assets by several countries makes it possible for the gains accruing to the country whose currency is used as vehicle in international transactions to be distributed more widely.

While sections II and III will present a broad interpretation of the Euro-dollar market, the subsequent sections will deal with some of its implications. Section IV will attempt to disentangle some of the issues involved in assessing the impact of the Euro-dollar market on the balance of payments of the United States. Section V will analyze the market's potential contribution to credit creation. The concluding section will sketch some of the implications of the analysis for the conduct of economic policy in both the United States and individual "outer" countries.

II. VEHICLE CURRENCIES

Our first task is to account for third-currency denomination of transactions among countries and for the predominance of the dollar and a few other currencies in such transactions. To understand the rationale of these transactions, of which Euro-dollar operations are a special case, it is necessary to ask, first, why an economic agent should ever want to hold assets or incur liabilities in a foreign currency; and, second, why he should show a preference for a few out of all available foreign currencies.

Currency Preferences

Traditional foreign-exchange theory does not offer an answer to these questions. True, it states that an investor will hold foreign rather than domestic assets if the return net of risk on the former is larger—or, strictly speaking, if the expected utility of holding the former is greater, where the argument of the utility function is limited to the probability distribution of monetary returns on the asset. This theory, however, does not explain why an economic agent should decide to hold his wealth in assets denominated in, say, dollars rather than in lire, if risk and interest rates on dollar and lire assets are equal and if there is absolute confidence in the maintenance of prevailing exchange rates. That is, particular assets are not held because of their currency denomination *per se*, according to traditional theory—except that lip service is occasionally paid to the fact that economic agents do keep working balances in various currencies. This theory, therefore, cannot explain the fact that private investors (as well as monetary authorities) display a preference for holding foreign assets denominated in major currencies—sterling in the past, dollars at present. Neither can it explain why the Euro-*dollar* market looms so large in Euro-currency markets.

To explain such specific currency preferences it is necessary to examine the place of assets denominated in foreign currency in wealth owners' portfolios, examine it independently of considerations of risk and return on the assets themselves.

The simplest approach to this issue is to ask what economic reasons there are for any individual or private institution to hold inventories of foreign currency even under severely simplified assumptions. That is, suppose that the only interest-bearing assets the residents of a country are allowed to hold are denominated in domestic currency (the only foreign-currency assets they can hold are *cash* assets). Suppose also that it is known with perfect certainty that exchange rates and prices will remain fixed at present levels for all future time periods. Under these assumptions there exists no economic reason for the holding of foreign

cash in the absence of asset-exchange costs. However, when transactions costs—broker's fees, bank charges, bookkeeping costs, psychological inconvenience, and so forth—are involved in the exchange of one asset for another, it becomes profitable for those agents whose receipt and expenditure streams are at least partly denominated in foreign currencies to hold cash balances in foreign currency even though the interest return on the latter is zero.

To illustrate, suppose that the foreign trade of a country is invoiced in foreign currency. Then, an importer's expenditure stream is denominated in foreign currency and his income stream in domestic currency, while the opposite pattern holds for an exporter. The importer accumulates domestic currency when his receipts exceed his expenditures, that is, as his net worth expands, and must pay out foreign currency as his net worth contracts. Were there no fixed costs of converting domestic cash into foreign cash, the importer would sell domestic interest-bearing assets and acquire foreign currency continuously as his net worth contracts, pay foreign suppliers immediately, and never accumulate any significant amount of foreign cash. A fixed cost per conversion, however, incites him to make lump-sum conversions and therefore to maintain, on the average, positive balances of foreign cash.

Similarly, an exporter accumulates foreign cash as his net worth expands and must pay out domestic cash as his net worth contracts. In the absence of asset-exchange costs, a profit-maximizing exporter will convert, upon receipt, his foreign-exchange earnings into domestic currency and invest them in interest-bearing domestic assets until he needs to make payments. With fixed costs per asset exchange he will let foreign-cash balances accumulate until the cost of conversion falls below the interest return that can be earned by investing the foreign exchange in domestic assets. In other words, exporters as well as importers will keep, on the average, positive balances of foreign cash.

It can be shown, by a similar line of reasoning, that traders who combine the functions of importer and exporter will keep positive balances of foreign cash as long as a discrepancy in the currency denomination of their receipt and expenditure streams exists. It can also be shown that the pooling of separate income and expenditure streams, either directly by an importer-exporter or by specialized intermediaries such as banks or foreign-exchange brokers, usually results in a lowering of the share of both foreign and domestic cash in working balances and in a higher return on over-all working balances. (Working balances, as defined by Professor James Tobin, are those balances which are held for the purpose of meeting seasonal excesses of expenditures over receipts; they can include both cash and interest-bearing assets.)

These conclusions are derived, implicitly, from the inventory approach to the demand for money developed by Professor William Baumol and by Professor Tobin. The appendix gives an explicit proof of the argument for the case of an importer. The essence of that argument can be put verbally.

Consider an importer who must make payments in foreign currency to his suppliers (continuously and at a constant rate) over some relevant planning period. The importer must decide how much cash to keep on hand and how much to invest in domestic interest-bearing assets (bonds for short). How often the importer converts domestic bonds into foreign cash—and hence his average foreign-cash holdings—depends on the domestic rate of interest and on the asset-exchange costs of converting bonds into foreign cash.

In order to maximize the return on his working balances, the importer will seek to convert domestic bonds into foreign cash in those discrete amounts which minimize the cost of holding foreign-cash balances. This cost has two components: the opportunity cost of giving up interest on bond holdings, and the cost of converting domestic bonds into foreign currency. The higher the interest rate, the greater is the opportunity cost of holding foreign cash—and hence the lower will optimum foreign-cash balances be. The higher the fixed costs of asset exchanges, the higher will be the cost of each asset exchange and the lower the optimum number of asset exchanges—hence the greater will average foreign-cash holdings be. More precisely, the appendix shows that foreign-cash balances will be positive as long as fixed asset-exchange costs are positive, that they will vary directly with these costs and the volume of transactions, and inversely with the domestic rate of interest.

The economic basis for the existence of currency preferences can now be summarized: the interaction of discrepancies in the currency denomination of receipts and outlays with asset-exchange costs results in a demand for specific currencies in an open economy. The foreign-currency composition of working balances should be related to the composition of trade, the demand for a specific foreign currency varying directly with the volume of transactions denominated in that currency and inversely with the rate of interest on domestic assets.

The Demand for Vehicle Currencies

The foregoing analysis accounts for the demand for specific currencies; it does not explain, however, why such demand should concentrate on one or a few currencies. For, the foreign exchange which is held in working balances is not a single commodity but is made up of the currencies of the several economies with which the home country trades.

The traders of various countries will carry out transactions predominantly in one vehicle currency only if such practice results in some economic advantage to all parties concerned. The advantages of using a vehicle currency reside, on the one hand, in increased interest income on working balances, and, on the other hand, in the opportunity to accumulate wealth in assets of fairly universal purchasing power.

Consider, first, the gains from the denomination of working balances in a vehicle currency. Reducing the foreign-exchange component of working balances from many currencies to one vehicle currency enables traders to reduce transactions costs and to increase the over-all return on their working balances. For, while it may be difficult to accumulate sufficiently large cash balances in each of a multitude of different currencies to make conversion into interest-bearing assets profitable, no such difficulty is likely to be encountered when all income and expenditure streams arising from foreign transactions are denominated in one and the same currency.

This proposition can be illustrated by considering the gains from reducing the number of foreign currencies in which an importer's expenditure streams are expressed. Assume, again, that only foreign *cash* assets are available and take the case of a German importer who must make payments in each of the currencies of the several countries with which he trades. The importer will hold cash balances in each of these currencies. Should his trade with Italy, for instance, now be settled in dollars rather than lire, his dollar cash balances will increase by less than the amount of lire cash balances (multiplied by the dollar-lire exchange rate) he was previously holding. That is, as the volume of transactions denominated in dollars increases, optimum cash holdings of dollars increase less than proportionately. As a consequence, the proportion of interest-bearing assets in, and hence the interest income on, working balances increases.

These specific results are a reflection of a more general principle: whenever discrepancies exist in the timing or currency denomination of income and expenditure streams, economies of cash balances can be realized by pooling different income and expenditure streams together. In the simple importer example above and under certain simplifying assumptions, it can be shown that these economies are directly related to the value and number of separate expenditure streams that are pooled together and denominated in a single currency. This is demonstrated in the appendix.

There are, thus, economic advantages to be derived from the use of vehicle currencies even when, as we have assumed so far, the residents of a country are limited to holding only foreign *cash* assets in addi-

tion to domestic assets. The possibility of holding foreign interest-bearing assets increases the share of foreign exchange in general, and of vehicle-currency assets in particular, in the working balances of various economic units.

The demand for foreign-exchange and vehicle-currency assets has been ascribed so far to the place of these assets in working balances. This demand is additional, or at least complementary, to that motivated by the usual considerations of risk and return stressed by traditional foreign-exchange theory. Another source of demand for foreign exchange can be distinguished if the usual assumption that economic agents are concerned with the domestic-currency value of their net worth is relaxed.

Such an assumption may be unwarranted in a world in which an economic unit's country of residence is not necessarily the country in which this unit ultimately desires to dispose of its wealth. To give but two examples: a Middle Eastern potentate may be more interested in the Swiss-franc value of his wealth than in its domestic-currency value; an international oil company may be more concerned about the dollar value of its assets than about their value in the currency of the company's country of residence.

The ultimate goal of wealth accumulation can usually be taken to be consumption by present or future generations. To the extent that future consumption comprises goods and services supplied by foreign countries, a country's residents in fact want to accumulate part of their wealth in foreign-currency assets. When exchange rates are expected to remain fixed, accumulation of foreign-currency assets enables wealth owners to bypass future asset-exchange costs. When there is uncertainty as to the future course of exchange rates, accumulation of foreign-currency assets provides wealth owners with a hedge against a change in the value of their wealth in terms of goods and services. From this point of view a wealth owner should accumulate assets in currencies matching his future consumption needs.

Assets denominated in the currency of a country which looms large in world trade will be demanded on that account. Such demand contributes to the potential vehicle-currency status of a large country's means of payments. Moreover, if wealth owners are uncertain as to the country-by-country breakdown of their future import requirements, they can still accumulate command over foreign goods in general by holding assets in the currency of that country which offers the widest menu of potential import goods. (Note, however, that the principle of risk diversification works against the pooling of *all* wealth in one currency in the face of uncertainty.) The relevance of this discussion to the vehicle-currency status of the dollar is obvious.

The Choice of a Vehicle Currency

The preceding paragraph suggests that the question to be asked next is, *which* currency is likely to be used as a vehicle currency? The choice depends partly on historical accident, but also on factors about which it is possible to generalize.

In the first place, asset-exchange costs play an important role in this choice. For instance, conducting transactions on income account in dollars will be preferred to conducting these transactions in Dutch guilders if the asset-exchange costs from dollars to domestic currency are lower than those from guilders to domestic currency. It is likely that asset-exchange costs depend inversely on the size of the market for a particular asset: economies of scale in financial intermediation are likely to arise if only because of familiarity and bookkeeping economies. The size of the market for a particular currency depends, in turn, in part on the size of a country's foreign transactions and, therefore, on the volume of its external trade and the structure of its balance of payments.

Second, the currency of a country whose financial market exhibits "depth, breadth, and resiliency" is a good candidate for use in external markets if investors are risk-averters. For, the risk of capital loss on the sale of an asset traded in such a market is smaller than that on an asset traded in a thinner market. There are at least two reasons for this. First, an economic unit acting alone is less likely to have an influence on the market price of securities in a broad than in a thin market. Second, an exogenous disturbance of given magnitude induces greater price variations in a thin than in a deep, broad, and resilient market; therefore, the range of interest-rate fluctuations is likely to be greater in the former market unless the size of disturbances is proportional to the size of markets.

Third, the expected behavior of exchange rates has some relevance to the choice of a vehicle currency; no currency which is expected to fluctuate wildly—or to depreciate continuously over the long run—is likely to be used as a vehicle currency by private wealth owners. Of course, a currency—for instance, sterling—which was initially chosen as a vehicle may subsequently begin to exhibit such characteristics. Such a currency need not lose its vehicle-currency status immediately, though persistent expected or actual instability will erode its usefulness as a vehicle in the long run. Finally, it may be worth noting that the fact that foreign currencies are pegged to the dollar contributes to its worth as a vehicle currency. Foreign central banks peg their currencies in terms of the dollar at approximately ¾ of one per cent on either side of par under the European Monetary Agreement. This means that, whereas the maximum range of exchange-rate fluctuation of any currency covered