

COMPETING MONIES AND THE BIG POLISH INFLATION OF 1989

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Abstract

This paper seeks to explain the big Polish inflation of 1989. It begins with a description of the country's unique experience with currency substitution (CS). I develop a model in which an endogenously emerging CS is assigned a key role in the inflationary process. In the model, selling and buying for currencies other than some prescribed local money is illegal. Thus, CS involves dodging the currency laws, which is assumed to require labor effort. In contrast to the existing literature, I study a case in which not only buyers, but sellers as well, optimally choose the currency denomination of payment. The fact that selling for the alternative currency is costly implies that CS is incompatible with the absolute PPP. Money is introduced using a flexible cash-in-advance constraint. Flexibility means that while purchases (sales) must be paid for (cashed) in currency, how much is bought (sold) for one relative to the other money is optimally determined by the buyers (sellers). The model stresses the dependence of CS and inflation on fiscal policies, in particular, on the size and the geographical distribution of government spending. I discuss how the government's decision to redirect its consumption into foreign goods necessitates CS thus leading to a fall in the real demand for the local money. This argument is critical for my explanation of the big Polish inflation of 1989.

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1. Introduction

This paper seeks to explain the Polish (near)hyperinflation of 1989. In a formal model presented below, an endogenously emerging currency substitution (CS henceforth) is assigned a critical role in the inflationary process.

There are two rather unique features of the post-war Polish experience with CS. First, competing monies were issued by the (same) domestic government. In the usual CS situation there are domestic "pesos" and foreign "dollars", and the home government issues "pesos" alone. Second, the Polish government used CS to soak up the real U.S. dollars and thus finance its consumption of foreign goods.

In the model studied below, selling and buying for currencies other than some prescribed local money is illegal. Thus, CS involves dodging the currency laws, which is assumed to require labor effort. If the foreign inflation exceeds the domestic inflation, then the foreign money is not used as a medium of exchange. This realistic feature is absent in these models of CS in which both currencies either appear as arguments of the utility function (see e.g., Liviatan (1981)), or reduce the shopping costs (see e.g., Vegh (1989)). In contrast to the existing literature, I study a case in which not only buyers but sellers as well optimally choose the currency denomination of payment. The fact that selling for the alternative currency is costly implies that CS is incompatible with the absolute PPP. All the existing research on CS that I am aware of takes PPP for granted. Money is introduced using a flexible cash-in-advance (CIA henceforth) constraint. Flexibility means that while purchases (sales) must be paid for (cashed) in currency, how much is bought (sold) for one relative to the other money is optimally

determined by the buyers (sellers).

The model stresses the dependence of CS and inflation on fiscal policies, in particular, on the size and the geographical distribution of government spending. I discuss how the government's decision to redirect its consumption into foreign goods necessitates CS thus leading to a fall in the real demand for the local money. This argument is critical for my explanation of the big Polish inflation of 1989.

The remainder of this paper is organized as follows. A brief description of the Polish experience with CS is given in section 2. In section 3 I lay down and solve a model of CS and discuss its relevance for the Polish inflation. Conclusions close the paper.

2. The Privately Used Monies in the Post-War Poland

In this section I briefly describe the history of the privately used monies in the post-war Poland. The qualification "privately used" is meaningful. In the late 1940s most of the retail trade was nationalized. Clearly, buying, say, groceries in the state-owned store is not a transaction between two private agents. Moreover, because of the binding price controls many goods offered in the state-owned stores could only occasionally be acquired by paying the money price alone. Other costs, like waiting in line, bribes, etc. had often to be paid. Parallel to the controlled market thrived the free (mostly black) market. This paper is concerned with monies used on the free market.

Three currencies were used in clearing the transactions on the free market: the local zloty, the U.S. dollar, and the U.S. dollar-denominated coupon. The Polish peculiarity, the coupons, were issued by the state-owned Bank PeKaO S.A. Their existence seems to be

virtually unknown outside Poland. The Pick's Currency Yearbook and its successor, The World Currency Yearbook, is an exception (see e.g., The World Currency Yearbook (1989)). One can understand why. First, the coupon money is truly a mystery. Until 1990 all the coupon-related documents (including the texts of the legal regulations) were classified and unavailable. Second, since coupons are dollar-denominated and their zloty price was, especially after 1971, only slightly lower than that of the "true" dollars, it is common to put both currencies under one roof and talk about the "black market dollar".

The history of the coupons goes back to the late 1950s and can be reconstructed as follows. The private ownership of the foreign-exchange was banned at the time of the currency reform in October 1950. In particular, the law required that all the foreign exchange be sold to the central bank at the official, truly confiscatory, exchange rate. The ban was effectively enforced, i.e., the travelers were routinely frisked, international mail was searched, etc. The strict foreign exchange controls apparently put the government on the wrong side of the Laffer curve. In 1953 the amounts of the dollar and the pound transfers from abroad were, respectively, 95% and 97% lower than in 1948 (see Landau and Tomaszewski (1983), table 18). Anecdotic evidence suggests that money transfers were simply substituted by transfers in kind.

In 1960 the government reacted by implementing a rather ingenious reform. The key changes were as follows. First, a new paper money, called coupons (in Polish, bony PeKaO), was introduced. It was denominated in the U.S. dollars (the denominations mimic these of the dollar, but even the small change is paper). In contrast to the genuine dollars, coupons could be legally held and traded by the population.

They could be acquired by exchanging one-for-one the U.S. dollars at the state-owned banks. No questions were asked upon such conversions. The reverse transactions were not foreseen.¹ Second, the government drastically expanded a chain the duty-free hard-currency stores (HCS) and make them available to the general public. The first HCSs were opened in 1948, but until 1960 they served exclusively the foreign nationals. The coupons were declared equivalent to dollars in the HCSs (in certain circumstances the domestic residents were allowed to pay with the U.S. dollars). Third, from then on certain people could obtain an exemption from the maintained ban on a possession of dollars provided they agreed to convert one-for-one a specified fraction into coupons. In practice, this concerned the American pensioners who were allowed to keep the U.S. Social Security checks after converting 20% into coupons.

The reform was extremely successful in increasing the government's acquisition of the hard currencies. It doubled within one year (see Landau and Tomaszewski (1983)) mostly due to a threefold increase in the HCS sales. It has to be added that the HCS sales were additionally boosted by a concomitant drastic increase in the import tariffs. The HCS sales continued to rise ever since, especially in the aftermath of the major liberalizations of the foreign exchange restrictions undertaken in 1967, 1970 and 1976. In 1976 the government legalized the foreign exchange deposits in the state-owned Bank PekaO S.A.

Historically, most of the growth in the HCSs sales was contributed by an increase in the direct purchases by the domestic residents.

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In fact, a fine print on the coupons says that they are not redeemable.

Already in 1961 they accounted for over 20% of the total. The number continued to rise passing 50 % in the early 1970s, and 80% in the 1982 (see Krzyzkiewicz (1987) appendix 1). The network of HCSs (named Pewex in 1974) reached every Polish town and the list of merchandise expanded much beyond the "Western luxuries". In particular, between 1974 and 1984 the sales of the domestically-made automobiles and alcoholic beverages accounted for, roughly, 50% of the total. Wyczanski (1989) estimates that in 1988 the HCSs sales (valued at the black market exchange rate) were equal to 12% of the total zloty retail sales in the state-owned stores. However, this number overestimates the true importance of HCSs since Wyczanski (1989) does not correct for the artificial undervaluation of many zloty goods sold in the state-owned stores.

Table 1, displays the selected annual data on the relative price of the coupons in terms of the black market U.S. dollars, the nominal stock of coupons, and the ratio of the coupon stock to the total zloty cash. The numbers reveal several facts. First, a gradual decline of a premium indicates that over time the coupon became an increasingly good substitute for the dollar. This is understandable given that coupons could be purchased from the government at a price of one dollar and were equivalent to dollars in HCSs. Second, there have been a steady growth in the stock of coupons. Recalling the standard arguments about the fixed exchange rates, it is clear that given the effective pegging of the U.S. dollar-coupon exchange rate, the government had no control over the nominal supply of coupons. Therefore the entire coupon growth must have been due to the "couponization" of the dollar trade surpluses run by the private agents. Third, although, in the dollar terms, the stock

of coupons remained relatively low, it was not insignificant compared to the zloty cash in circulation.

It is obvious that since the agents chose to hold increasing amounts of the non-interest-bearing coupons they must have been used as money. Indeed, following the 1976 liberalization the coupons started to outgrow their role as the "dollar store" money. They began to be used in transactions between private agents. This coincided with the zloty inflation. The data in the Statistical Yearbook of Poland reveal that between 1975 and 1986 the zloty M1 was growing by 22% on average per year, i.e., twice as fast as in the period 1961-1974.

By the early 1980s the coupon firmly established itself as a medium of exchange. It was most frequently used in large transactions involving durables and real estate. There was a very active coupons market. The classified sections in the newspapers were dominated by offers to buy and sell coupons, and a large-volume business was very often conducted just outside branches of the "dollar/coupon bank", PeKaO S.A. Obviously, it is impossible to tell what fraction of the transactions was actually carried out in the U.S. dollars. While the coupon was increasingly used as a medium of exchange, the true dollar was successfully competing with the zloty as a store of value. The dollar deposits grew quite dramatically since their legalization in 1976. In 1980 there was 1.2 millions of accounts totaling million \$472. In 1989 these numbers stood at, respectively, 3.7 million and \$3.15 billion. In the late 1980s 66% of the deposits carried one to three years maturity corroborating a claim that dollars were held mostly as a store of value (see Wyczanski (1989)). The ratio of the dollar deposits (valued at the black market exchange rate) to the total zloty deposits

rose from 7.8% in 1976 to 332.6% in 1988, reflecting both the size and valuation effects.

The behavior of the real exchange rate is not clear cut. There is some evidence of a highly depreciated real exchange rate. In the late 1980s, the average nominal wage when valued at the black market rate did not exceed 20 dollars/coupons per month. A dinner for two in a four-star restaurant in Warsaw cost around \$5. The Newsweek magazine (1989) even called Poland the place of the best bargains in Eastern Europe. However, as shown in Table 2, a measure of the real exchange rate obtained by deflating the black market exchange rate by the index of the free (bazaar) prices of foodstuff (used as a proxy for a black market CPI as the binding price controls made the official CPI, essentially, useless) shows a mixed pattern in the 1980s. In particular, the real exchange rate does not vary in any regular way with the trade surplus nor changes in the stock of coupons and CS. A continuous increase in CS in the late 1980s is poorly reflected by movements in the real exchange rate (e.g., there is a sign of a real appreciation in 1989).

The government chose to ignore the increasing use of coupons as private money as this meant an increase in the number of dollars converted into coupons. These voluntary conversions had a major contribution to the Polish balance of payments in convertible currencies. The National Bank of Poland (1991) data show that, historically, the item "private unrequited transfers", which in the Polish case stands, essentially, for the dollar-coupon conversions and the dollar purchases in the HCSs, was quite large. In the second half of the 1980s these gross "private unrequited transfers" were larger than

one fourth of the hard currency exports, and finally reached 50% in 1989. As displayed in Table 2, in 1987-1989 the positive net transfers were actually larger than the trade surplus.

It should be said that the CS and dollars-for-coupons conversions were encouraged through several means. For example, from the early 1980s until 1990 state banks offered a 10% interest bonus on the dollar accounts if the interest was collected in coupons. Also, for a long time holding of a dollar deposit in a state-owned bank was a necessary condition to get a passport.

In 1989 Poland both welcome a long-awaited political change and suffered a traumatic experience of a (near)hyperinflation. Since accounts of the recent Polish hyperinflation are given elsewhere (see, e.g., Lipton and Sachs (1990)), I will be extremely brief and focus on issues that have not been previously discussed.

The Spring of 1989 brought an acceleration of the money growth. It continued through the remainder of the year. In the second, third and fourth quarters the rate of increase in M1 was equal to, respectively, 24.6 %, 49.7 %, and 70 % (the data on the money supply and CPI are from the IMF's International Financial Statistics (1990)). Simultaneously, price controls were being phased out, especially since August. By the end of the year 86% of consumer goods prices were freed. Progressing price liberalization meant that an "official" CPI was becoming an increasingly meaningful measure of the price level. This "official" CPI rose by 28.4 %, 67.3 % , and 150.9 % in the said quarters. The monthly rate of inflation peaked in October at 54.8%. The real M1 was eroded by 41 % between the end of the first and the end of the fourth quarter. For the entire 1989 the real broad money fell by 60% (see Lipton and

Sachs (1990, table 4)).

Perhaps surprisingly, it is not too easy to establish hard facts about what happened in 1989 on the fiscal side. Throughout the 1980s the government domestic consumption as a fraction of GDP oscillated around 8-9%. In 1989 it actually fell to 6%. By definition this does not include the numbers on the repayment of foreign debt nor changes in the foreign exchange reserves. This are the areas where a lot of action seems to have taken place. In the second half of the 1980s the country was repaying its creditors roughly \$1.5-1.9 billion each year. There was also a buildup of foreign exchange reserves. They rose from \$870.4 million in 1984 to \$ 2314.2 million in 1989. However, the sum of debt repayment and the reserve changes does not show the kind of increase that could explain a hyperinflation. In fact, it peaked at \$ 2363 million in 1987 and then fell. What dramatically changed was the way the debt repayment and reserve changes were financed. As seen in Table 2, while the trade surplus was falling, the net unrequited transfers were rising. In 1984 the transfers contributed 25.4% to the sum of the two, but this fraction rose to 84% in 1989. Given the state ownership of export-import companies, exports were really carried out by the government itself. It was simply buying the goods for zlotys and later reselling them on the foreign market for hard currency. As already said, the transfers reflect HCS sales and coupons-for-dollars conversions. Clearly, in the latter case the government were buying dollars not for goods but for coupons. The privately sold dollars must have been earlier earned by private exporters. Thus, in either case there is a corresponding excess of income over domestic absorption. The data says that, in the aggregate, it actually fell the late 1980s. It

is, therefore, rather difficult to argue that debt repayment or, more broadly, government consumption caused the hyperinflation. This and the earlier observation on the changed financing method are crucial in my argument about the hyperinflation in 1989. They are also captured in the model developed below.

Fast printing of zlotys was preceded and accompanied by an unprecedented liberalization of the foreign exchange restrictions. From June 16, 1988 the state-owned banks were allowed to sell and buy coupons at, essentially, the black market rate. On March 15, 1989 the licensed private exchange houses (obtaining a license was a formality) began freely selling and buying coupons, dollars and other hard currencies. Casual observation suggests that in 1989 these exchange houses (kantors, in Polish) were the fastest growing industry in the country.

3. A Simple Model

I consider the following simple perfect foresight model of a small-open economy set up in a continuous time. The economy is populated by a large number of immortal and identical households. A representative household has three members: a manager, a shopper, and a worker. Each of the three acts independently of the others. The manager runs the family-owned firm. The firm costlessly harvests a constant amount y of a perishable traded good. The good can be sold either on the world market for U.S. dollars, or on the domestic market for zlotys or dollar-denominated coupons. The world and the coupon prices are the same and equal to the exogenously given number p^* , while the endogenous zloty price is p . The equality of the U.S. dollar and coupon prices follows from the unmodeled institutional considerations.

Recall that coupons can be bought from the government at a unitary dollar price, and that in the HCSs they are equivalent to dollars. The no-arbitrage condition implies that the coupon-dollar exchange rate is effectively pegged at unity. It also follows from the standard argument pertaining to the fixed exchange rates that the supply of coupons is endogenous. Once the foreign sales are completed, the manager runs to the government-owned bank where she converts the earned hard currency into coupons. Holding dollars is assumed to be infinitely costly, and thus does not occur in the equilibrium. Let E denote the zloty price of one coupon, and a stand for a fraction of the zloty sales in the total quantity sold. Selling $(1-a)y$ units of the good for dollars or coupons requires hiring kzy hours of lookout service. z is a positive, twice-differentiable, strictly increasing, and strictly convex function of $1-a$, and k is a positive number. The manager pays individuals working as lookouts the nominal wage W coupons per hour. It will be verified below that the firm is always able to pay its wage bill with coupons. The expression kzy stands for the labor input necessary to evade the foreign exchange restrictions. These restrictions forbid sales in other currencies than zlotys, i.e., they require $a = 1$. Notice that evasion is costless for k equal to zero, and impossible for k equal to infinity. k will measure the degree of the foreign exchange controls.

The assumption that the function z is rising in $1-a$ means in words that the difficulty in evading the currency restrictions is itself positively dependent on the extent of evasion. The simple justification is that a small scale evasion has simply a higher chance of going unnoticed than a large scale one. Hence the latter requires more

(costly) caution on the part of the blackmarketeers. Greenwood and Kimbrough (1987) make a qualitatively similar assumption in modeling the black market for foreign exchange. In their model the black market activity is costly in terms of goods and not leisure. In defense of the "lookout" assumption I should say that anybody who has ever transacted on the black market has probably gotten an impression that this activity is "labor intensive".

The two remaining family members perform the following tasks. The shopper buys the consumption goods (c) against the household's holdings of zlotys (M) and coupons (F), while the worker sells n hours of his labor to the domestic employers (and the only job available in this economy is standing on a lookout). On each market, the shopper faces a cash-in-advance (CIA) constraint. Let e stand for the fraction of the zloty purchases. The coupon purchases are illegal. Because of this illegality, buying $(1-e)c$ units of the coupon goods requires hiring khc hours of lookout services. The function h whose argument is $1-e$ is the same as the function z introduced above.

In addition to monies, the households hold privately-issued domestic real bonds, b , each yielding an instantaneous real return ρ . The representative family maximizes a life-time integral of discounted intraperiod utilities subject to a budget constraint, two CIA constraints, and the No-Ponzi-Games condition. The momentary utility is a separable function of consumption and labor. The utility of consumption has standard properties (including the Inada conditions), and, to facilitate the algebra, the disutility of labor is linear (which, obviously, implies a perfectly elastic labor supply).

Formally, each household solves the following problem:

$$(1) \quad \max_{n, c, a, e, m, f, b} \int_0^{\infty} \{u(c) - n\} \exp(-\delta t) dt$$

subject to:

$$(2) \quad \dot{d} = d\rho - m(\rho + \pi) - (\rho + v - \epsilon)fr + wn + y[a + r(1-a) - kzw] - c[e + r(1-e) + khw]$$

$$(3) \quad m = \alpha ec$$

$$(4) \quad fr = \alpha(1-e)cr$$

$$(5) \quad d = m + fr + b$$

$$(6) \quad \lim_{t \rightarrow \infty} d \exp\left(-\int_0^t \rho d\tau\right) = 0 \quad (\text{No Ponzi Games})$$

where: $\delta > 0$ is the subjective rate of time preference; $m = M/p =$ real balances of zlotys; $f = F/p^* =$ real balances of coupons; $r = Ep^*/p =$ real exchange rate; $d =$ domestic real assets; $w = WE/p =$ real wage; $c = r/r$; $0 < v = p^*/p =$ the rate of foreign inflation; $\alpha > 0$; in addition to the already mentioned properties, the function z , and thus h , satisfy $z(0) = 0$; the CIA constraints are written as equalities anticipating the fact that in equilibrium the opportunity costs of both monies will turn out to be positive; time subscripts are suppressed to economize on notation;

(1)-(6) define an optimal control problem that captures two independent optimizations: profit maximization by firms (choice of a), and utility maximization by consumers/workers (choices of n, c, e, m, f and b). This together with the subsequently assumed market clearing implies that its solution defines a competitive equilibrium. Given the convexity of the maximization problem, (1)-(6), the necessary conditions for its solution are also sufficient.

It is convenient to eliminate m and f by substituting (3)-(4) into (2). Denoting by μ the multiplier on (2) (the marginal utility of the real life-time wealth), the conditions for an optimum include (2), (5)-(6) and:

$$(7a) \quad -1 + \mu w \leq 0$$

$$(7b) \quad n(-1 + \mu w) = 0$$

$$(8) \quad u'(c) = \mu \left[e[1+\alpha(\rho+\pi)] + (1-e)r[1+\alpha(\rho+v-\epsilon)] + khw \right]$$

$$(9a) \quad 1 - r + kz'w \leq 0$$

$$(9b) \quad a(1 - r + kz'w) = 0$$

$$(10a) \quad - \{1+\alpha(\rho+\pi) - r[1+\alpha(\rho+v-\epsilon)] - kh'w\} \leq 0$$

$$(10b) \quad - e\{1+\alpha(\rho+\pi) - r[1+\alpha(\rho+v-\epsilon)] - kh'w\} = 0$$

$$(11) \quad \dot{\mu} = \mu(\delta - \rho)$$

where a prime, "", indicates the derivative.

As usual, (7a)-(7b) and (8) implicitly define the supply of labor and demand for consumption, respectively. The assumed Inada condition on the function u ensures that consumption is always positive. Note that its effective cost is a share-weighted average of the costs of the zloty and coupon goods, and that it includes both the opportunity cost of money balances held in advance of the acquisition of goods, and the "lookout" costs incurred because of the illegality of the coupon transactions. (9a)-(10b) implicitly determine the optimally-chosen geography of sales and purchases. In particular, the interior choice of a requires that the marginal "lookout" cost of selling for coupons be equal to the price differential between the two markets. An (almost) analogous condition holds for the consumer. Finally, (11) is the costate equation.

(9a)-(9b) as well as the assumptions that the function z is convex and $z(0) = 0$ imply that, at the optimum, the proceeds from coupon sales, $p^*(1-a)y$, are indeed not smaller than the coupon wage bill kwz . It will be shown below that if $1-e$ is positive so is $1-a$. Given this and (9)-(10), it is easy to demonstrate that agents would never demand coupons if their rate of return, $-\rho-v+c$, were not higher than the rate of return on zlotys, $-\rho-\pi$. For suppose that both $-\rho-v+c \leq -\rho-\pi$ and $1-e > 0$. It then follows from (9) that $r > 1$. But together with the fact that $kz'w > 0$ this implies that $1+\alpha(\rho+\pi) - r[1+\alpha(\rho+v-c)] - kh'w < 0$ which, given that consumption and the marginal utility of wealth are strictly positive, contradicts (10a). The finding is intuitive in that

agents should not be expected to demand the currency which is not only return-dominated but also costly to use.

As one can recall, the rate-of-return dominance of the domestic money is not a sufficient condition for ruling out CS in these standard models in which both moneys either yield utility directly (see, e.g., Liviatan (1981)) or reduce shopping costs (see, e.g., Vegh (1989)). It must be noted that the current model belongs to a class of shopping costs models as the domestic money saves leisure. Nor surprisingly, a reasoning along the lines of Brock (1974) and Feenstra (1986) would also show that it is a close relative of money-in-the-utility-function model. It is easy to see that the assumed Inada condition on the function z effectively rules out a complete deztotization of transactions ($a=0$ or $e=0$).

When it holds as a strict equality, the envelope condition (10a) can be used to rewrite (7)-(8) as:

$$(12) \quad u'(c) = \{[1+\alpha(\rho+\pi)] + k[h-h'*(1-e)]w\}/w$$

The LHS of (12) is the marginal rate of substitution between consumption and leisure, while the RHS is the relevant relative price. The convexity of the function z and the assumption that $z(0) = 0$ jointly imply that this price is lower than the one that would obtain if all the goods were purchased for zlotys. In this sense CS reduces the inflation-induced distortion of the relative prices. Solving (9)-(10) for r and w yields:

$$(13) \quad r = 1 + \{z'[\alpha(\pi-v+\epsilon)]\}/\{z'[1+\alpha(\rho+v-\epsilon)]+h'\}$$

$$(14) \quad w = \alpha(\pi - v + \varepsilon) / \left[k(z' [1 + \alpha(\rho + v - \varepsilon)] + h') \right]$$

I now focus on the behavior of the government. It consumes a constant amount of goods, g ($g < y$). A fraction ϕ is purchased at home against the newly-printed zlotys. The remainder is bought on the world market for the U.S. dollars obtained from the voluntary dollars-for-coupons conversions made by the population. The assumption about the geography of the government purchases should be taken as a simplified description of the situation in which the government, while not engaging itself in an international exchange, consumes both domestic and foreign goods, and the domestic (foreign) residents do not hold dollars (home money). The latter implies that the government cannot convert zlotys into dollars and vice versa, and hence it faces two separate budget constraints. Assuming that the nominal money is printed at a rate σ these constraints are:

$$(15a) \quad \sigma m - g\phi = \dot{M}/p - g\phi = 0$$

$$(15b) \quad fr + vfr - g(1-\phi)r = FE/p - g(1-\phi)E\dot{p}/p = 0$$

In equilibrium the following must be true:

$$(16) \quad ya = ce + g\phi$$

$$(17) \quad b = 0$$

$$(18) \quad n = ykz + ckh$$

$$(19) \quad \dot{m} = (\sigma - \pi)m$$

that is, the zloty sales equal the zloty purchases by the domestic residents and the government (because the foreign agents do not hold the zlotys and hence cannot buy the zloty goods), the net holdings of private bonds are zero (because every family is alike), the labor supply equals the labor demand, and, finally, the market for zlotys clears. It is easy to show that (2) and (13)-(18) imply the following chain of equalities:

$$(20) \quad g(1-\phi)r = fr + vfr = FE/p = r[y(1-a) - c(1-e)]$$

that is, the dollar-denominated government spending is equal to the dollars-for-coupons conversions or, equivalently the excess of the non-zloty sales over the non-zloty purchases. Assuming that g and $1-\phi$ are both positive, it follows from (20) that if $1-e$ is positive so is $1-a$. The last equality in (20) and (16) imply that:

$$(21) \quad y = c + g$$

I will study the steady-state equilibrium. In a steady-state all real variables are constant. In particular, it follows from (11) and (19) that:

$$(22) \quad \pi = \sigma$$

$$(23) \quad \rho = \delta$$

Given that in the stationary state $\dot{f} = \dot{\epsilon} = 0$, (3)-(4), (15a)-(16) and (20) can be used to solve for the stationary e , a , and σ :

$$(24) \quad e^* = 1 - [g(1-\phi)/\alpha v(y-g)] = e^*(y, g, v, \phi)$$

+ - + +

$$(25) \quad a^* = 1 - \{g(1-\phi)[1 + (1/\alpha v)]/y\} = a^*(y, g, v, \phi)$$

+ - + +

$$(26) \quad \sigma^* = gv\phi/[\alpha v(y-g) - g(1-\phi)] = \sigma^*(y, g, v, \phi)$$

- + - -

where the comparative statics results in (26) uses (28) below.

As one can see, both e^* and a^* are not larger than one. A sufficient condition to ensure that they are nonnegative is:

$$(27) \quad \alpha v(y-g) > g(1-\phi)$$

(27) is intuitive. It rules out the equilibrium without zlotys by requiring that if coupons were the only money held by the population (i.e., $e = 0$) then the collected seignorage should exceed the government's dollar spending. (27) also ensures that σ^* is positive. As I have discussed earlier, CS does not occur unless $\sigma^* > v$. A sufficient condition is:

$$(28a) \quad g\phi > \alpha v(y-g) - g(1-\phi)$$

or

$$(28b) \quad g/\alpha(y-g) > v$$

(28b) says that if the government spending fell entirely on the zloty goods and coupons were not held then the required rate of the zloty inflation would be higher than the foreign inflation.

The comparative statics results are easy to explain. For, example, it is clear that if a fraction of g bought for dollars increases (i.e., ϕ falls) then the demand for coupons has to increase as well. Other things being equal, the latter will occur if there is an increase in the zloty inflation tax that makes them a relatively unattractive currency to hold.

Given (13), (24)-(26) and the properties of z and h , it is not difficult to verify that the steady-state real exchange rate, r^* , is given by:

$$(29) \quad r^* = 1 + [z'\alpha(\sigma^* - v)] / \{z'[1 + \alpha(\delta + v)] + h'\} = r^*(y, g, v, \phi)$$

? ? ? ?

The ambiguous dependence of the real exchange rate on the underlying exogenous parameters implies that CS and trade surplus will not necessarily be associated with a real depreciation. As argued in section 2, such ambiguity seems to enjoy some support in the Polish data.

In the model, the rate of the money growth is an endogenous variable. Thus, I cannot address the standard question in the CS

literature which is concerned with a direction of the real exchange rate response to a permanent increase in the money growth (see, e.g., Calvo and Rodriguez (1977), Liviatan (1981), Calvo (1985), Engel (1989)).

Substituting (21) and (24) into (3)-(4) yields the expression for the stationary real demand for zlotys, m^* , and coupons, f^* :

$$(30) \quad m^* = \alpha(y-g) - g(1-\phi)/v = m^*(y, g, v, \phi)$$

+ - + +

$$(31) \quad f^* = g(1-\phi)/v = f^*(y, g, v, \phi)$$

0 + - -

(30) shows, in particular, how the government spending and its geographical distribution affect the real demand for zlotys. An increase in g lowers m^* due to both a negative income effect and an increase in the couponization of transactions which it necessitates. It is the latter channel that brings a decrease in m^* in response to a decrease in ϕ . Recall that in a standard model of CS, the dollarization is a by-product of the government's attempts to pay for its consumption of home goods by inflationary taxation. Things are different in a current model in that CS serves as mean to pay for part of the domestic government consumption. More precisely, the domestic government cannot buy the foreign goods unless it collects the seignorage payments on the foreign money.

Notice that if the domestic government rebated the coupon seignorage, $g(1-\phi)$, back to the agents then the coupon scheme would Pareto-dominate the arrangement without the coupons, for in the latter the domestic economy would make seignorage payments to the

dollar-issuing country.² In the highly "dollarized" economies such payments can be substantial. The coupon regime, obviously, does not eliminate a one-time cost of acquiring the stock of foreign money.

In equilibrium the degree of the foreign exchange controls, k^* , is an endogenous variable. To see that substitute the steady-state versions of (13)-(14), (21) and, implicitly, (24)-(26) into (12) to get:

$$(32) \quad u'(y-g) = k^* \left[\frac{[1+\alpha(\delta+\sigma^*)]\{z'[1+\alpha(\delta+v)]+h'\}}{[\alpha(\sigma^*-v)] + h-h'(1-e^*)} \right]$$

Implicit differentiation yields:

$$(33) \quad k^* = k^*(y, g, v, \phi)$$

? ? ? ?

Recalling (14) it follows that:

$$(34) \quad w^* = \alpha(\sigma^*-v) / \left[k^* \{z'[1+\alpha(\delta+v)]+h'\} \right] = w^*(y, g, v, \phi)$$

? ? ? ?

Clearly, an ambiguous behavior of w^* can be explained by (33). As discussed in section 2, the data for the second half of 1980s shows that, while the debt repayment and reserve accumulation by the Polish government did not increase substantially or even fell, the two were financed in an increasing degree by the private unrequited transfers. In a current model this roughly corresponds to a fall in ϕ and no change in g . The result is that, exactly as in Poland, the

² As long as there were leisure costs of dodging foreign exchange controls the deadweight loss of leisure would occur with and without coupons.

growth rate of zlotys goes up and their real demand falls. However, the model makes no sharp prediction on the degree of the foreign exchange controls. This is in contrast to reality since these controls were significantly liberalized in Poland.

4. Conclusions

I have briefly described the recent Polish experience with the currency substitution. In particular, I have focused on the role played by the dollar-denominated, government-issued coupons. The existence of the latter money was a crucial feature of the Poland's post war monetary experience. However, it remained essentially unknown outside the country.

Following the history part, I have studied a formal, general equilibrium model of currency substitution. The model has three main features. First, currency substitution is assumed to be costly in terms of labor. Second, both sellers and buyers optimize over the currency denomination of payment. Third, the government finances its consumption of the goods by collecting seignorage on the inconvertible local currency and on a domestic substitute for the foreign currency. I have demonstrated precisely why and how a switch in the geographical distribution of the government spending towards the foreign goods necessitates an increase in the growth rate of the domestic money and a fall in its real demand. Since the data largely supports such scenario, I finally conclude that the model studied in this paper provides a consistent explanation of the Polish (near)hyperinflation of 1989.

References

- Brock, W. A., 1974, Money and Growth: The Case of Long Run Perfect Foresight, *International Economic Review* 15, 750-777.
- Calvo, G., 1985, Currency Substitution and the Real Exchange Rate: the Utility Maximization Approach, *Journal of International Money and Finance* 4, 175-188.
- Calvo, G., and C.A. Rodriguez, 1977, A Model of Exchange Rate Determination under Currency Substitution and Rational Expectations, *Journal of Political Economy* 85, 617-625.
- Engel, C., 1989, The Trade Balance and the Real Exchange Rate under Currency Substitution, *Journal of International Money and Finance* 8, 47-58.
- Feenstra, R.C., 1986, Functional Equivalence between Liquidity Costs and the Utility of Money, *Journal of Monetary Economics* 17, 271-291.
- Greenwood J., and K. Kimbrough, 1987, Foreign Exchange Controls in a Black Market Economy, *Journal of Development Economics* 26, 129-143.
- International Monetary Fund *International Financial Statistics*, 1990, (International Monetary Fund, Washington D.C.), September.
- Krzyzkiewicz, Z., 1987, The Influence of the Hard Currency Sales on the Black Market Exchange Rate, working paper, Institute of Finance, Warsaw (in Polish).
- Landau, Z., and J. Tomaszewski, 1983, Bank PeKaO S.A. 1929-1979, Warsaw (in Polish).
- Lipton D., and J. Sachs, 1990, Creating a Market Economy in Eastern Europe: The Case of Poland, *Brookings Papers on Economic Activity* 1, 75-133.
- Liviatan N., 1981, Monetary Expansion and the Exchange Rate Dynamics, *Journal of Political Economy* 89, 1218-1227.
- National Bank of Poland, 1991, Annual Report 1990, Warsaw.
- Statistical Yearbook of Poland, Central Statistical Office (Warsaw, Poland), various issues.
- The World Currency Yearbook 1986-1987, 1989, P.P. Cowitt ed., (International Currency Analysis, Inc., Brooklyn N.Y).
- The Newsweek, 1989, July 17 issue.
- Wyczanski, P., 1989, The Dual Currency System in the Polish Economy and the Methods and Possibilities of its Reduction, working paper,

National Bank of Poland.

Vegh, C.A., 1989, The Optimal Inflation Tax in the Presence of Currency Substitution, *Journal of Monetary Economics* 24, 574-591.

Table 1

Poland: The Dollar-Denominated Coupons

Year	The rel. price of coupons in terms of \$	Stock of coupons (end of year) in millions of \$	rel. to zloty cash in circ. (%)
1961	n. a.	1.2	n. a.
1966	0.77	6.1 ¹	n. a.
1970	0.79	16.1	n. a.
1976	0.91	45.8 ²	n. a.
1980	0.99	86.0	4.3
1985	0.97	117.6	8.2
1986	0.99	127.1	10.0
1987	0.92	137.1	13.7
1988	0.96 ³	170.4	14.4

Note: the relative price of coupons in terms of dollars was computed by dividing the black market zloty price of a coupon by the black market price of the U.S. dollar; unless indicated otherwise, the numbers refer to the average rate in December of a given year; ¹ = data for 1965; ² = data for 1975; ³ = data for July;

Data Sources: Krzyzkiewicz (1987) and data supplied by Marek Oles, Pawel Wyczanski and the staff of the Bank PeKaO S.A.

Table 2

Poland: Balance of Payments in Convertible Currencies and the Real Exchange Rate

Year	Trade Surplus in \$ million	Private Transfers \$ million	Debt Repayment and For. Exch. Reserves Changes \$ million	Real Exch. Rate; Jan 1981 = 1 ¹
1984	1380	470	1949	1.69
1985	1088	774	1760	1.55
1986	1035	947	1689	1.80
1987	1040	1402	2363	1.69
1988	941	1422	2147	2.35
1989	240	1232	1822	0.86

Note: the item "Debt Repayment and Foreign Exchange Reserves Changes" was computed by adding items "Interest Payments: Due and Paid", "Medium and Long-Term Capital Repayments: Due and Paid" and "Changes in Official Reserves Net" from National Bank of Poland (1991) annex V; ¹ = data as of the end of December;

Data Sources: National Bank of Poland (1991) and data supplied by Hanna Zawadzka and Pawel Wyczanski.