Chapter 16
Dollarization and Euroization in Transition Countries: Currency Substitution, Asset Substitution, Network Externalities and Irreversibility

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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 foreign cash in circulation, we obtain unique measures of currency substitution, asset substitution, and dollarization, and examine the consequences of network externalities for hysteresis and irreversibility. Finally, we examine factors leading some transition countries to euroize officially and bilaterally, and others to euroize unilaterally - that is, without prior sanction by the EMU.

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

Edgar L. Feige and James W. Dean*

16.1 Introduction

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 de jure as their sole legal tender. Official euroization could be bilateral, by joining the European Monetary Union (EMU). Alternatively it could be unilateral, without joining EMU and without explicit prior sanction by the authorities in Brussels and Frankfurt who control EMU membership.[1] An important element in determining this choice is the extent to which these countries are already unofficially euroized or dollarized. Unofficial (de facto) euroization or dollarization results from individuals and firms voluntarily choosing to use foreign currency as either a transaction substitute (currency substitution) or a store of value substitute (asset substitution) for the monetary services of domestic currency.

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 in circulation (FCC) is typically unknown. There is virtually no reliable empirical information concerning the actual extent of dollarization or euroization in transition countries.

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 "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 unreported 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, 1997; Porter and Judson 1996) suggesting that 40-60 percent of US cash is held abroad. The "official" estimate now

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[1] A similar discussion is underway in several Latin American countries about possible adoption of the U.S. dollar as official currency: indeed, Ecuador, El Salvador and Guatemala have all recently done so.

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 in 2001, 50 percent of the $580 billion of US currency in circulation was held abroad. Studies by Seitz (1995) and Doyle (2000) find that 35-70 percent of D-Marks (DM) was held outside of Germany. In this paper we present newly collected data on the location of US dollars abroad as well as the location of 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.

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.[2] Oomes (2001) and Feige et al. (2002a, 2000b) 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 16.2 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

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

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 16.3 we present estimates of per capita holdings of U.S. dollars in various transition countries, and also review several indirect means of estimating FCC that have been employed in Croatia (Feige et al., 2002a). We also present new survey estimates by the Austrian National Bank (ONB) of both the amount and composition of FCC holdings in several CEECs. FCC estimates are then employed to obtain new dollarization indices. In Section 16.4 we compare these new indices 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. Section 16.5 employs, inter alia, our estimates of unofficial foreign currency holdings to analyze the likelihood that various CEECs will choose to euroize officially, and if so whether they are likely to do so bilaterally or unilaterally.

16.2 Definitions[3]

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

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[3] This conceptual framework is adopted from Feige et al. (2002a).

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. [4] Thus:

(1) $EBM \equiv LCC + FCC + LCD + QM \equiv BM + FCC$, where:
(2) $QM \equiv FCD + LTD$
(3) $BM \equiv LCC + LCD + QM$
(4) $NM \equiv LCC + LCD$
(5) $ENM \equiv NM + FCC$

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), employ the ratio of FCD to broad money to establish the extent to which countries are dollarized.[5] We denote this common dollarization index:

(6) $(DI_{IMF}) \equiv FCD/BM$.

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*

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

[5] Balino et al. (1999) choose to define highly dollarized countries as those whose ratio of FCD/broad money exceeds 30 percent. 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 threshold value of the dollarization index at which dollarization is likely to become irreversible because of network externalities.

index (CSI), which shows the fraction of a nation's total currency supply held in the form of foreign currency.[6] Thus,

(7) $CSI \equiv FCC/(FCC+LCC)$

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) $CSI_n \equiv FCC/(ENM)$.

When dollarization primarily involves the use of foreign denominated monetary assets as substitutes for domestic ones in their capacity as stores of value, it is useful to define an *asset substitution index* (ASI) as the ratio of foreign denominated monetary assets to domestic denominated monetary assets excluding cash outside banks[7]:

(9) $ASI \equiv FCD/(LCD+QM)$.

When both asset substitution and currency substitution take place, or when FCD's are used by firms to make transactions with international partners, we define a broader *unofficial dollarization index* (UDI) that represents the fraction of a nation's broad effective money supply composed of foreign monetary assets. Thus:

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

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

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[6] 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 as a store of value and included in the asset substitution index.

[7] The quality of ASI as a definition of asset substitution 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.

depreciation, as well as the relative benefits and costs associated with network externalities and switching costs.

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.

16.3 Measurement

16.3.1 Direct measurement of FCC

Empirical studies suggest that roughly 50 percent of US currency circulates abroad. US currency (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 (CMIR).[8] The information contained in the millions of confidential individual CMIR forms has 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 each destination, 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 1999 CMIR estimates of per capita FCC holdings in US dollars in various transition countries are presented in Column (1) of Table 16.1.

A second source of data on per capita holdings of US currency is obtained from informal interviews and surveys [US Treasury Department (2000)] conducted by Federal Reserve and Treasury officials. These estimates are presented in Column 2 of Table 16.1. Although the CMIR estimates and informal interview estimates for some countries are quite different, both sources confirm the belief that per capita holdings of US currency are highest in Russia, Latvia, Turkey and Bulgaria.

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[8] See Feige (1996; 1997) for greater detail concerning CMIR data.

TABLE 16.1

ALTERNATIVE ESTIMATES OF PER CAPITA FCC HOLDINGS IN VARIOUS TRANSITION COUNTRIES. 1997-2001.

Country	(1)* Per Capita $FCC CMIR Estimates (1999) Dollars Only	(2)** Per Capita $FCC Treasury Informal Survey Dollars Only	(3) Per Capita $FCC ONB Survey All Currencies	(4) Per Capita $FCC ONB Survey Blowup All Currencies	(5)*** Per Capita $FCC Denomination Displacement All Currencies	(6)*** Per Capita $FCC Money Demand All Currencies
Armenia	10.6	NA				
Azerbaijan	21.1	NA				
Belarus	0.8	288				
Bulgaria	63.1	120				
Croatia	NA	NA	166	831	273	1386
Czech Republic	NA	NA	220	1098		
Estonia	34.7	NA				
Hungary	2.2	NA	29	145		
Kazakhstan	288	NA				
Kyrgyzstan	7.1	NA				
Latvia	432	208				
Lithuania	24	139				
Poland	90	26				
Romania	10.3	52				
Russia	448	407				
Slovak Republic	NA	NA	148	742		
Slovenia	NA	NA	246	1231		
Turkey	74.7	157				
Ukraine	23.9	NA				

* Author's calculations; ** United States Treasury Department (2000); *** Feige (2002a)

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.[9] Column (3) of Table 16.1 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 percent of the nation's total currency supply in circulation outside of banks. Official estimates of US dollar holdings abroad suggest that roughly 50 percent 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 16.1, upper-bound ONB estimates employing the same blow up factor required for the Federal Reserve survey estimates. [10]

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[9] We are indebted to the Austrian National Bank (ONB) for providing us with the underlying survey data that permitted computation of the estimates presented in the accompanying tables and figures.

[10] 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. In each of the five countries, the DM is the largest component of FCC holdings, followed by the US dollar. 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

16.3.2 Indirect Measures of FCC

16.3.2.1 *Denomination Displacement Method*

Feige et al. (2002a) developed indirect methods for estimating the amount of unobservable FCC 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 larger denomination foreign currency notes, particularly 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 this indirect method as yielding a lower bound estimate.

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 obtain estimates of FCC in both highly and only partially dollarized countries. The denomination structure of local currency was then examined in order to determine the extent to which 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

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Germany. The Czech Republic appears to hold almost 10 percent of estimated DM abroad, followed

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 16.1.

16.3.2.2 *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 modeled. Since the Argentina hyperinflation experience and subsequent stabilization program was similar in many respects to that of Croatia, Feige et al. (2002a) 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 16.1. 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.

16.4 Comparison of Alternative Dollarization Indices.

16.4.1 Overall Dollarization Indices

Given the estimates of FCC holdings displayed in Table 16.1 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. (2002a) examined these ratios for a sample of 24 countries for which data were available and found that the

by Croatia with 6 percent.

widely used IMF dollarization index is highly correlated with the asset substitution index but is an imprecise measure of currency substitution.

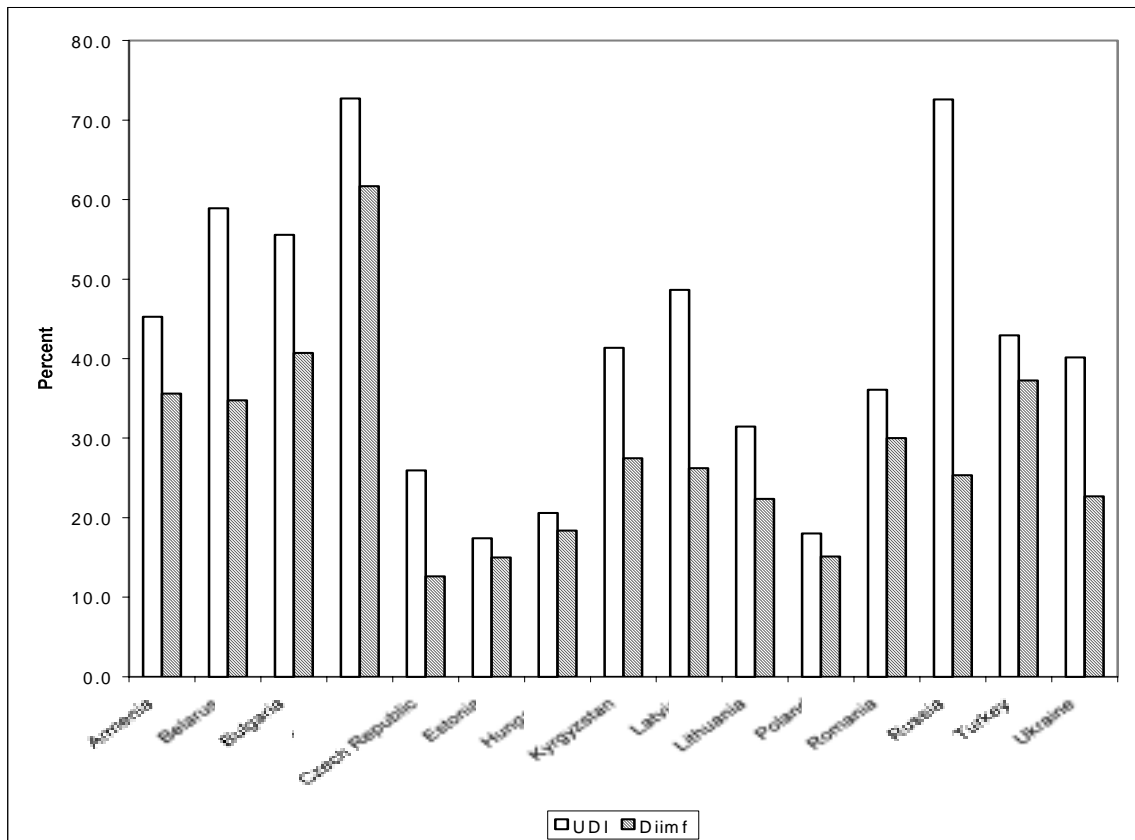**FIGURE 16.1 COMPARISON OF ALTERNATIVE DOLLARIZATION INDICIES-1999**

Figure 16.1 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 in 1999.[11] By definition, 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

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[11] The calculations for both indices employ the average values of FCC obtained by the various methods in each of the transition countries.

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. Armenia, Belarus, Bulgaria, Kyrgyzstan, Latvia, Turkey, and the Ukraine score above 40 percent in the de facto dollarization ranking.

16.4.2 Currency Substitution and Asset Substitution Indices

Feige et al. (2002a) 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 16.2 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 in 1999.[12]

The figure reveals that the fraction of the total currency supply made up of foreign cash (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 making it highly unlikely that it 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; *bilateral* adoption of the euro, by contrast, would be compensated by seigniorage sharing with the rest of the EMU.

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[12] These indices are based on the average estimated FCC holdings over all methods of estimation.

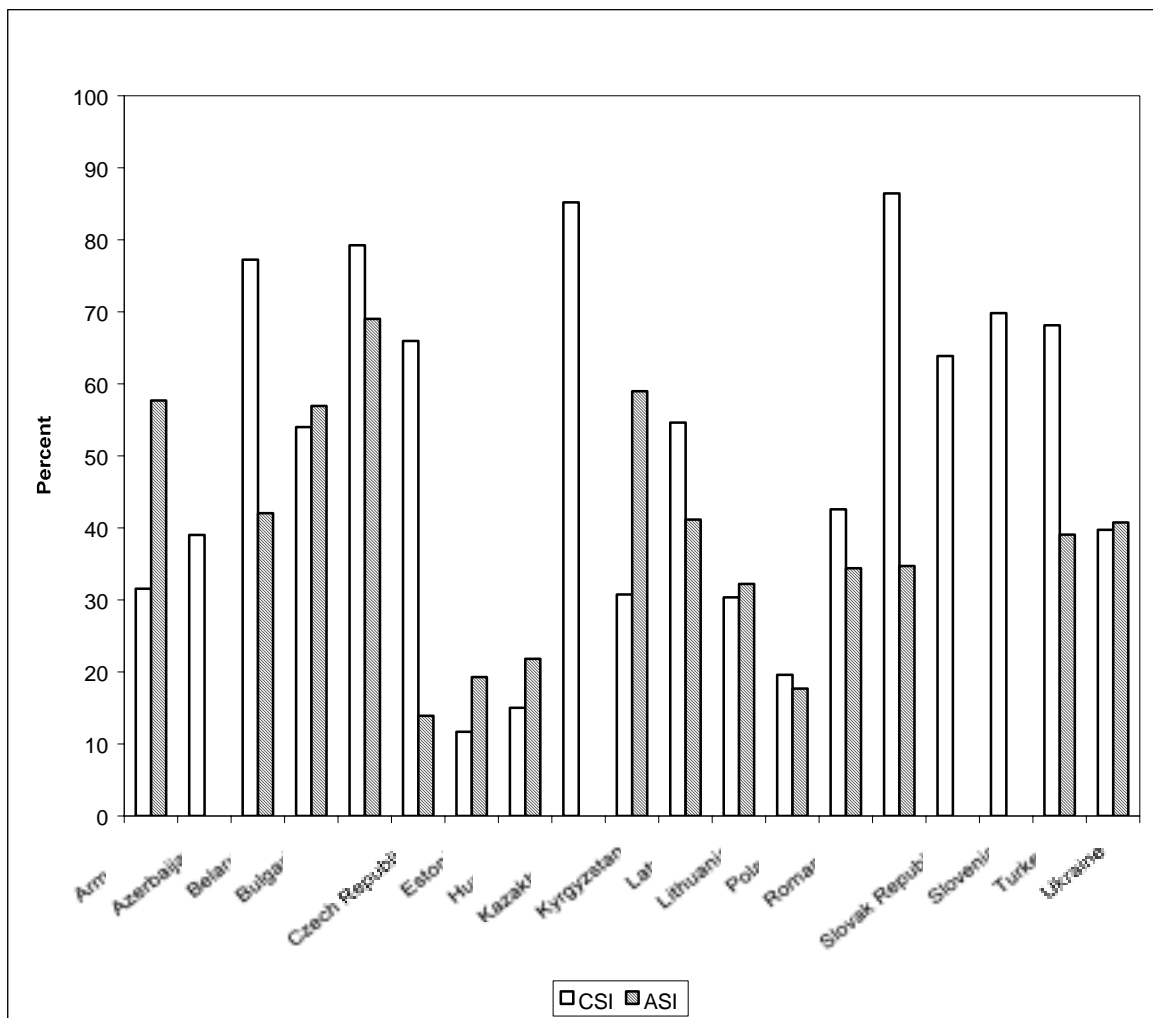**FIGURE 16.2 MEASURES OF CURRENCY AND ASSET SUBSTITUTION -1999**

Figure 16.2 also reveals that patterns of currency substitution and asset substitution are in fact quite different among the countries observed. Armenia and Kyrgyzstan exhibit a pattern in which asset substitution dominates currency substitution by a wide margin. The converse is true for Belarus, Croatia, Czech Republic, Latvia, Romania, Russia, 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.

16.5 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 and bilaterally 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 then be expected to euroize officially. Finally, the remaining seven or eight countries are likely to become increasingly dollarized or euroized de facto, and some may be tempted to withdraw their domestic currencies from circulation altogether and adopt foreign currency exclusively and unilaterally.

Now consider network externalities. Feige et al. (2002b), 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 – the potential benefits from unilateral euroization are likely to rise rapidly in the near future.

Most of our data is on dollar holdings, not DMs or euros. It is misleading to extrapolate the latter from the former, since ratios of dollar to non-dollar foreign currency holdings vary widely from country to country. Nevertheless it seems realistic to infer 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, the incentive will rise for CEECs to move unilaterally from unofficial, partial dollarization or euroization to official, 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 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. Substantial nominal exchange rate appreciation would also obviate the post-accession inflationary pressure that could come from joining the EMU at an under-valued rate, as happened with the Irish punt after March 1998.

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 sidestep the Masstricht criteria. 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 have 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.

16.5.1 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. Figure 16.2, reveals that the Czech Republic and Slovenia have CSIs of 65 or more: that is, at least 65 percent of their total currency supply is held in the form of foreign currency. Poland has 20 percent, with Hungary and Estonia at less than 15 percent. However, the ONB surveys suggest that Hungary has long been a heavy user of the DM and the Austrian Schilling. What we will call Group B consists of Bulgaria, Latvia, Lithuania, Romania and the Slovak Republic. Three of the five have CSIs of 54 or more; Romania is also high, at 43, and Lithuania is at 30 percent. 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 68 to 86, with the other four between 31 and 40. Moreover in all cases the ASI is 35 or above.

Overall, the CSI average for Group A is 36 percent, for Group B 49 percent and for Group C 60 percent. What this admittedly casual comparison suggests is that the degree of currency substitution increases 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 all DM holdings were included, 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., 2002b) suggests that countries with more than

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[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).

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 on our list (Group C) 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 are Armenia, Croatia, and Kyrgysztan. Moreover, Kazakhstan probably has an ASI over 50, but data are unavailable.

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: their relative reluctance to hold dollars as bank deposits reflects both distrust of banks, 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, which are then converted into domestic currency for transactions. Moreover Ukraine's dollarized debt is relatively small and it runs a fiscal surplus; therefore 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.) Finally, 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 since they still receive considerable FDI from, and trade substantially with, Russia (though their investment and trade with Euroland is growing)[14], they have less immediate reason on OCA grounds than do CEECs to adopt the euro.

16.6 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 dollar 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 indices 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 countries that will not qualify for EU or EMU membership in the near future are nevertheless motivated to

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

abandon their domestic currencies and adopt the euro unilaterally. Although our CSI and ASI indices suggest that the incentives to do so are particularly high in Armenia, Belarus, Croatia, Kazakhstan, Kyrgyzstan, Russia, and Turkey - that is, all have strong transactions, asset or bank-credibility motives for euroization - other considerations make it unlikely that Belarus, Russia and Ukraine will do so for the foreseeable future.

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