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**VOUCHER PRIVATIZATION,  
HOUSEHOLDS' DEMAND  
FOR CONSUMPTION GOODS AND  
FINANCIAL ASSETS AND IMPLICATIONS  
FOR MACROECONOMIC POLICY**

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The views expressed in the paper are those of the authors, and do not necessarily represent those of the Czech National Bank.



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# Contents

1. Introduction .....	7
2. Voucher Privatization and Households' Demand for Consumption Goods and Financial Assets:The Czech Case .....	11
3. A Theoretical Framework for Estimating the Two-Stage Decision Model .....	19
4. The Econometric Results .....	23
5. Implications for Macroeconomic Policy .....	29

References ..... ,.....

35

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# 1. Introduction

This paper aims to analyze the impact of voucher privatization schemes on behavior of households and its consequences for macroeconomic policy. In transitional countries that are going to adopt a similar approach of privatization, the interdependence between privatization and macroeconomic stability should be better understood by policy makers. During transition, one of the important policy targets for the government is macroeconomic stability. At the same time, there is a need to privatize a significant portion of the state property in the environment of emerging financial markets and low domestic liquidity. One of the methods available to do this is a voucher privatization scheme that transfers a large portion of the state wealth into the hands of households. An increase in financial wealth has important consequences for both consumption as well as portfolio decision of households that both affect macroeconomic stability of the

economy. The paper tries to analyse the Czech experience with the impact of voucher privatization scheme on behavior of households since the Czech Republic was the first country among transitional economies that adopted a voucher privatization scheme.

First, we summarize the stylized facts. The capital transfer in the form of voucher shares <sup>1</sup> increased financial wealth of households to a degree that was not easy to accommodate. Households cashed the undesired portion of voucher shares by selling them to other sectors. The embryonic financial markets left households with only two main options for allocation of income from capital gains - consumption of goods or savings in the form of traditional term deposits. We develop here a methodology for econometric evaluation of the two-stage decision process of households. In the first stage, households decide between consumption and savings given their income, financial wealth and the real interest rate. In the second stage, they adjust the structure of portfolio to relative rates of return of available financial assets. The econometric estimation of the demand system is a complicated issue since voucher shares were not available prior to introduction of voucher privatization scheme. We apply an envelope theorem in an Almost Ideal Demand System framework in order to find a corresponding model. Our empirical results correspond to our hypothesis of significant positive impact of an increase in wealth on demand for goods as well as financial assets.

In our model framework, the macroeconomic consequences of the voucher privatization scheme depend on the degree of capital mobility. In the case of low mobility, the consequences are similar to those of fiscal expansion. In the case of high capital mobility, the consequences are similar to fiscal expansion combined with monetary restriction. Two main approaches of policy responses are outlined. First, a slow-adjustment approach requires the economy to undergo a period of external imbalance or higher inflation. Second, a fast-adjustment approach demands a change in macroeconomic policy that would

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<sup>1</sup> The voucher privatization scheme is one of examples of how the government increases wealth of households during transition. Similar consequences for consumption and portfolio decisions of households may be induced by a restitution process.

neutralize the impacts of a wealth transfer. Both approaches have advantages and disadvantages. For example, if the central bank is responsible for internal and external stability of a currency, it can face considerable difficulties when managing consequences of the voucher privatization. Monetary policy may not be powerful enough to keep aggregate demand within the targeted range under a fixed-exchange rate regime that is usually a part of stabilization package. Hence policy coordination is needed in order to employ either fiscal restriction or a change in exchange rate regime when neutralizing impacts of voucher privatization scheme.





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## **2. Voucher Privatization and Households' Demand for Consumption Goods and Financial Assets: The Czech Case**

In this section we present some important stylized facts that illustrate the behavior of households after the voucher privatization scheme was introduced. In the Czech Republic, the voucher privatization scheme was implemented as a sequence of six events that one after another increased the Czech households' financial wealth (See Figure 1).<sup>2</sup> In December 1992, households that invested indirectly (through the investment privatization funds) in the first wave of voucher privatization were given advanced payments for their vouchers since the funds competed for new customers. In June 1993, households who invested directly (by bidding with vouchers for shares of enterprises in several rounds) got their shares. In January 1994, households who invested indirectly received their

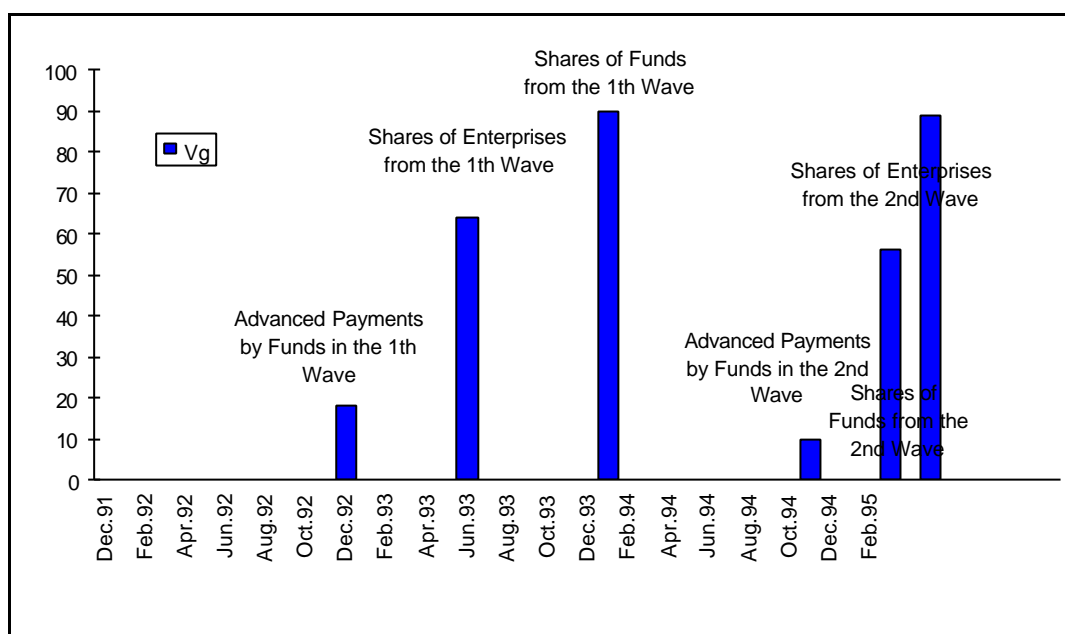
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<sup>2</sup> Each wave of a voucher privatization scheme was based on a transfer of vouchers from the hands of the Czech government to the hands of households. Those citizens who wanted to participate paid a registration fee of 1,000 CZK (Czech crowns) in order to get booklet of vouchers. Then they could bid either directly or indirectly via investment funds for voucher shares. In the first wave, the book value of vouchers in one booklet exceeded the fee by more than thirty times. Consequently, financial wealth of households was increased significantly.

shares of investment funds. A similar scenario held for the second wave of the voucher privatization.<sup>3</sup>

**Figure 1**

**Voucher Privatization: Sequence of Shocks to Financial Wealth of Households (billion of CZK)**



**Data Source:** Czech Ministry of Privatization, Fund of National Property.

**Notes:** In the first wave of voucher privatization, households that invested indirectly (through the investment privatization funds) were given advanced payments in December 1992. In June 1993, households who invested directly got their shares of enterprises. In January 1994, households who invested indirectly got their shares of investment funds. In the second wave, households that invested indirectly were given advanced payments in November 1994. In March 1995, households who invested directly got their shares of enterprises. Households who invested indirectly were expected to receive their shares of investment funds in the second half of 1995. A distribution of shocks is our own approximation based on reports of the Fund of National Property. Data in billion of CZK (Czech crown).

<sup>3</sup> In the sake of simplicity, we neglect in our analysis the fact that there was a difference in a quality of obtained assets. While advanced payments were liquid, the shares differed as far as a degree of liquidity is concerned. In general, the shares of enterprises were more liquid than those of funds. Also, the shares of funds become more undervalued during a fall of price index. One possible explanation is that there was even less information on the investment privatization funds available to investors than on enterprises themselves. In addition, managers of investment funds did not act in the interest of small shareholders.

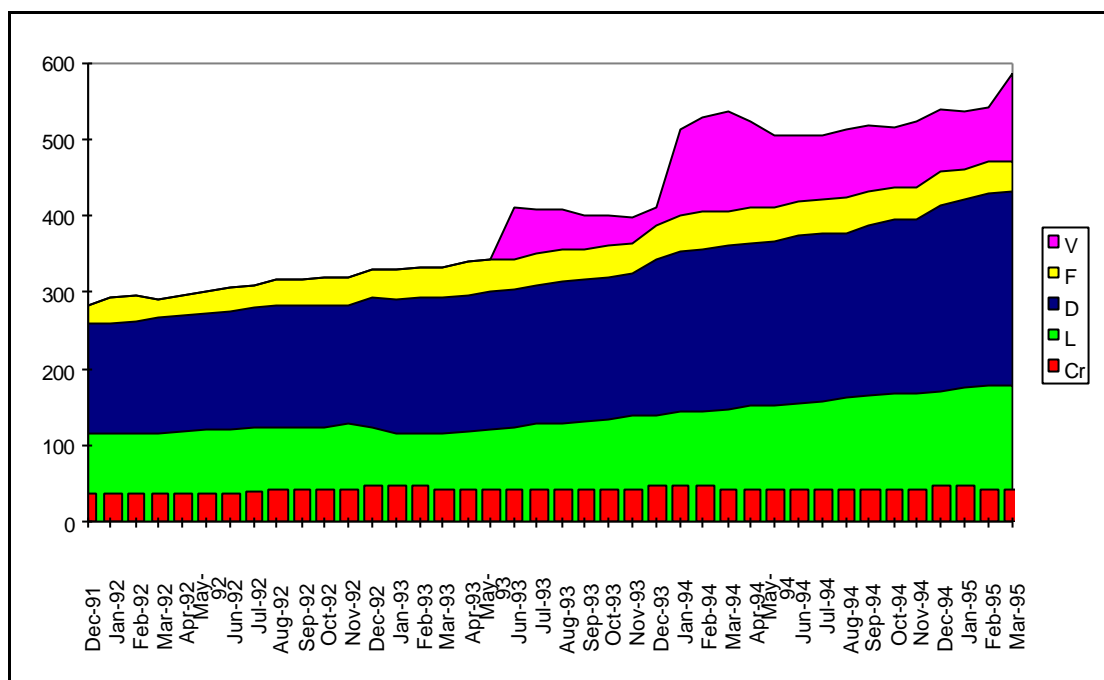
It follows that there are two sources for the financial wealth of households increasing: (i) savings, the standard source and (ii) a “transitional source” - transfers of voucher shares. The Czech experience suggests that the latter temporarily becomes the most dynamic part of the financial wealth of households (See Figure 2). The nominal increase in the financial wealth of households during both waves of voucher privatization was ex ante approximately equal to the level of net monetary wealth in 1993. Although the fall in the Prague Stock Exchange index has reduced the size of this shock partially, the ex post increase in wealth was still considerable. It is important to note that the voucher privatization scheme played a role of a financial innovation since it has become possible for households to diversify among monetary and non-monetary assets. The two definitions of wealth (monetary and financial) started diverging only in 1993. Interestingly, the level of credits given to households remained nearly constant during the period signaling that households were unable to overcome the transitional period of depressed real incomes by borrowing. However, they used the voucher transfer as a substitute for consumer credit to some extent.<sup>4</sup>

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<sup>4</sup> One should observe that banks (and their investment privatization funds) accepted

**Figure 2**

**Structure of Financial Wealth of Households (billion CZK)**



**Data Sources:** Czech National Bank, Authors' Calculations.

**Notes:** The changes in the structure of financial wealth of households are shown from the end of 1991 to the beginning of 1995. Hence the impact of the second wave is not captured fully here. The reported financial assets and liabilities of households are as follows: credits (*Cr*), narrow money - currency and checkable deposits (*L*), term deposits (*D*) and deposits in foreign currency (*F*). The stock of shares held by households (*V*) is our own approximation. We define  $V_t = (P_t / P_{t-1})V_{t-1} + \Delta V p_t + V g_t$ , where  $V_t$  is the current stock of shares held by households, and  $P_t$  is a market price index of voucher shares as quoted on the Prague Stock Exchange,  $\Delta V p_t$  is net purchase of voucher shares (approximated from the Balance of Income and Expenditures of Households) and  $V g_t$  is a government transfer. There is a strong seasonal pattern in the level of term deposits in the end of each year because the major Czech commercial banks used an accounting system in which they wrote-up a majority of interest-rate earnings uniformly on December, 31. There was a switch of holdings of narrow money into termed deposits in February 1993 due to the monetary dissolution of the former Czechoslovakia.<sup>5</sup>

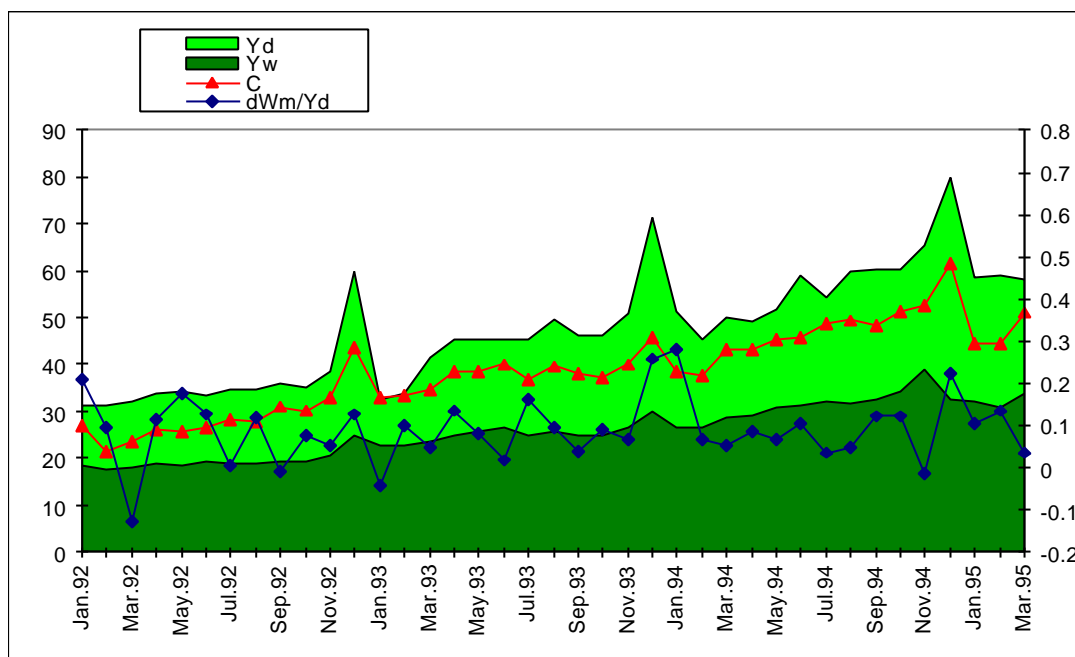
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voucher shares as collateral or exchanged the ownership rights with households for deposits.

<sup>5</sup> When the Czech crown was separated from the Slovak crown, citizens of the newly established Czech Republic were asked to deposit their cash holdings into commercial banks in order to avoid large queues when exchanging the old banknotes and coins for the new ones. Hence households' holdings of termed deposits expanded during the week of a currency dissolution.

**Figure 3**

**Income, Consumption and Savings of Households (billion of CZK)**



**Data Source:** Czech National Bank.

**Notes:** The reported monthly series are as follows: total nominal disposable income ( $Y_d$ ), wage nominal income ( $Y_w$ ), private nominal consumption ( $C$ ) - scaled on the left axes, and indicator of a saving behavior of households defined as  $dWm/Y_d = (Y_d - C - E_o)/Y_d$  where  $E_o$  is other expenditures- scaled on the right axes. The difference between wage and disposable income is “other income” that includes insurance payments, interest payments and estimates of capital gains and dividends from voucher shares.

Czech households spent a significant portion of their disposable income<sup>6</sup> on consumption of goods and services during the transitional period (See Figure 3). The indicator of a saving behavior of households was on average 9%. However, consumption exceeded wage income which was the main source of disposable income prior to a transitional period. The other sources of income have started playing an increasingly important role since the introduction of the restitution program, the voucher privatization scheme and capital markets.

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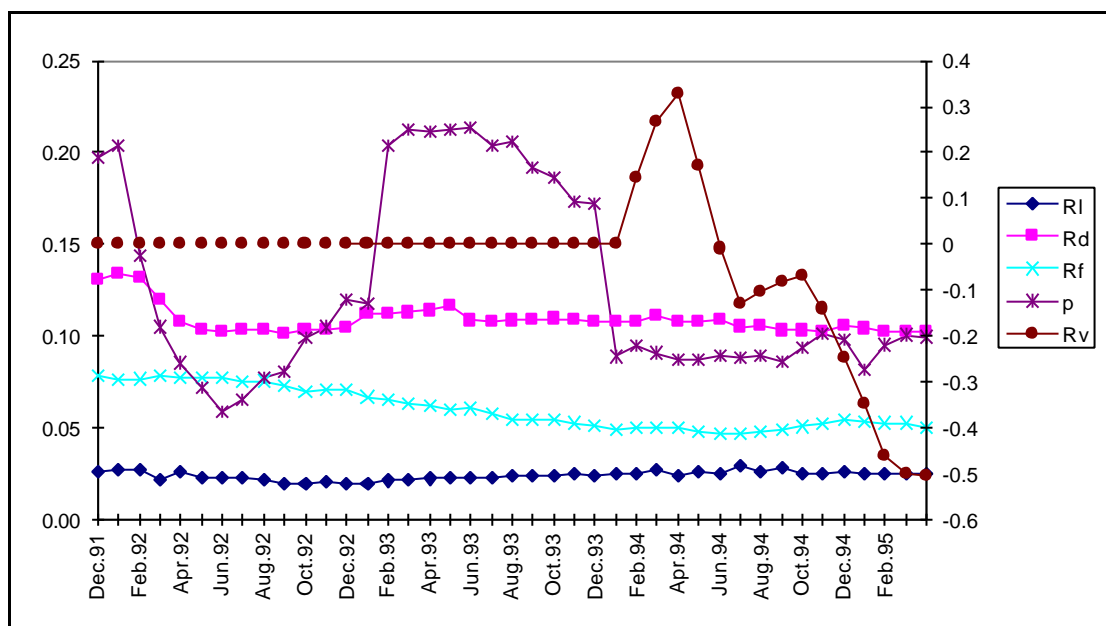
<sup>6</sup> In the balance of income and expenditures (CNB), disposable income is defined in a standard way:  $Y_d = Y_w + Y_x + Tr - T$ , where  $Y_w$  is wage income,  $Y_x$  is income

Hence without large capital transfers, *ceteris paribus*, the saving ratio would have been much lower.

When investing their savings into financial assets, the Czech households faced four main options: transaction money (narrow money), term deposits, deposits in foreign currency and voucher shares. Other types of financial assets such as government bonds, foreign securities, and pension schemes were not available on a large scale during the analyzed period due to embryonic stage of relevant markets or limited convertibility of the Czech crown. Transaction money earned a constant and low rate of return around 2% (See Figure 4).

**Figure 4**

**Rates of Return on Various Financial Assets and Inflation (%)**



**Data Source:** Czech National Bank, Czech Statistical Office, *Hospodářské noviny* (Economic News).

**Notes:** The reported rates of return are as follows: interest rate on narrow money (*RI*), interest rate on term deposits (*Rd*), interest rate on deposits in foreign currency (*Rf*), inflation (*p*) and capital gains on voucher shares (*Rv*) - labeled by the second axis. Note that voucher shares have been available only since December 1992.

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from other sources (insurance payments, interest payments), *Tr* are transfers and *T* is tax payment.

Interest rates on term deposits fell slightly but remained at around 10% while deposits in foreign currency provided small investors with consistently lower gains as a result of the successful strategy of pegging the exchange rate. When market with voucher shares emerged, the prices started falling after an initial period of volatility. As a result, the expected return from investing into voucher share considerably fell.<sup>7</sup> This explains why term deposits kept their role of major portfolio asset for the Czech households. Inflation has not remained stable in the analyzed three years. Due to a problem of accommodating the two important transitional shocks - price liberalization in 1991 and the introduction of VAT in 1993 - there was a problem of a persistent double-digit inflation. One could hardly find longer period of time during which the real interest rate on deposits was positive especially when considering after-tax returns. Consequently, the portfolio motives for building up the real wealth were weak. On the other hand, there was an increase in uncertainty during transition that might have forced households to save relatively more. The real monetary wealth<sup>8</sup> of households (measured in Czech crowns in constant prices of 1984) did not reach its pre-transitional level until 1995. In December 1989, it stood at 181 billion and was reduced to 137 billion in December 1991. It recovered to 139 billion in December 1992, to 141 billion in December 1993 and 155 billion in December 1994. The real financial wealth coincident with monetary wealth until 1992 stood at 151 billion in December 1993 and at 85 billion in December 1994.

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<sup>7</sup> The expected return fell due to falling prices on the Prague Stock Exchange as well as very low dividends paid to small shareholders in the emergence period. A lack of domestic liquidity and illnesses of embryonic financial markets were the reasons of falling prices on the stock exchange. See Šmídková (1996) for the analysis of the process of emergence of financial markets in the Czech Republic.

<sup>8</sup> Monetary (net) wealth is defined as  $Wm = L + D - Cr + F$ , where  $Wm$  is (net) monetary wealth,  $L$  is narrow money (currency plus checkable deposits),  $D$  is term deposits,  $Cr$  is credits and  $F$  is deposits in foreign currencies. Until voucher privatization took place, the concept of financial wealth coincided with the concept of monetary wealth. Once the voucher shares were introduced by the government, we define financial wealth as  $W = Wm + V$ , where  $W$  is (net) financial wealth and  $V$  is voucher shares.



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### **3. A Theoretical Framework for Estimating the Two-Stage Decision Model**

In this section, we present a model of the two-stage decision process of households that provide a framework for the partial analysis of consequences of voucher privatization for economic policy. Specifically, we aimed to quantify the importance of the following factors: the impact of increase in financial wealth on consumption (ie. which portion of voucher shares was cashed); the feasibility of neutralizing the impact via restrictive monetary policy, the impact of relative rates of return on the structure of financial wealth (and which portion of voucher shares remained in the portfolio after the initial adjustment had taken place); and what the main substitute for shares was. The empirical estimates of the models of both stages are presented in the next section.

We model the decision process of households in the two stages. In the first stage, households determine their consumption of goods and services given

their financial wealth, disposable income and the rates of return on financial assets:

$$(1) C = c(W/P, Yd/P, R, p),$$

where  $C$  is real consumption of households,  $W$  is financial wealth,  $P$  is consumer price index,  $Yd$  is nominal disposable income,  $R$  is rate of return on the marginal financial asset and  $p$  is expected inflation. We would expect  $\partial c / \partial (W/P) > 0$ ,  $\partial c / \partial (Yd/P) > 0$ ,  $\partial c / \partial R < 0$  and  $\partial c / \partial p > 0$ .

Based on the stylized facts discussed in the previous section, we hypothesize that the level of financial wealth should be a significant determinant of a consumption decision for two reasons. First, most households were likely to be restricted by credit rationing. Hence they only could smooth their consumption path by reducing their financial wealth when real disposable income fell during transition. Second, they were affected by several significant exogenous shocks. Specifically, each transfer of voucher shares expanded the level of wealth. The stylized facts suggest that a part of the newly gained wealth was cashed and consumed. We include the interest rate on term deposits as a rate of return on a marginal asset (together with expected inflation) in order to evaluate the potential scope for monetary policy to neutralize the impact of shocks to wealth. Term deposits were chosen as the marginal asset since their returns have always dominated those of the other assets and since households maintained the share of term deposits in wealth even after introduction of voucher shares. As a result, we have got a consumption function analogous to what is suggested in Hendry, Muellbauer and Murphy (1990).

In the second stage, households determine the structure of their financial portfolio according to rates of return on available assets. Similarly to the first stage decision, portfolio decisions are affected significantly by the transitional strategy of the authorities. We search for a model capturing the following features of a transitional economy: (i) prior to time  $T$  households could diversify their portfolio only across the relatively homogenous group of monetary assets (deposits), (ii) at time  $T$ , the new financial asset was introduced via the voucher privatization scheme allowing for households to diversify portfolio across larger and more heterogeneous group of assets, and (iii) since time  $T$ , financial wealth of households has been increased in several waves of transfers.

In our previous study Allen, Šmídková (1996) we applied an envelope theorem to the Almost Ideal Demand system in order to derive a constant parameter demand system which is robust to this type of financial innovation. The system approach for estimating asset demands has been extensively used due to improved efficiency in estimation and straightforward interpretability. Barr and Cuthbertson (1991, 1994) and Dinenis and Scott (1992) provide recent applications. To account for the progressive introduction of voucher shares, we have made use of an envelope relationship from duality theory. Assume that households' asset demand behavior can be characterized by a cost function, the minimum cost of obtaining a given level of asset utility, given the set of rates of return (or their reciprocals seen as prices). Household utility is given by the same underlying preferences over the whole period. However, prior to the introduction of voucher shares, it is characterized by a restricted cost function, because of non-availability of voucher shares. The envelope theorem allows us to explicitly link the parameters of the restricted and non-restricted cost functions by deriving the shadow price of the non-available shares. Although, in a general case, it has been found difficult to derive closed form solutions to such a problem using flexible functional form such as Almost Ideal Demand system, in the case of a zero restriction, we were able to derive a particularly simple relationship between asset demands prior to an after the introduction of voucher shares.<sup>9</sup> Specifically, the restricted demand shares equation can be written in the following form (for  $k \neq i$ ):

$$(2) \quad s_k^R = (a_k - a_i \cdot \frac{g_{ki}}{g_{ii}}) + \lambda \frac{(g_{kl} - g_{il} \cdot \frac{g_{ki}}{g_{ii}})}{\alpha_i} \cdot \ln p_l,$$

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<sup>9</sup> We take a homothetic AIDs cost function in a standard log form:  $\ln C(u, p) = a_0 + \sum_k a_k \cdot \ln p_k + 1/2 \cdot \sum_k \sum_l g_{lk} \cdot \ln p_k \cdot \ln p_l + u$ .

From Shephard's lemma, the unrestricted compensated demand functions for budget shares take the form:  $s_k = a_k + \sum_l g_{lk} \cdot \ln p_l$ .

Hence by inversion, we can derive the shadow price for a zero budget share of the restricted  $i$ th asset:  $\ln p_i^* = -g_{ii}^{-1} \cdot (a_i + \sum_{l \neq i} g_{li} \cdot \ln p_l)$ .

where the unavailable asset is indexed with  $i$ ,  $s_k^R$  is a restricted share of  $k$ th asset in the financial wealth,  $a$  and  $g$  are parameters of the almost ideal demand system and  $p_i$  is a price of the  $i$ th asset defined as  $(1+R_i)^{-1}$  with  $R_i$  being rate of return on the  $i$ th asset.

Hence we are able to relate these restricted demands to unrestricted demands and express the demand functions over the whole period by the formula:

$$(3) \quad s_k^R = (a_k - \delta \cdot a_i \cdot \frac{g_{ki}}{g_{ii}}) + \frac{\lambda}{l \alpha_i} (g_{kl} - \delta \cdot g_{il} \cdot \frac{g_{ki}}{g_{ii}}) \cdot \ln p_l,$$

where  $d$  is a dummy variable equal to one prior  $T$  and equal to zero from period  $T$  onwards.

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## 4. The Econometric Results

For the purposes of estimation, we use two monthly data sources: the Balance of Income and Expenditures of Households and the Monetary Survey. Our sample going from December 1991 to March 1995 covers both the pre-privatization period as well as the one of the first wave of voucher privatization. There are several assumptions we have made. Price expectations are adaptive. This seems to be a plausible assumption for a transition period in which households had to accommodate large institutional as well as economic changes in a very fast sequence consequences of which were difficult to predict. We approximate the rate of return on voucher shares by capital gains as implied

by the Index of the Czech National Bank for the Prague Stock Exchange.<sup>10</sup> We construct the rate on deposits in foreign currency as rate of return with the zero exchange-rate risk.<sup>11</sup> We neglect that difference between taxed and untaxed rates of return.<sup>12</sup> We define term deposits as net term deposits (term deposits minus credits given to households).

We estimated the models of both the first-stage and the second-stage decisions of households. In general, we followed a methodology developed in Hendry (1995) for estimating dynamic systems. Note that our assumption that share prices and inflationary expectations are adaptive and the fact that the crown was credibly fixed against a basket of foreign currencies allow us to avoid the complications of rational expectation models. We investigated the stationary properties of the data set by performing tests for the main forcing variables in the model which are relative prices of financial assets. Although the assets prices are themselves non-stationary, there was some evidence that the normalized series were stationary. Test lag selection procedure was on the basis of Breusch-Godfrey LM test for up to third-order autocorrelation. The results for narrow money price relative to deposit price was  $ADF(1) = -4.224$  ( $LM(3)=0.198$ ) and for similarly normalized foreign currency price  $ADF(1) = -6.853$  ( $LM(3) = 1.162$ ). The econometric estimates of the consumption function of the Czech households are presented in Table 1.

From the reported estimates we are able to derive two conclusions. First, there seems to be a significant impact of a wealth variable in the estimated consumption functions which does not depend on a selected type of dynamic

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<sup>10</sup> We are aware of the fact that it is only approximations since the majority of trading with voucher shares took place outside the official markets. Our argument is that households did not have access to unofficial market with large block of shares. We did not include dividends into our model since they were both insignificant and difficult to observe in the first years of transition.

<sup>11</sup> We weighted rate on DM deposits by 65% and the rate on \$ deposits by 35% in accordance with the definition of a basket peg of the Czech crown.

<sup>12</sup> It was not possible to define after tax return for sale of voucher shares. While capital gains and dividends were taxed by 25%, the capital gains from the first sale of the voucher shares were not taxed at all (interest earnings from all monetary assets were taxed by 15%).

form of the model. Hence the first-stage decision of households was likely to be influenced by any significant increase in financial wealth. According to our model, asset transfers to the hands of households (such as were implied by voucher privatization) tend to expand consumption of households at least temporarily. Second, on one hand, the impacts of increase in real income and wealth on consumption are of a similar magnitude. The estimated income elasticity was 0.42 for error-correction model. The wealth elasticity was estimated 0.58. On the other hand, the estimated real interest rate semi-elasticity was not very high (-4.97). This implies that in order to neutralize the effect of an increase in real wealth on consumption of households, *ceteris paribus*, either real disposable income need to be reduced by a percentage rate approximately equal to the rate of a wealth increase or real interest rate need to be increased by several percentage points.<sup>13</sup>

**Table 1**

**The Error-correction Model of Consumption Function**

	<b>Coefficient</b>	<b>Std. Error</b>	<b>T-Statistic</b>
$\chi_1$	-0.445	0.174	-2.563
$\chi_2$	-0.492	0.139	-3.543
$\chi_3$	0.421	0.210	2.001
$\chi_4$	-4.967	1.986	-2.501
$\chi_5$	0.680	0.080	8.543
$\chi_6$	0.366	0.206	1.774

**Note:** After following the general-to-specific approach, the model was finally estimated in this form:  $\Delta c = \chi_1 + \chi_2 \cdot \{c - \chi_3 \cdot y - (1 - \chi_3) \cdot w - \chi_4 \cdot (R - p)\}_{-1} + \chi_5 \cdot \Delta y + \chi_6 \cdot \Delta w$ , where  $c$  is logarithm of real consumption of households,  $y$  is logarithm of real disposable income,  $w$  is logarithm of real financial wealth,  $R$  is interest rate on termed deposits and  $p$  is inflation rate. Sample: 1992:02 1995:03. Statistics: Adjusted R-squared 0.737, S.E. 0.057, Sum squared resid 0.104, Durbin-Watson stat 1.954.

The empirical model of the second-stage decision of households during which their financial portfolio is formed was derived according to the

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<sup>13</sup> Although the ex post shock to real financial wealth was much smaller than ex ante nominal shock, it can be still approximated by 5-10% increase of real wealth in the first wave.

methodology explained in the previous section. In our empirical work, we have found that a partial adjustment mechanism was adequate to characterize all empirical dynamics. Because of singularity in the error terms, we dropped out equation for share of term deposits. The parameters of this equation can be fully derived from those of the estimated equations as discussed in Anderson and Blundell (1982) and Allen and Urga (1995). We estimated the demand share equations in the following form:

$$(4) \Delta S_t = K \cdot (S_t^* - S_{t-1}) + e_t,$$

where  $S_t$  is a  $(n-1) \times 1$  vector of shares of financial assets in financial wealth,  $e_t$  is a  $(n-1) \times 1$  vector of standard error terms and  $K$  is a  $(n-1) \times n$  matrix of adjustment coefficients.  $S_t^*$  is a  $(n-1) \times 1$  vector of optimal shares defined as  $A \cdot x_t$ , where  $A$  is a  $(n-1) \times n$  matrix of long run coefficients and  $x_t$  is a  $n \times 1$  vector of  $[1, p]$  ( $p$  is a vector of the logs of relative prices).

Table 2 presents the estimated parameters<sup>14</sup> that are despite the short sample period reasonable well determined and are consistent with the postulates of demand theory. Hence we were able to define the demand system with constant coefficients consistent with empirical evidence. The empirical results can be summarized as follows. A vector of constant shares of financial assets in the wealth approximates what the long-run shares would be if no change in relative prices took place. Interestingly, while shares of all monetary assets are significant (and have the expected signs), the portfolio share of voucher shares is not significantly different from zero. One can argue that the zero restriction on supply of voucher shares was not binding for households' demand for financial assets, and that the newly introduced voucher shares were in this sense oversupplied. Even after voucher privatization took place, households as "conservative" portfolio makers continued to store their financial wealth in the form of deposits. In this context, it is worth analyzing which assets served as substitutes for voucher shares.

Table 3 reports the relevant interest-rate and price (semi)-elasticities implied by our econometric estimates. Own-return interest rate semi-elasticities

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<sup>14</sup> The more detailed analysis of econometric results was provided in our previous study Allen, Šmídková (1996).

are around 2 for narrow money and term deposits and around unity for deposits in foreign currency and voucher shares. These are somewhat lower than elasticities commonly found for market economies,<sup>15</sup> but this may not be surprising since there was a very much smaller range of assets available to households in the Czech Republic. A very interesting set of elasticities of substitution emerges. Term deposits are a substitute for every other asset, with narrow money being the closest substitute. Narrow money is the main both gross and net substitute to term deposits. Income and substitution effects of a rise in narrow money returns cancel each other in the case of deposits in foreign currency and voucher shares. The intriguing net complementarity of voucher shares and foreign currency deposits appears to be mostly due to income effects, the compensated substitution effect between the two is zero. In summary, a rise in relative price of voucher shares that came next to the voucher privatization scheme was accommodated by an increase in the share of term deposits.

**Table 2**

**Estimated Parameters of a Demand System**

Parameter	Estimate	Standard Error	t-Statistic
<b>Constant Shares</b>			
$\alpha_L$	.469	.024	19.896
$\alpha_F$	.144	.210	68.508
$\alpha_V$	-.029	.041	-704
<b>Price Share Elasticities</b>			
$\gamma_{LL}$	-.423	.198	-2.144
$\gamma_{LF}$	-.004	.007	-500
$\gamma_{LV}$	-.018	.024	-734
$\gamma_{FF}$	-.005	.002	-2.268
$\gamma_{FV}$	-.011	.004	-2.536
$\gamma_{VV}$	-.028	.035	-786
<b>Adjustment Parameters</b>			
$K_{LL}$	.796	.085	9.313
$K_{LF}$	.033	.100	.328

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<sup>15</sup> In the study of Barr and Cuthbertson (1991) the elasticities are reported from 3 to 6.

$K_{LV}$	.478	068	6.992
$K_{FL}$	-.048	041	-1.192
$K_{FF}$	.083	025	3.291
$K_{FV}$	-.057	028	-1.990
$K_{VL}$	-1.509	178	-8.467
$K_{VF}$	-3.807	537	-7.095
$K_{VV}$	-1.113	166	-6.712

**Note:** Estimated by maximum likelihood. Log of Likelihood Function: 475.428. Sample: 1992:01 1995:03. The parameters are defined as follows:  $\alpha_k$  is a long-run parameter of a  $k$ th financial asset's share in wealth.  $\gamma_{kl}$  is a long-run parameter of elasticity of demand for  $k$ th asset with respect to a relative price of  $l$ th asset.  $K_{kl}$  is a short-run parameter of adjustment of  $k$ th asset's share to adisequilibrium on the market with  $l$ th asset.  $L$  stays for narrow money,  $F$  for foreign deposits and  $V$  for voucher shares.

**Table 3**

**Interest Rate Semi-Elasticities and Compensated Price Elasticities**

	<b>Narrow Money</b>	<b>Deposits in Foreign Currency</b>	<b>Voucher Shares</b>	<b>Term Deposits</b>
<b>Interest Rate Semi Elasticities</b>				
Narrow Money	2.09 (4.11)	0.01 (0.50)	0.05 (0.78)	-1.15 (-2.13)
Deposits in Foreign Currency	0.03 (0.50)	1.05 (49.00)	0.10 (2.54)	-0.18 (-3.17)
Voucher Shares	0.18 (0.73)	0.11 (2.54)	1.28 (3.59)	-0.57 (-3.37)
Term Deposits	-1.10 (-2.13)	-0.05 (-3.17)	-0.14 (-3.37)	2.29 (4.49)
<b>Compensated Price Elasticities</b>				
Narrow Money	-1.71 (-3.35)	0.05 (0.84)	0.10 (5.46)	1.56 (2.88)
Deposits in Foreign Currency	0.21 (0.84)	-1.18 (-3.31)	-0.00 (-0.004)	0.98 (5.75)
Voucher Shares	0.35 (5.46)	-0.00 (-0.004)	-0.94 (-43.85)	0.58 (10.29)
Term Deposits	1.49 (2.88)	0.24 (5.75)	0.16 (10.29)	-1.88 (-3.70)

**Note:** Interest rate semi-elasticities and compensated price elasticities are evaluated at sample means.  $t$ -statistics in brackets.

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## **5. Implications for Macroeconomic Policy**

This section tries to illustrate results of our empirical analysis of behavior of households within the standard Mundell-Fleming model for a small open economy as summarized for example in Gandolfo (1987). Then the implications for economic policy are summarized. In order to depict the short-term consequences of voucher privatization, we make two assumptions

corresponding to stylized facts and empirical findings. First, during the implementation of the voucher privatization scheme, demand for money by other sectors is relatively stable while demand for money by households is affected by an increase in wealth due to portfolio motives. Unless the process is accommodated by the central bank, the domestic interest rate is likely to be pushed up during the adjustment process. Secondly, government consumption and investment are not affected by the voucher privatization scheme on a scale comparable to the impact on the consumption of households. Specifically, Ricardian equivalence does not hold. Hence after the transfer of voucher shares to the hands of households government consumption is not reduced adequately to adjust the fall in assets. We determine the equilibrium real exchange rate and output by expressing internal and external balances in two equations:

$$(5) \text{ RR: } c(Yd, W, 1/P, r) + D = Y$$

$\partial c/\partial Yd > 0$ ,  $\partial c/\partial W > 0$ ,  $\partial c/\partial (1/P) < 0$ ,  $\partial D/\partial r < 0$ , where  $c$  is real consumption of households,  $Yd$  is nominal disposable income of households,  $W$  is their nominal financial wealth,  $1/P$  is real exchange rate (note that due to a fixed exchange rate regime and relatively stable foreign prices it is possible to substitute an inverse domestic price level for real exchange rate),  $r$  is domestic real interest rate,  $D$  is real demand by other sectors (government consumption, investment and exports) and  $Y$  is real output.

$$(6) \text{ BB: } ca(Y, e) + ka(M/W, R^* + \rho) = \kappa$$

$\partial ca/\partial Y < 0$ ,  $\partial ca/\partial e > 0$ ,  $\partial ka/\partial (M/W) < 0$ ,  $\partial ka/\partial (R^* + \rho) < 0$ , where  $ca$  is current account (due to assumptions of stable foreign prices and fixed exchange rate real and nominal units coincide),  $e$  is real exchange rate ( $e=1/P$ ),  $ka$  is capital account,  $M/W$  is a ratio of monetary to total financial wealth held by households,  $R^*$  is foreign interest rate and  $\rho$  is a proxy for country risk (including exchange rate risk) and  $\kappa$  is external position targeted by authorities.

We start in the short-run equilibrium  $E_1$  (See Figure 5). According to our empirical findings, voucher privatization moves, ceteris paribus, the RR schedule to the right ( $RR_1 \rightarrow RR_2$ ) due to a significant impact of real financial wealth on consumption of households. As far as the external balance is concerned, the impact of voucher privatization depends on the elasticity of capital flows to domestic interest rates. Specifically, if the capital mobility is high, the voucher privatization tends to attract capital inflows at least temporarily. In

this case, the BB schedule shifts to the right ( $BB_1 \rightarrow BB_2$ ), and the new short-run equilibrium is at  $E_2$ .

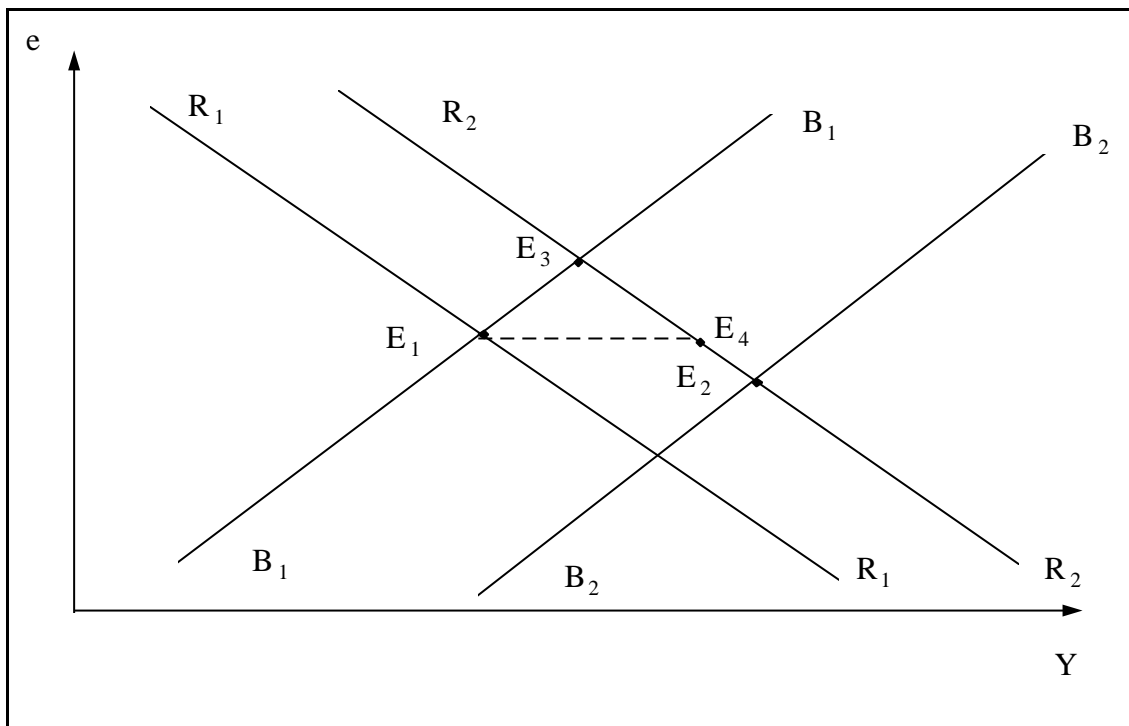
If there are restrictions on capital account operations and consequently low capital mobility, the BB schedule does not move, and the new short-run equilibrium is at  $E_3$ . Note that the sensitivity of capital flows to voucher privatization does not depend only on the level of domestic currency convertibility. It also depends on characteristics of an emerged equity market. Specifically, if newly introduced voucher shares are not attractive to foreign investors (e.g. due to the low transparency of the market) and the liquidity of the equity market is low, the size of transfer is reduced rapidly by a fall in prices on the stock exchange. Consequently, the ratio of monetary to total financial wealth returns to its pre-privatization level.<sup>16</sup>

**Figure 5**

**Consequences of Voucher Privatization:  
A Partial Analysis of Behavior of Households**

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<sup>16</sup> If households do not change their demand for shares during transition, each privatization wave is likely to push prices of shares down unless there is a demand from other sectors. According to the Czech experience analyzed in Smidkova (1996), households are net seller of voucher shares (foreign and banking sectors being net buyers).



**Note:** An increase in  $e$  means real depreciation.

In the first case, the new short-run equilibrium ( $E_2$ ) brings higher output and real appreciation of domestic currency. In the case of a fixed exchange rate, the domestic currency is undervalued. The economy adjusts to the new equilibrium with domestic inflation and can run a current account deficit (eg. at  $E_4$ ). In the case of a more flexible exchange rate regime, the nominal exchange rate would adjust by appreciation. In the second case, the new short-run equilibrium ( $E_3$ ) brings higher output too. However, domestic currency is overvalued. There is a real depreciation of a currency either by downwards adjustment of domestic prices (together with a balance of payments deficit) under a fixed-exchange rate or by nominal depreciation of currency under more flexible regime. This implies that the consequences of voucher privatization are similar to those of fiscal expansion in the case of low capital mobility while in the first case they correspond to outcome of a policy mix of fiscal expansion and monetary contraction. The Czech experience seems to fit to the scenario with high capital mobility (See Table 4).

**Table 4****Czech Economic Indicators: Years of Voucher Privatization**

	<b>1993</b>	<b>1994</b>	<b>1995</b>
Real Output	-0.9%	2.6%	4.8%
Consumption of Households	2.9%	5.3%	6.4%
Government Spending	-0.1%	-2.3%	-4.3%
Current Account to GDP	1.0%	-1.0%	-3.2%
Capital Account to GDP	8.0%	7.0%	16.5%
Voucher Shares to GDP	19.0%	17.0%	37.0%
Inflation (CPI)	21.0%	10.0%	9.5%
Nominal Exchange Rate (CZK/DEM)	17.64	17.75	18.50

**Data Source:** Annual Report, 1995, Czech National Bank.

**Note:** The reported ratio of voucher shares to GDP was equal to zero in 1992.

In summary, the voucher privatization scheme may have implications for macroeconomic policy. Transfers of voucher shares have impact on both stages of allocation decisions of households. In the first stage, households use it to overcome a liquidity constraint and they increase their consumption of goods. Hence there is a potential demand pressure on the current account balance. In the second stage, households adjust their financial portfolio using broad money as substitute for voucher shares. Consequently, there is a potential danger of short-term capital flows, and inflation pressure.

What are the policy options? The first option is to keep the exchange rate fixed and let the adjustment process to restore internal and external balances without changes in monetary or fiscal policy. However, there are some costs involved that may make this approach unfeasible. Specifically, in the case of low capital mobility caused either by restricted convertibility or by restricted access of foreign investors to the equity market, foreign reserves need to be high enough to cushion temporary external deficit (the adjustment might be very fast if the transfer of vouchers shares loses its purchasing power rapidly). With capital mobility, the medium-run consequences are ambiguous since they depend on the persistence of capital inflow. On one hand, inflationary pressure of capital inflows may be difficult to overcome due to the costs of sterilization policy by the

central bank. On the other hand, the economy builds up foreign reserves allowing it to handle a overvaluation of the currency.

Regardless of the degree of capital mobility, the most adequate policy response in the case of a fragile external position of economy is restrictive fiscal policy. Following a voucher privatization scheme, a balanced budget may not be enough to protect economy from demand-push imbalances; a fiscal contraction should be adequate to outweigh the size of the transfer. However, it is usually the central bank who is responsible for external and internal stability of domestic currency. The bank can employ restrictive monetary policy to restore balances, but the success of this strategy is limited by capital mobility as well as sensitivity of consumption to interest rates. With low capital mobility, the chances are higher since higher interest rates would not attract speculative flows. Nevertheless, empirical results suggest that an increase in interest rates necessary to neutralize the impact of voucher transfer might be too costly for the central bank due to potential recession costs. With capital mobility, the possibilities of monetary policy are much more limited. If there is no room for fiscal or monetary contraction, the only remaining option for the policy makers is to change the exchange rate regime. Specifically, broadening bands around central parity seem to have two advantages. First, it can speed up the adjustment process by nominal depreciation in the case of low capital mobility or appreciation in the case of high capital mobility leaving less room for depletion of foreign reserves or inflationary pressure. Second, in the case of high capital mobility, capital flows are likely to play a role of short-term adjustment mechanism. Thus the broad band allowing for exchange rate fluctuations seem to be superior to a simple revaluation of central parity.

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