

Department of Economics

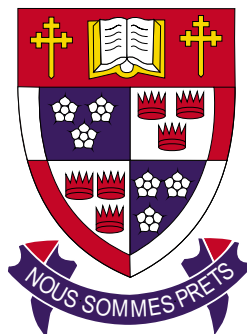
Discussion Papers

02-9

**Dollarization & Euroization in
Transition Countries:
Currency Substitution, Asset
Substitution, Network
Externalities & Irreversibility**

J. Dean

2002



SIMON FRASER UNIVERSITY

Dollarization and Euroization in Transition Countries: Currency Substitution, Asset Substitution, Network Externalities and Irreversibility

Forthcoming in George von Furstenburg, ed., Euroization and Dollarization, Oxford University Press.

James W. Dean
Professor
Simon Fraser University
jdean@sfu.ca

Edgar L. Feige
Professor Emeritus
University Of Wisconsin
elfeige@facstaff.wisc.edu

Abstract:

We examine the extent, causes and consequences of transition countries' use of foreign currency as a co-circulating medium of exchange and store of value. Using new estimates of cash holdings, obtain unique measures of currency substitution, asset substitution, dollarization and bank credibility. We also examine the consequences of network externalities in the use of foreign currency for hysteresis and irreversibility. Finally, we look at the future: factors that will lead some transition countries to euroize officially, in the context of European Monetary Union, and that may lead others to euroize unilaterally, outside EMU.

JEL: E41 E51 F41 H26 K42 P33

To be presented at the Fordham University Conference on "Euro and Dollarization: Forms of Monetary Union in Integrating Regions", April 5th and 6th, 2002.

Dollarization and Euroization in Transition Countries: Currency Substitution, Asset Substitution, Network Externalities and Irreversibility

Edgar L. Feige
Professor Emeritus
University of Wisconsin
elfeige@facstaff.wisc.edu

James W. Dean
Professor
Simon Fraser University
jdean@sfu.ca

Introduction of the euro on January 1, 2002 has implications far beyond the present borders of the European Union. A crucial aspect of Central and Eastern European Countries' (CEECs') transition from planned to market economies is their transition toward new exchange rate regimes. At issue is first, whether and when certain CEECs will officially euroize, that is adopt the euro within the context of European Monetary Union (EMU); and second, whether others might unofficially euroize.¹ By unofficial euroization we mean using the euro without Brussels' or Frankfurt's blessing: that is without meeting conditions for entry to EMU. Unofficial euroization can be either partial or full: that is it could simply entail widespread but not complete substitution of the euro for local currency, or it could (in principle though nowhere yet in practice²) entail complete withdrawal of local currency. This latter possibility is often referred to as "unilateral euroization". Throughout this paper we will use the term "de facto" to denote partial adoption of a foreign for domestic currency. A final distinction, that we will not pursue in this paper, is between complete withdrawal of local currency accompanied by designation of the euro as sole legal tender, and withdrawal of local currency without legally prohibiting other foreign currencies (such as the U.S. dollar³).

Advocates of dollarization or euroization suggest that adopting a strong foreign currency enables countries to eliminate the temptation of inflationary finance and thereby avoid currency and balance of payment crises, reduce the level and volatility of interest rates, and ultimately stimulate growth. Opponents cite loss of seigniorage and loss of an independent monetary policy.

Often overlooked in this normative debate are positive issues surrounding the extent to which these countries are already de facto euroized or dollarized. The major limitation of any analysis of unofficial foreign currency use is that the amount of foreign cash is typically unknown. Hence there is virtually no reliable empirical information concerning the actual extent of dollarization or euroization in transition countries. In their review of the key issues concerning currency substitution, Calvo and Vegh (1992) observed:

“In the final analysis, the relevance of currency substitution is an empirical issue...At the empirical level, the study of currency substitution faces a fundamental problem: there is usually no data available on foreign currency circulating in an economy. Therefore the importance of currency substitution is basically unobservable.”

Asset and currency substitution is induced by past inflations, devaluations, and currency confiscations. When de facto dollarization or euroization is widespread, the effective money supply is much larger than the domestic money supply and is, moreover, less easily controlled by the monetary authority because of the public’s propensity to substitute foreign for domestic currency. For example, de facto use of FCC will thwart government efforts to employ inflationary finance to impose implicit taxes on domestic monetary assets. Extensive currency substitution not only makes domestic monetary policy less effective, it also makes active exchange rate intervention more dangerous.

Currency substitution also has fiscal consequences that are particularly salient for transition countries. Foreign cash transactions reduce the costs of tax evasion and facilitate participation in the unreported or “underground” economy. This weakens the government’s ability to command real resources from the private sector and deepens fiscal deficits. The shifting of economic activity toward the underground economy distorts macroeconomic information systems (Feige, 1990, 1997), thereby adding to the difficulty of formulating macroeconomic policy. By obscuring financial transactions, currency substitution reduces the cost of enterprise theft and facilitates corruption and rent seeking.

There is now a growing body of evidence (Feige 1994, 1996, 1997; Porter and Judson 1996) suggesting that between 40-60% of US cash is held abroad. The “official estimate, now published by the Bureau of Economic Analysis and the Federal Reserve Board (based on Feige, 1994) suggests that in 2000, 52% of US cash was held abroad. Similar studies by Seitz (1995) and Doyle (2000) find that between 35-70% of D-Marks (DM) were held outside of Germany. In this paper we present newly collected data on US dollars as well as certain former European national currencies held in transition countries. These data enable us finally to circumvent the problem of “unobservability” that has plagued the currency substitution literature since its inception, permitting a refinement of definitions and measures of currency substitution, asset substitution and unofficial foreign currency use, as well as a new measure of the credibility of domestic banking institutions.

Once unofficial foreign currency use is measurable, it becomes possible to examine its causes, as well as the circumstances under which it is likely to become persistent, if not irreversible.⁴ Oomes (2001) and Feige et al. (2002a) find that hysteresis and irreversibility are induced by network externalities associated with the use of foreign currency. When network externalities become sufficiently large, countries may decide to dollarize or euroize their economies, forgoing the flexibility of domestic monetary management in exchange for greater financial stability and an enhanced ability to attract foreign investment.

In Section I we briefly review earlier IMF efforts to measure dollarization by employing foreign currency deposits (FCD) as a proxy for the degree of dollarization. We then define several new measures of dollarization, currency substitution and asset substitution that take explicit account of newly available information on holdings of U.S. cash in various transition countries. In principle, currency substitution occurs when a foreign currency substitutes as a medium of exchange for the domestic currency, whereas asset substitution refers to the holding of foreign rather than domestic money as a store of value. In practice, we will define currency substitution in terms of U.S. dollar *cash* holdings, and asset substitution in terms of U.S.-dollar-denominated *bank deposits*.

In Section II we present estimates of per capita dollar holdings in various transition countries, and also review several indirect means of estimating FCC that have been employed in Croatia (Feige et al., 2002b). We also present new survey estimates conducted by the Austrian National Bank (ONB) to determine both the amount and composition of FCC holdings in several CEECs. These estimates of FCC are then employed to obtain new dollarization indices. In Section III we compare these to earlier proxy measures of dollarization employed by the International Monetary Fund (IMF). We find that IMF dollarization measures are highly correlated with our measure of asset substitution but appear to be imprecise measures of currency substitution. We also derive a Bank Credibility index, based on revealed preference for bank deposits vis a vis cash.

The final section presents a framework for estimating the amount of euros circulating in transition countries and reports the survey instrument adopted by some fifteen transition countries in an effort to monitor the historic introduction of the euro. Its introduction offers a unique opportunity to obtain more accurate estimates of FCC in circulation. ED : I CAN'T FIND THIS SECTION OR REFERENCE TO THE SURVEY INSTRUMENT!

I. Definitions⁵

In an economy with unofficial dollarization, the *effective* broad money supply (EBM) consists of local cash in circulation outside the banking system (LCC), foreign cash in circulation outside the banking system (FCC), local checkable deposits (LCD), foreign currency deposits (FCD) held with domestic banks, and local currency time and savings deposits (LTD). Quasi money (QM) consists of FCD and LTD. The typical definition of broad money (BM) falls short of the EBM by the unknown amount of FCC. The narrow money supply (NM) is typically defined to include only LCC and LCD. However in a dollarized economy, the effective narrow money supply (ENM) also includes FCC. ⁶ Thus:

$$(1) \text{ EBM} \equiv \text{LCC} + \text{FCC} + \text{LCD} + \text{QM} \equiv \text{BM} + \text{FCC}, \text{ where:}$$

$$(2) \text{ QM} \equiv \text{FCD} + \text{LTD}$$

$$(3) \text{ BM} \equiv \text{LCC} + \text{LCD} + \text{QM}$$

$$(4) \text{ NM} \equiv \text{LCC} + \text{LCD}$$

$$(5) \text{ ENM} \equiv \text{NM} + \text{FCC}$$

In a regime with de facto dollarization, the recorded money supply falls short of the effective money supply due to the omission FCC, which is typically unknown and not directly controllable by the local central bank.

Due to lack of data on foreign currency in circulation (FCC), research on the currency substitution process has been forced to accept the observable amount of foreign currency deposits (FCD) as a proxy for dollarization. Studies of currency substitution, often associated with the International Monetary Fund (IMF) (Ortiz,1983; Canto,1985; Marquez,1987; Clements and Schwartz 1992; Sahay and Végh, 1995; Ize and Yeyati,1998; Balino, Bennett and Borensztein,1999), employ the ratio of FCD to broad money TO establish the extent to which countries are dollarized.⁷ We denote this common dollarization index:

$$(6) \text{ (DI}_{\text{IMF}}) \equiv \text{FCD/BM.}$$

De facto dollarization is often a response to hyperinflation or a history of bank confiscations. Under such circumstances, a foreign currency may first serve as a unit of account and store of value and only later as a circulating medium of exchange. Currency substitution suggests that the foreign currency largely displaces the domestic currency as the medium of exchange. When a foreign nation's currency has substituted for local currency primarily as the medium of exchange, it is useful to define an explicit currency substitution index (CSI). When dollarization primarily takes the form of asset substitution, it is useful to define an asset substitution index (ASI). Finally, when both asset substitution and currency substitution take place, we define a broader unofficial dollarization index (UDI) that reflects the fraction of the broad effective money supply that is composed of foreign currency and foreign deposits. We use the following definitions throughout the paper.

Currency substitution occurs when foreign currency is partly or entirely used as a unit of account and medium of exchange. Currency substitution can be official or unofficial.⁸ While official cases are still

rare, unofficial dollarization is widespread. The most sensitive transaction measure of de facto dollarization is represented by the *currency substitution index (CSI)*, which shows the fraction of a nation's total currency supply held in the form of foreign currency.⁹ Thus,

$$(7) \text{ CSI} \equiv \text{FCC}/(\text{FCC}+\text{LCC})$$

Since domestic transactions are typically settled by debiting and crediting local checkable deposit (LCD) accounts, it may also be useful to modify the CSI and use instead, (CSI_n) defined as the fraction of the effective narrow money supply made up of foreign currency.

$$(8) \text{ CSI}_n \equiv \text{FCC}/(\text{ENM})$$

Asset substitution involves the use of foreign denominated monetary assets as substitutes for domestic ones, in their capacity as a store of value. It is measured by the *asset substitution index (ASI)*, defined as the ratio of foreign denominated monetary assets to domestic denominated monetary assets excluding cash outside banks.¹⁰:

$$(9) \text{ ASI} \equiv \text{FCD}/(\text{LCD}+\text{QM})$$

Dollarization is a summary measure of the use of foreign currency in its capacity to produce all types of money services in the domestic economy. It is measured by the *unofficial dollarization index (UDI)*, which represents the fraction of a nation's broad effective money supply composed of foreign monetary assets. Thus:

$$(10) \text{ UDI} \equiv (\text{FCC}+\text{FCD})/\text{EBM}.$$

The choices individuals make concerning the disposition of monetary assets reflects their perceptions of the credibility of the domestic banking system. Since this perceived credibility is an important factor affecting the ability of the monetary authority to pursue its macroeconomic objectives, it is useful to define a *bank credibility index (BCI)* reflecting the ratio of monetary assets held in the domestic banking system to assets held in the form of currency outside the banking system. Thus,

$$(11) \text{ BCI} \equiv (\text{LCD}+\text{FCD}+\text{LTD})/(\text{LCC}+\text{FCC}),$$

where LTD represents time and savings deposits in domestic banks. The higher BCI, the higher is the public's confidence in the domestic banking system.

Each of the foregoing indices depends upon a number of incentives to hold the different assets described in the denominator and numerator. These incentives include relative rates of return as reflected in interest rate differentials, inflation differentials, and exchange rate depreciation, as well as the relative benefits and costs associated with network externalities and switching costs. Finally, risky banking institutions act as an incentive to hold cash.

The conventional IMF dollarization index (DI_{IMF}) will be an adequate proxy of de facto dollarization when foreign currency holdings are of marginal importance, or when FCC and FCD are highly complementary. If, however, significant amounts of foreign currency circulate for transaction purposes, or if FCC and FCD are in fact substitutes, the IMF dollarization measure is likely to perform poorly as an indicator of de facto dollarization. Typically, the IMF dollarization index will understate the true extent of dollarization due to its omission of FCC holdings. Moreover, DI_{IMF} does not permit one to distinguish between the dynamic currency substitution and asset substitution processes that our more refined indicators attempt to capture. In order to examine the adequacy of the IMF index, we turn first to a discussion of our efforts to obtain direct estimates of US currency holdings in transition countries.

II. Measurement

A: Direct measurement of FCC

Empirical studies suggest that US currency is widely used outside of the US. While the exact percentage of US currency held abroad is difficult to determine and still subject to considerable debate, Feige's estimates (1996, 1997) suggest that between 35-45 percent of US currency is held abroad whereas Porter and Judson's (1996) estimates suggest that 60-70 percent of all US currency in circulation is held overseas. The "official" estimate of the fraction of US currency held abroad, now published by the Bureau of Economic Analysis and the Federal Reserve Board, is based on an

adjusted version of the proxy measure proposed by Feige (1994). The official estimate suggests that of the \$520 billion dollars of US currency in circulation during the year 2000, 52 percent was held overseas.

US currency, particularly in the form of cash, has many desirable properties. It has a reputation as a stable currency, and is therefore a reliable store of value. It is available in many countries, is widely accepted as a medium of exchange, and protects foreign users against the threat of bank failures, devaluation and inflation. Cash usage preserves anonymity because it leaves no paper trail of the transaction for which it serves as the means of payment. Indeed the very characteristics that make the US dollar a popular medium of exchange also makes it difficult to determine the exact amount and location of US notes circulating abroad. Nevertheless, there is a direct source of information that can be used to determine the approximate amounts of US cash in circulation in different countries.

Over the past two decades, the United States Customs Service has been mandated to collect systematic information on cross border flows of US currency. The Currency and Foreign Transactions Reporting Act (also known as the "Bank Secrecy Act") requires persons or institutions importing or exporting currency or other monetary instruments in amounts exceeding \$10,000 to file a Report of International Transportation of Currency or Monetary Instruments. The U.S. Customs Service has collected these reports, commonly known as Currency and Monetary Instrument Reports (CMIR), since 1977. Although the CMIR data system was established with the aim of recording individual instances of cross border inflows and outflows of currency and monetary instruments, its micro records can be usefully aggregated to study the size, origin and destination of cross border currency flows. The CMIR data system consists of more than 2.5 million inbound filings and more than 300,000 outbound filings. With the cooperation of the U.S. Customs Service and the U.S. Treasury Department's Financial Crimes Enforcement Network, the information contained in the millions of accumulated confidential individual CMIR forms have been aggregated in order fully to preserve the confidentiality of individual filers' information. The aggregated data yield time series observations on the gross inflows and outflows of US currency to different destinations. By cumulating the CMIR

recorded net outflows of US dollars to all destinations, we are able to obtain estimates of the amount of US currency held abroad as well as the location of US currency in various transition countries. The CMIR estimates of per capita FCC holdings in US dollars in various transition countries are presented in Column (1) of Table 1.

A second source of data on per capita holdings of US currency are obtained from informal interviews and surveys [US Treasury Department (2000)] conducted by Federal Reserve and Treasury officials who conducted interviews with central bankers, finance ministry officials and other sources with knowledge of FCC holdings in various countries. The results of these informal surveys are presented in Column 2 of Table 1. Although the CMIR estimates and survey estimates for some countries are quite different, both confirm the belief that Russia is the most dollarized among the transition countries, followed by Latvia, Turkey and Bulgaria.

There is considerable anecdotal evidence that many of the CEECs employed national currencies of European nations, in addition to dollars, as co-circulating currencies. Unfortunately CMIR type data are not available for European currencies. Residents of several transition countries are however known to hold various amounts of DM and other European currencies such as the Austrian schilling (AST) and the Swiss Franc (SF). In anticipation of the euro conversion, the Austrian National Bank (ONB) commissioned Gallup to conduct a series of surveys in five CEECs in order to determine the extent of FCC holdings of various non-local currencies. Each of the ten surveys conducted between June 1997 and November 2001 involved approximately 1000 persons above the age of 14.¹¹ Column (3) of Table (1) presents the average estimate of total per capita FCC holdings expressed in terms of US dollars over the period 1997-2001.

Survey results concerning self-admitted currency holdings are best considered as lower bound estimates of actual currency holdings since such surveys are known to suffer from underreporting bias. For example, Federal Reserve Survey of Currency Usage reveals that US households admit to holding less than 10% of the nation's total currency supply in circulation outside of banks. Official

estimates of US dollar holdings abroad suggest that roughly 50% of US currency is presently held overseas. Since firms hold a negligible amount of cash, it appears that the Federal Reserve currency survey results require a blow-up factor of five in order to obtain a true estimate of actual domestic currency holdings. Assuming that the ONB survey estimates are subject to the same types of underreporting bias observed in similar Federal Reserve studies, we present in Column (4) of Table (1), upper-bound ONB estimates employing the same blow up factor required for the Federal Reserve survey estimates.

One important contribution of the ONB surveys is that they provide insight not only into the total amount of FCC held in the five survey countries, but also into the currency composition of these FCC holdings. Table 2 reveals that in each of the five countries, the DM is the largest component of FCC holdings followed by the US dollar.

Seitz (1995) and Doyle (2000) suggest that between 35 and 70 percent of DM were held abroad. The consensus estimate of DM held outside of Germany is roughly the equivalent of \$50 billion. Using the ONB survey blowup estimates of total DM held in the five countries implies that these countries collectively account for roughly 23 percent of the DM believed held outside of Germany. The Czech Republic appears to hold almost 10% of estimated DM abroad, followed by Croatia with 6%.

B: Indirect Measures of FCC

Denomination Displacement Method

Feige et al. (2002a) developed indirect methods for estimating the amount of unobservable FCC in circulation in Croatia. The first of these, known as the denomination displacement method, derives from the observation that in dollarized countries using US currency as a means of exchange, most transactions are effected with the largest denomination bills available: that is, with \$100 U.S. bills. Similarly, it is suspected that in Croatia, the bulk of transactions involving co-circulating currency are carried out with the larger denomination DM notes (500 and 1000 DM bills). The denomination displacement method is based on the hypothesis that countries that are heavily dollarized, with large

denomination foreign bills, will have domestic currency (LCC) denomination structures that are unusually skewed away from the higher denomination domestic bills. Denomination displacement occurs as higher denomination FCC bills substitute for high denomination LCC bills. It is however recognized that as network externalities lead to the more pervasive use of foreign currency, lower denominations may also be employed for various transactions. It is therefore appropriate to view the DM as yielding a lower bound estimate of FCC.

In order to employ the denomination displacement method to estimate FCC holdings in Croatia, Feige et al. (2002a) employed Currency and Monetary Instrument Reports to first obtain estimates of FCC in both highly and only partially dollarized countries. For those countries for which actual estimates of FCC could be derived from CMIR data, the denomination structure of local currency was examined in order to determine the extent to which the denomination displacement took place. The denomination structure of the Croatian kuna was then compared to the denomination structures of currencies from other transition countries. By examining the denomination structures for currencies in both dollarized and non-dollarized countries, Feige et al. (2002a) were able to estimate the extent of denomination displacement in dollarized regimes. The dollarization displacement was estimated by regression analysis and the displacement parameters were then applied to Croatia in order to obtain and estimate of the amount of FCC in circulation. The resulting estimates are presented in column (5) of Table 1.

Money Demand Method

The second indirect approach to estimating the unknown amount of FCC in circulation in Croatia was to investigate the demand for money in a highly dollarized country for which data were available on the actual amount of currency substitution that had taken place. Argentina was chosen as the country whose dollarization process could be directly modelled. Since the Argentina hyperinflation experience and subsequent stabilization program was similar in many respects to that of Croatia, Feige et al. (2002a; 2002b) estimated an empirical demand function for FCC in Argentina that depended upon independent variables that are readily measured in Croatia. The parameters derived

from the estimated FCC demand function for Argentina were then used to simulate the unobserved demand for FCC in Croatia. The resulting estimates of FCC holdings in Croatia are reported in column (6) of Table 1. The table reveals that the blown up ONB survey estimate of FCC holdings in Croatia falls within the range bounded by the two indirect methods of estimation.

III Comparison of Alternative Dollarization Indices.

A: Overall Dollarization Indices

Given the estimates of FCC holdings displayed in Table 1 it is now possible to examine the consequences of employing the new unofficial dollarization index UDI as compared to the conventional IMF dollarization index (DI_{IMF}). Feige, et al. (2001a) examined these ratios for a sample of 24 countries for which data were available and found that the widely used IMF dollarization index is highly correlated with the asset substitution index but appears to be an imprecise measure of currency substitution.

Figure 1 displays a country-by-country comparison of the conventional IMF dollarization proxy (DI_{IMF}) as well as our broader unofficial dollarization index (UDI) that takes explicit account of the estimated amount of FCC in circulation in each nation.¹² For all countries in our sample, the IMF dollarization index understates the true extent of unofficial dollarization due to its omission of FCC. The corrected UDI index reveals that of the transition countries in our sample, Croatia and Russia exhibit the highest degree of de facto dollarization, that is, the highest fraction of the effective broad money supply in the form of foreign- denominated assets. Belarus, Bulgaria, Latvia, Turkey and the Ukraine also rank high in the de facto dollarization ranking. Balino et. al. (2000) classify nations as being heavily dollarized if their de facto dollarization indices are greater than 30 percent. According to this definition, all of the transition countries in our sample with the exception of Estonia, Hungary, Poland and the Czech Republic would be classified as heavily dollarized.

B. Currency Substitution and Asset Substitution Indices

Feige et al. (2001b) examined the relationship between the (DI_{IMF}) index of unofficial dollarization and found that the widely used IMF dollarization index is highly correlated with the asset substitution index but appears to be an imprecise measure of currency substitution. Figure 2 therefore presents the more refined CSI and ASI indices that respectively measure the degrees of currency and asset substitution for each of the transition countries. The figure reveals that the fraction of the total currency supply made up of foreign currency (CSI) exceeds 75 percent for Russia, Kazakhstan, Croatia and Belarus. These are countries in which the extensive use of foreign currency has likely surpassed the threshold level of network externalities, making it highly unlikely that the use of foreign currencies can be reversed. These are also countries that earn relatively little seigniorage from their own currencies since FCC has largely displaced them. Conversely, Poland, Estonia and Hungary are nations whose total currency supply consists of more than 80 percent local currency. These countries would bear highest seigniorage costs by unilaterally euroizing; however, *official* adoption of the euro, by contrast, would be compensated by seigniorage-sharing with the rest of the EMU.

Figure 2 also reveals that patterns of currency substitution and asset substitution are in fact quite different among the countries observed. Armenia, Kyrgyzstan, and the Ukraine exhibit a pattern in which asset substitution dominates currency substitution by a wide margin. The converse is true for Belarus, Russia, Turkey, Latvia, Croatia and Turkey. The reasons for these differences may be quite complex, but the data indicate that asset substitution and currency substitution need not go hand in hand.

The final index of interest that can be derived from the transition country data is a Bank Credibility Index (BCI). It represents the revealed preferences of agents for holding their assets inside the banking system as against the more liquid form of local or foreign currency. The higher the ratio of bank assets to currency assets, the higher the BCI and therefore, we suggest, the greater the confidence in the banking system. Figure 3 displays the BCI for those countries for which it can be

measured. The highest BCIs are found for Turkey, Poland, Hungary, Romania, Czech Republic and Estonia. The lowest BCIs are in Russia, Ukraine and Kyrgyzstan.

IV. The Future

What can we infer from our data and indicators on 19 transition economies about the direction of dollarization and euroization in CEECs in future: say over the next five to ten years? Of course the data themselves carry limited information, but in the context of probable accession to the European Union, and accounting for so-called “network externalities”, they are certainly suggestive.

Politically, it is likely that five of the countries on our list – a group that was “first tier” until this ranking system was replaced by an informal queue after the November 1999 Helsinki summit -- will join the EU on or about January 2005. At least another five – the original “second tier” group -- is likely to join before, say, 2010. Once these countries join the EU, they will be expected – indeed, required – to adopt the euro officially as soon as they meet the five “Maastricht” criteria for accession to European Monetary Union (EMU). Of the remaining nine countries on our list, two or three may also join the EU within the next decade, and will also be expected to euroize officially. Finally, the remaining seven or eight countries are likely to become increasingly dollarized or euroized informally, and some may be tempted to withdraw their domestic currencies from circulation altogether and adopt foreign currency exclusively.

Now consider network externalities. Feige et al (2002a), building on a well known model by Dowd and Greenaway (1993), derive plausible conditions under which dollarization becomes “irreversible”, essentially because the benefit/cost ratio attached to the external currency rises rapidly with the number of users relative to users of the domestic currency. The same logic would suggest that euroization might become irreversible as an increasing number of contiguous and nearby countries euroize. In other words, the network externality logic suggests that even in those CEECs not presently in the queue for accession to the EU – countries like Croatia and even Ukraine – the potential benefits from unilateral euroization are likely to rise rapidly in the near future.

Of course our data is on dollar holdings, not DMs or euros. It is misleading to extrapolate the latter from the former, as is evident from Table 2, which shows that ratios of dollar to non-dollar foreign currency holdings vary widely from country to country. What we can nevertheless infer is that the marginal costs of shifting from one foreign currency into another (i.e. from dollars into euros) are substantially lower than the marginal costs of shifting from foreign to domestic currencies. Hence countries that have partially dollarized are more likely to move toward euros than back to local currencies. In addition, we can infer that the relative benefits attached to euros as opposed to dollars – at least for transactions purposes – will rise as contiguous and nearby countries euroize. These two inferences together – both of them consistent with network externality models --suggest that as official euroization spreads eastward (Greece being but the first of many to come), the incentive will rise for CEECs to move from partial dollarization or euroization to exclusive euroization.

The network externality logic can be elaborated by considering certain conventional measures of criteria for optimal currency areas (OCAs). Most of these criteria are not strictly separable from network effects: for example, the extent to which a country trades with so-called “Euroland” interacts with and enhances network benefits from using the euro domestically, as does the extent to which labor and capital are mobile to and from Euroland.

A final factor that is likely to influence a CEEC’s decision to euroize unilaterally is the looming straight-jacket of Maastricht criteria. Two of these criteria in particular are likely to prove problematic for countries in early stages of transition: the inflation criterion, and the exchange rate criterion. The former requires a country aspiring to adopt the euro officially to run an average inflation rate of no more than 1.5 percentage points above the best three “member states”: i.e., countries already in EMU. The latter requires that its nominal exchange rate remain within “normal fluctuation margins” (plus or minus 15 percent) for at least two years prior to adoption of the euro.

The potential problem with meeting these criteria results from the likelihood that productivity growth in the tradeables sectors of CEECs will increase faster than in the EU. It then follows from the Balassa-Samuelson condition that the real exchange rate (in terms of euros per unit of CEEC currency) will rise.¹³ Now of course the real exchange rate can rise in one or a combination of two ways: the domestic price level can rise relative to EU levels, or the nominal exchange rate can rise. The upshot is that the first is likely to violate the EMU's inflation criterion, and the second is likely to violate its exchange rate stability criterion.

Countries aspiring to join the EMU are likely to be put through a wringer of sorts in order to meet the inflation criterion. With prices of non-tradeables rising faster than in the EU, they may be forced to impose a recession, and/or limit wage increases in controllable sectors like government, education and health. This in turn would increase incentives for labor to emigrate to Western Europe, and exacerbate tensions between CEECs and the EU. An easier out would be to allow nominal exchange rate appreciation (which would lower inflation in tradeables), but large short term exchange rate changes are similarly proscribed by the Maastricht conditions.

However, countries *not* aspiring to EMU in the near future – in practice, countries currently ineligible to join the EU -- might well be tempted to euroize unilaterally, so as to avoid the grief described in our previous paragraph. This temptation applies to our Group C countries, and increases their incentive to euroize early. More precisely, in the post-euro era, the likelihood that non-accession CEEC countries will unilateral euroize depends on three factors: the extent to which they are already euroized *or* dollarized; the extent to which they meet OCA criteria, particularly those that involve trade, capital and labor flows with the EMU countries; and finally the length of time they are likely to wait before they become eligible for accession to the EU. In the next section we ask what light our new dollarization data can cast on the first of these three factors.

Partial dollarization as an incentive for full euroization

Consider first what we will call Group A: the five countries likely to enter the EU by 2005: Czech Republic, Estonia, Hungary, Poland and Slovenia. From Figure 2, three of the five have CSIs of 60 or more: that is, at least 60 percent of their total currency supply is in U.S. dollars. Poland is also high, at 30 percent, with Hungary an outlier at only 10 percent. However, Hungary has long been a heavy user of DM currency (Table 2). What we will call Group B consists of Bulgaria, Latvia, Lithuania, Romania and the Slovak Republic. Three of the five have CSIs of 55 or more; Latvia is also high, at 30, whereas Romania is an exception at only 19. Now consider Group C, the remaining countries on our list: Belarus, Croatia, Kazakhstan, Russia, Turkey, Armenia, Azerbaijan, Kyrgyzstan and Ukraine. The first five of these nine countries have CSIs ranging from 62 to 87, with the other four between 28 and 39. Moreover in all cases the ASI is 32 or above.

What this admittedly casual comparison suggests is that the degree of currency substitution *as measured by holdings of U.S. cash* increases somewhat as the country's remoteness from EU membership increases. While it may be that some Group A and B countries' CSI indices would exceed Group C's if we included DM holdings, these figures nevertheless suggest that at least five Group C countries may already be irreversibly addicted to foreign currency. Indeed, a network externality analysis of Argentina (Feige et al., 2002) suggests that countries with more than 60 percent of their currency in the form of external currency are likely to be irreversibly dollarized.

Moreover the high ASI scores of Group C countries reinforce their incentives to lock into external currency, since the costs of continuing with local currency rise with asset substitution. Dean (2001) discusses three phenomena, all related to asset and liability substitution, that add to a country's incentives to exclusively adopt foreign currency. The three phenomena are liability dollarization, risk premia on interest rates, and exchange rate impotence. They are related to asset substitution in the sense that lenders, including domestic lenders, would much rather hold dollar claims than local

currency claims; hence developing and transition country borrowers must either issue dollar-denominated liabilities (in fact that is in practice their only option for external borrowing), or pay currency risk premia on local-currency liabilities. Moreover, even dollar liabilities carry a *default* risk premium that derives from the risk of currency depreciation and consequent increase in the local-currency debt burden. The upshot is that countries are afraid to permit exchange rate depreciation: hence the exchange rate's "impotence" as a policy tool.

In short, most of the non-EU-accession CEECs (Group C) on our list are a) more highly currency- (i.e. cash-) dollarized than most EU-accession countries, and b) more highly bank-deposit-dollarized as well. We infer from this that *a) for network externality reasons the use of foreign currency (be it in dollars or euros) for transactions purpose is unlikely to be reversible in these countries, even if they pursue moderate macroeconomic policies and hence reduce inflation risk and b) for currency and default risk reasons the net benefits from full dollarization or euroization are likely to be high. Such benefits rise in proportion to their foreign-currency-denominated asset holdings and debt liabilities.*

According to CSI criteria, the Group C countries where foreign currency use is least likely to be reversible (with CSIs above 60 percent) are Belarus, Croatia, Kazakhstan, Russia and Turkey.

According to ASI criteria, those that would benefit most from full dollarization or euroization (with ASIs above 50 percent) are Armenia, Croatia, Kyrgyzstan and Ukraine. Moreover, Kazakhstan probably has an ASI over 50, but data are unavailable. This leaves, on our list, only Azerbaijan, for which we do not have ASI data either.

If some of these countries do withdraw their domestic currencies, are they likely to dollarize, or will they euroize? Here once again we distinguish between the network benefits that are related to currency substitution, and the liability dangers that are related to asset substitution. The latter, we would argue, are likely to be decisive. Belarus and Russia, each with manageable foreign currency debt, are likely to choose to live without the additional transactions benefits that could come from full dollarization. In addition, much of their extraordinarily high cash relative to bank deposit holding

derives from asset rather than transactions motives; relative reluctance to hold dollars as bank deposits reflects both distrust of banks (note their low BCI indices in Table 3), and a desire to avoid taxes. In any case, nationalism and hubris will prevail against full dollarization in Russia for the foreseeable future.

Croatia, Kazakhstan and Turkey are different: there, network externality motives are much more likely to prevail. In Croatia and Turkey this will be reinforced by their strong trade (and tourism) links to Western Europe; the euro, not the dollar, is likely to be the foreign currency of choice. Kazakhstan may be different because of its oil industry, which dominates both external trade and much internal commerce.

Ukraine is a case in point. The dollar is not commonly used (in fact is technically illegal) for transactions purposes; although most foreign firms, aid agencies and non-government organizations pay their employees in dollars, they are then converted into domestic currency for transactions.¹⁴ Moreover Ukraine's dollarized debt is relatively small and it runs a fiscal surplus; therefore and putative currency depreciation does not jeopardize either the private or public sectors. (In fact, the Ukrainian Hryvnia has recently begun to appreciate, a la Balassa-Samuelson.) Moreover inflation has been well under control for the past six years. In fact introduction of the Hryvnia in 1995 coincided with the end of hyperinflation, which has helped to establish the currency as an important icon of Ukraine's independence. In short, Ukrainians do not hold dollars primarily for either transactions purposes or as a hedge against inflation or devaluation. And finally, since they still receive considerable FDI from, and trade substantially with, Russia (though their investment and trade with Euroland is growing)¹⁵, they have less immediate reason on OCA grounds than CEECs to adopt the euro.

V. Summary and Conclusions

In an effort to overcome the 'unobservability' problem that has plagued the currency substitution literature, we present direct estimates of the amounts of US dollar foreign currency in circulation in

various transition countries. We also review other evidence on the use of European national moneys, particularly the DM, as co-circulating currencies. Finally, we present estimates of FCC based on two indirect methods.

Traditional measures of dollarization largely relied on foreign currency deposits as an indicator of currency substitution because actual measures of foreign currency in circulation were unavailable. Employing aggregated data derived from Currency and Monetary Instrument Reports on dollars inflows and outflows to and from the US, as well as estimates of other European currencies that co-circulate with local currencies, we estimate the total amounts of FCC in various transition countries. These new estimates permit a refinement of definitions and indicators of currency and asset substitution, as well as broader indices of the extent of de facto dollarization. Traditional measures of dollarization tend to be indicative of asset substitution but perform poorly as measures of currency substitution.

Our measures of currency and asset substitution help us to infer how likely are countries that will not qualify for EU or EMU membership in the near future to nevertheless abandon their domestic currencies and adopt the euro unilaterally. Although our CSI, ASI and BCI indices suggest that the incentives to do so are particularly high in Armenia, Belarus, Croatia, Kazakhstan, Kyrgyzstan, Russia, Turkey and Ukraine – that is, all have strong transactions, asset or bank-credibility motives for euroization -- other considerations make it unlikely that Belarus, Russia or Ukraine will do so for the foreseeable future.

References

- Baliño, T.J.T.; A. Bennett; E. Borensztein et al (1999) *Monetary Policy in Dollarized Economies*, Occasional Paper 171 , International Monetary Fund, Washington DC
- Berg, A and Borensztein, E. (2000) “The Pro’s and Cons of Full Dollarization” *IMF Working Paper*, International Monetary Fund, Washington DC
- Begg, D. (1997) “ The Design of the EMU” *International Monetary Fund Working Paper WP 97/99*, International Monetary Fund, Washington DC
- Brock, W.A. and S.N. Durlauf (2001) “Discrete Choice with Social Interactions“ *Review of Economic Studies*, 68, (2), 235-260
- Buiter, Willem H. and Clemens Grafe (2001) “Central Banking and the Choice of Currency Regime in Accession Countries” European Bank for Reconstruction and Development Working Paper 17-01-2001.
- Calvo, G.A. and C.A. Végh (1992) “Currency Substitution in Developing Countries - An Introduction” , *IMF Working Paper WP/92/40*, International Monetary Fund, Washington DC
- Calvo, G. (1999) “Fixed vs. Flexible Exchange rates: Preliminary of a Turn-of-Millennium Rematch” <http://www.bos.umd.edu/econ/ciecalvo.htm>
- Canto, V. (1985) “Moneary Policy, Dollarization and Parallel Market Exchange rates:The Case of the Dominican Republic” , *Journal of International Money and Finance*, 4(4) 507-21
- Clements, B. and G. Schwartz (1992) “Currency Substitution: The Recent Experience of Bolivia” *IMF Working Paper 92/65* International Monetary Fund
- Dean, J. W. (1977) “Is the European Common Currency Worth It?” *Challenge*, Vol. 40 (3)
- Dean, J. W. (2001) “Should Latin America’s Common Law Marriages to the US Dollar Be Legalized? Should Canada’s?” *Journal of Policy Modeling* 23 (2001) 291 – 300.
- Dean, James W. and Nadia Mankovska (2002) “Foreign Direct Investment and Trade Flows in a Transition Economy: The Case of Ukraine” In *Fostering Sustainable Growth in Ukraine* Heidelberg and New York: Physica-Verlag.

- Dowd, K. and D. Greenaway (1993) “Currency Competition, Network Externalities and Switching Costs: Towards an Alternative View of Optimum Currency Areas”, *The Economic Journal*, Vol. 103
- Doyle, B. M. (2000) “‘Here, Dollars, Dollars ...’ Estimating Currency Demand and Worldwide Currency Substitution”, *International Finance Discussion Paper No. 657*, Board of Governors of the Federal Reserve System, Washington, DC
- Eichengreen, B. and R. Hausmann (1999) “Exchange Rates and Financial Fragility” *NBER Working Paper 7418*
- Feige, E. L. (1990) “Defining and Estimating Underground and Informal Economies: The New Institutional Economics Approach” *World Development* 18(7)
- Feige, E. L. (1994) **The Underground Economy and the Currency Enigma**, Public Finance, 49 , 119-39 reprinted in Fiorentini, G. and S. Zamagni (ed) **The Economics of Corruption and Illegal Markets, International Library of Critical Writings in Economics**, Edward Elgar, (1999)
- Feige, E. L. (1996) **Overseas Holdings of U.S. Currency and the underground Economy** in S. Pozo (ed) *Exploring the Underground Economy*, W.E Upjohn Institute for Employment Research
- Feige, E. L. (1997) **Revised Estimates of the Size of the U.S. Underground Economy: The Implications of US Currency Held Abroad** in Owen Lippert and Michael Walker (ed) *The Underground Economy: Global Evidence of its Size and Impact*, Fraser Institute
- Guidotti, P. E. and C. A. Rodriguez (1992) **Dollarization in Latin America: Gresham's Law in Reverse?**, International Monetary Fund Staff Papers 39(3),
- Hausmann, R.; M. Gavin; C. Pages-Serra and E. Stein (1999) **Financial Turmoil and the Choice of the Exchange Rate Regime**, Interamerican Development Bank Working Paper
- Ize, A. and E.L. Yeyati (1998) **Dollarization of Financial Intermediation: Causes and Policy Implications**, IMF Working Paper WP/98/28, International Monetary Fund, Washington DC
- Kamin, S.B. and N.R. Ericsson (1993) **Dollarization in Argentina**, International Finance Discussion Paper, No. 460, Board of Governors of the Federal Reserve System, Washington

- Marquez, J. (1987) **Money Demand in Open Economies: A Currency Substitution Model for Venezuela**, *Journal of International Money and Finance* 6(2)
- Mongardini, J. and J Mueller (1999) **Ratchet Effects in Currency Substitution: An Application to the Kyrgyz Republic**, IMF Working Paper WP/99/102, International Monetary Fund, Washington DC
- Oomes, N. (2001) **Essays on Network Externalities and Aggregate Persistence** University of Wisconsin Ph.D Dissertation
- Oomes, N. and A. Shinkevich (2001) **Network Externalities and Dollarization Hysteresis: The Case of Russia**, International Monetary Fund, mimeo
- Ortiz, G. (1983) **Currency Substitution in Mexico: The Dollarization Problem**, *Journal of Money Credit and Banking*, 15 (2)
- Porter R. and R. Judson (1996) **The Location of US Currency: How Much is Abroad?**, Federal Reserve Bulletin,
- Sahay, R. and C.A. Végh (1995) **Dollarization in Transition Economies: Evidence and Policy Implications**, IMF Working Paper WP/95/96, International Monetary Fund, Washington DC
- Seitz, F. (1995) **The Circulation of Deutsche Mark Abroad**, Discussion Paper 1/95, Economic Research Group of the Deutsche Bundesbank, Frankfurt am Main, Federal Republic of Germany

¹ A similar discussion is underway in Latin America concerning the possible adoption of the U.S. dollar as official currency.

² Even Kosovo and Montenegro, both of which almost exclusively adopted the DM (and now the euro) after their respective estrangements from Yugoslavia, still use the Yugoslavian dinar for certain government transactions.

³ In practice, prohibition of co-circulating currencies is almost impossible to enforce. Even Cuba has legalized U. S. cash. What can be enforced, is prohibition of foreign-currency denominated bank deposits, or, as is common, prohibition of checkable foreign-currency-denominated bank deposits.

⁴ For an elaboration of the irreversibility problem see Guidotti and Rodriguez (1992) and Balino, Benett and Borensztein (1999).

⁵ This conceptual framework is adopted from Feige, et.al 2002a.

⁶ We ignore those rare institutional circumstances in which transfers between foreign currency deposits are employed for transaction purposes.

⁷ Balino, et. al. (1999) choose to define highly dollarized countries as those whose ratio of FCD/broad money exceeds 30%. The major shortcoming of this definition is that it takes no account of foreign cash in circulation. Further study is required to determine whether there exists a unique value of the dollarization index that represents a threshold effect at which point dollarization is likely to become irreversible because of network externalities. Mongardini and Mueller (1999) define the degree of currency substitution as measured by the ratio of FCD to total deposits.

⁸ Officially dollarized independent countries include the Marshall Islands, Micronesia, Palau and Panama, Ecuador and El Salvador.

⁹ In some countries foreign banknotes may simply be hoarded and treated purely as a store of value. When this part of FCC can be estimated, it should be treated in the capacity of money as the store of value and included in the asset substitution index.

¹⁰ The definition of ASI also depends upon the particular institutions of a nation. Its quality is high when the amount of FCD and LTD used for transactions purposes is low in comparison to the amount of those deposits used as income earning assets.

¹¹ We are indebted to the Austrian Central Bank for providing us with the underlying survey data that permitted computation of the estimates presented in the accompanying tables and figures.

¹² The calculations for both indices employ the average value of the estimates of FCC obtained by the various methods in each of the transition countries.

¹³ More precisely, this result follows from a higher excess productivity growth differential between traded and non-traded goods sectors in CEECs than in the EU. In recent years a lively literature has debated the relevance of Balassa-Samuelson for CEECs. See, for example, Buiter and Grafe (2001).

¹⁴ For the reasons that Ukrainians do nevertheless hold dollars, see Curtis, Gardner and Waller (2002).

¹⁵ For a recent study of Ukraine's evolving trade and investment patterns with Western Europe vis a vis the former Soviet Union see Mankovska and Dean (2002).