Consumption Behaviour and Persistently High Inflation: Evidence from Latin America*

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A major difficulty in estimating consumption functions when prices are not fixed is the perverse effect of inflation on private consumption behaviour. This paper examines an Euler equation-type consumption function to analyse consumption behaviour in a context of persistent high inflation. The paper examines how widespread backward-looking indexation and/or partial or total currency substitution in the case of dollarisation affect private consumption behaviour. Widespread indexation and/or dollarisation are expected to create a type of insurance against adverse investment outcomes. This leads to *ex post* efficient risk allocation and provides an important mechanism for smoothing consumption in the presence of uninsurable income shocks, such as inflation surprises. Latin American data is used in this paper due to the recent history of chronic inflation in the region.

Este artigo analisa o comportamento do consumo num contexto de inflação alta e persistente. Investigamos como a ampla indexação de preços e/ou a substituição total ou parcial de moeda afetam o comportamento do consumo privado em casos de dolarização. A indexação e/ou a dolarização tendem a criar um tipo de seguro contra choques adversos, o que tende a gerar uma alocação eficiente de risco *ex post* e a constituir um mecanismo importante para suavizar o comportamento do consumo na presença de choques, tais como surpresas inflacionárias. Foram usados dados para a América Latina em função de sua recente experiência com processos inflacionários crônicos.

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1. Introduction

A major difficulty in estimating consumption functions when prices are not fixed is the perverse effect of inflation on private consumption behaviour. The ratio of consumption to observed disposable income may rise in periods of high inflation because, as inflation rises, nominal interest rates rise thereby inflating the interest-bearing component of personal income (Siegel, 1979; Hendry & von Ungern-Sternberg, 1981). If inflation-induced capital losses in non-interest-bearing assets are not accounted for, personal income is, therefore, perceived as higher than observed income. This leads to excess sensitivity of consumption to changes in current, rather than permanent, income. These wealth effects tend to outweigh the corresponding intertemporal substitution effect, which would encourage consumers to divert resources away from consumption towards saving.

Alternatively, even if the wealth effects above are not too strong, in high-inflation economies, consumption hikes are likely to occur in the aftermath of stabilisation programmes. This is explained on the grounds that a fall in nominal interest rates, given the fall in inflation, reduces the relative value of current consumption with respect to future consumption (Reinhart & Vegh, 1995). In this case, the intertemporal substitution effect due to a temporary fall in the nominal interest rate outweighs the wealth effect described above. However, if the intertemporal elasticity of substitution is low, which is the case in most developing countries, the fall in the nominal interest rate has to be significantly high for the intertemporal substitution effect to outweigh the wealth effect.

Lucas (1976) points out that, under the rational expectations/permanent income hypothesis (RE-PIH), there is no structural relationship between private income and consumption. Consumption follows a random walk, and changes in consumption are unforecastable. Hall (1978) argues that the RE-PIH implies that only surprises in permanent income should affect current consumption. In the consumption capital asset pricing (CCAP) literature (Merton, 1971; Lucas, 1976; Mehra & Prescott, 1985), the sensitivity of consumption to changes in current, rather than permanent, income depends essentially on capital market imperfections affecting optimal portfolio allocations, and hence financial wealth. Limited access to capital markets prevents an optimal allocation of risks, as households cannot smooth consumption through

the life-cycle. The literature suggests that the degree of consumption volatility depends, among other things, on asset returns and risk premia (Mankiw & Zeldes, 1991), precautionary demand for savings (Heaton & Lucas, 1992), habit formation (Constantinides, 1986; Ingersoll Jr., 1992), and labour income uncertainties (Zeldes, 1989; Weil, 1992).

In this paper, we derive an Euler equation-type function to analyse consumption behaviour in a context of persistently high inflation. In particular, we examine how widespread backward-looking indexation and partial (or total) foreign currency substitution in the case of dollarisation affect private consumption behaviour (Sargent, 1977; Sargent & Wallace, 1973). The reason for focusing on the two cases above is twofold. First, if inflation is persistently high, with widespread indexation and/or dollarisation, a significant share of personal wealth is stored in indexed and/or foreign currency-denominated assets, rather than non-interest bearing and/or domestic currency-denominated assets. Second, widespread indexation and/or dollarisation are expected to create a type of insurance against adverse investment outcomes, which leads to *ex post* efficient risk allocation. This may provide an important mechanism for smoothing consumption in the presence of uninsurable income shocks, such as inflation surprises. However, full insurance against inflation-related income shocks are not without consequences. More persistent shocks have greater impact on permanent income and hence consumption. Also, by reducing inflation-induced capital losses, full insurance generates wealth effects which may explain the rise in private consumption in periods of rising inflation.

We use Latin American data due to the recent history of chronic inflation in the region. An additional factor that motivates our paper is the process of economic integration in Latin America in recent years with the advent of regional customs union agreements such as Mercosur (Brazil, Argentina, Paraguay, Uruguay, and now Bolivia and Chile as associate members), Nafta (Mexico, USA and Canada), and the Andean Pact. Consolidating economic integration in the region calls for a better understanding of cross-country consumption behaviour such that the impact on consumption of income-related external shocks can be fully assessed. A better understanding of consumption behaviour in the region is crucial to ensure effective policy co-ordination and harmonisation.

The paper is organised as follows. Section 2 contains the derivation of the theoretical model and the basic theoretical findings. Section 3 presents the testable hypothesis derived from the theoretical model and panel data analysis. Section 4 contains time series analysis, and section 5 concludes.

2. The Model

A unifying framework to study consumption behaviour is provided by the following conventional infinite-horizon representative agent set-up:

$$(P) \qquad \max E_t \int_0^{\infty} e^{-\rho t} u[c(t)]dt$$

$$\text{s.t. } \dot{W}(t) = \sum_i s_i r_i W(t) - c(t)$$

$$W(0) \geq 0$$

where:

ρ and r_i are respectively the rate of time preference of the utility maximiser and the rate of return on investment in asset i;

E_t is the expectations operator at time t;

$c(t)$ is private consumption;

$W(t)$ is non-human[1] private wealth;

s_i is the share of asset i in total private wealth.

It is assumed that the utility function is concave and additively time-separable, there is a finite number of tradeable assets, and there are no *a priori* short sales or borrowing constraints. All households are stockholders, such that the consumption pattern of the representative household is determined primarily by financial investment decisions (Hansen & Singleton, 1983; Bean, 1986). Letting $u[c(t)] = \ln c(t)$, for simplicity, and taking account of the

[1] *The consideration of human and non-human wealth would shed more light on the consumption/labour supply nature of consumption functions but divert attention from the asset pricing aspects we want to address.*

transversality conditions, the rate of growth of consumption associated with problem (P) is:

$$\overline{g}_c \equiv \frac{E_t \dot{c}_j^i(t)}{c_j^i(t)} = \sum_i s_i r_i - \rho \tag{1}$$

Equation (1) is an Euler equation-type consumption function. If negative consumption is to be avoided, the returns on assets holdings have to exceed the rate of time preference of the utility maximiser (Hall, 1978, 1989; Turnovski, 1995).[2]

Using the intertemporal constraint in problem (P), private consumption can be written as:

$$c(t) = \dot{W}(t) - \sum_i s_i r_i W(t) \tag{2}$$

Taking time derivatives of both sides of equation (2) and recalling that, by equation (1), private consumption can also be written as $c(t) = \theta E_t \dot{c}(t)$, where $\theta = (\Sigma_i s_i r_i - \rho)^{-1}$, we obtain:

$$c(t) = \theta E_t \Big[\ddot{W}(t) - \sum_i s_i r_i \dot{W}(t) \Big] \tag{3}$$

The expectation function on the RHS of equation (3) has solution $E_t[W^*(t)] = W^*(t)$, for $W^*(t) = e^{rt}$, such that $c^*(t) = \theta e^{rt} = \theta W^*(t)$, where $r = \sum_i s_i r_i$. Optimal consumption is then a fraction of permanent income or wealth, which grows at rate r. Because the relationship between private consumption and wealth depends on asset returns, deviations from the optimal consumption path may be attributed to capital market friction, such as imperfect cross-asset mobility, liquidity constraints, and credit rationing (Hall, 1978; Flavin, 1985; Campbell & Mankiw, 1991; Jappelli & Pagano, 1989). In all cases, consumption volatility is increased, since households may not be able to smooth consumption through time by changing the composition of their portfolios in line with changes in asset returns. In any case, private consumption may deviate from the benchmark case defined by $c^*(t)$. As a result, a deviation, or error-correction, term can be defined as $c(t) - c^*(t) = \nu(t)$ or, alternatively, $c(t) - \theta W^*(t) = \nu(t)$.

[2] *For a survey on the application of the Euler-equation approach to developing country data, see Reinhart & Vegh (1995).*

3. Data and Empirical Results

3.1 The hypotheses

Rather than using equation (1) as our basic estimating equation, we have opted for using an error-correction framework to estimate deviations from the benchmark case in equation (3), given $c(t) - \theta W^*(t) = \nu(t)$. If $\nu(t)$ is statistically significant and correctly signed, there is evidence of significant deviations from the benchmark case. In this respect, the error-correction term should not be interpreted as a disequilibrium term, but rather as an excess-volatility term or, alternatively, as a measure of the difference between observed and perceived income. A statistically significant ECM term would suggest that the difference between perceived and observed income is an important determinant of private consumption behaviour. Because permanent income (or wealth) is hardly measurable, we construct a proxy for $\theta W^*(t)$ as the (log of) real income "perceived" by consumers, which, in our context, is national income multiplied by the equity premium; that is, the ratio of the interest rate paid on equity and bonds (Hendry & von Urgen-Sternberg, 1981).

As for the portfolio of the representative consumer, we focus on:

a) government bonds, as the main domestic interest-bearing asset;

b) monetary or non-interest-bearing assets;

c) foreign currency holdings.

The rates of return of each of these assets are, respectively, the rate of interest paid on government bonds, the rate of inflation (as a measure of the capital losses associated with holding non-interest-bearing assets), and the parallel exchange market premium.[3] Holding foreign currency-denominated or interest-bearing assets, instead of non-interest-bearing assets, provides an insurance mechanism against domestic price or income shocks.

In what follows, we focus on 17 countries in Latin America that experienced spells of high inflation in the 70's and 80's. These countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru, Uruguay, and Venezuela. The variables are defined in logarithms and in

[3] *For further analysis of the bahaviour of foreign exchange markets in selected Latin American countries, see Mello Jr. & Carneiro (1997).*

real *per capita* magnitudes. The source of the data is the IMF's International Financial Statistics.

Visual inspection of the ratio of consumption to income and inflation patterns of some of the countries in the sample reveals some interesting features. Figure 1 graphs the consumption/income ratio against the log of inflation for selected countries. Almost invariably, the consumption/income ratio rises concomitantly with inflation.[4] This is particularly evident in the cases of Paraguay, Uruguay, Venezuela, Bolivia (until the stabilisation programme of the mid-80's), and Mexico (since the early 80's). The consumption ratio does not seem to trail behind inflation in the case of Peru. Some consumption volatility is also observed in most countries, with the exception of Brazil and, to a lesser extent, Argentina and Mexico, since the early 80's. As a result, despite persistent inflation, the latter countries seem to have been able to smooth consumption fairly effectively. This pattern confirms our intuition on the importance of wealth effects in the presence of indexation and/or foreign currency substitution.[5] Figure 1 also seems to corroborate recent claims that both the theoretical derivation and econometric form of the aggregate consumption function are far from being settled (Blinder & Deaton, 1985).

3.2 Panel data models

Panel data analysis is carried out for the period 1972-92. The estimating equation is:

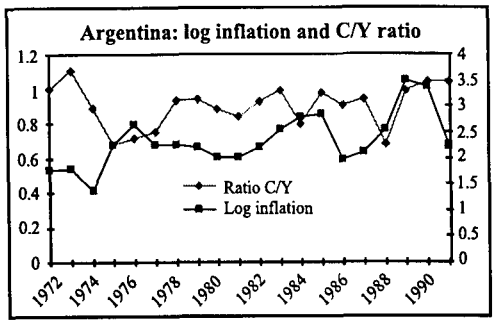
$$c_i(t) = f\left[W_i(t), \Delta p_i(t), \pi_i(t), g_i(t), \nu_i(t-1)\right] \tag{4}$$

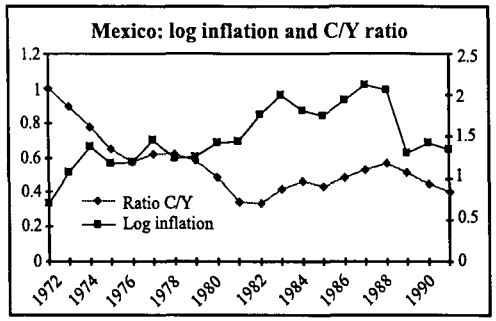
where $\pi_i(t)$ is the foreign exchange premium, $\Delta p_i(t)$ is the inflation rate, $g_i(t)$ is government spending, $\nu_i(t-1)$ is the ECM term, and i indicates the countries in the panel.

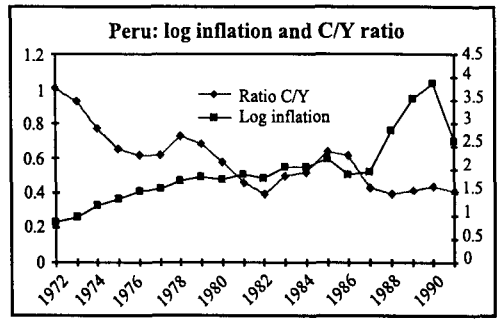
Table 1 contains panel data estimates of our basic equation and compares three different models, with and without the ECM term. In the first two models, all coefficients are statistically significant and present reasonable absolute values. In both models, past changes in consumption (Δc_{t-1}) affect

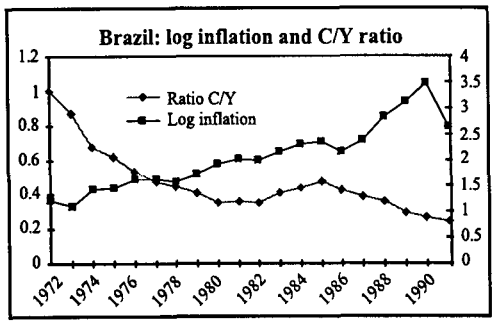
[4] *Reinhart and Vegh (1995) also report a rise in the consumption/income ratio following the implementation of stabilisation programmes in high-inflation economies.*

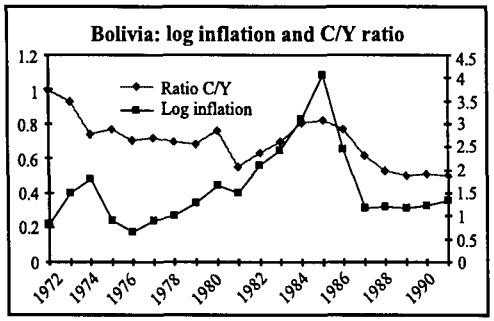
[5] *Faria and Carneiro (1997) and Faria (2000) examine the behaviour of narrow money demand in the presence of indexed money for countries experiencing high inflation and widespread indexation. These papers find a stable long-run demand for money for the case of Brazil by substituting the function of money as a reserve of value by indexed money.*

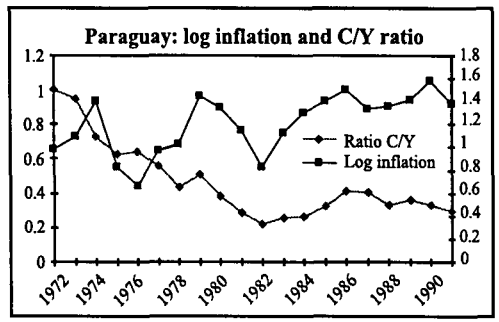

Argentina: log inflation and C/Y ratio
Ratio C/Y
Log inflation

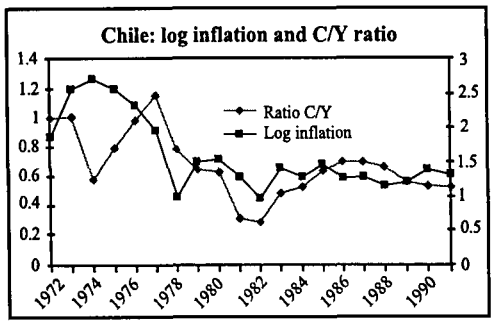

Mexico: log inflation and C/Y ratio
Ratio C/Y
Log inflation

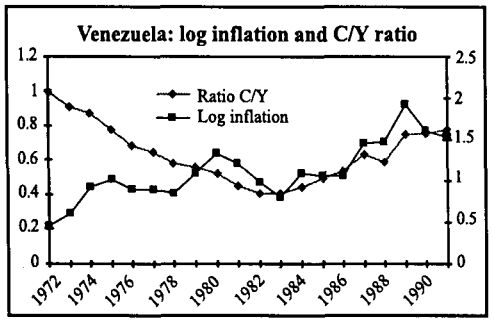

Peru: log inflation and C/Y ratio
Ratio C/Y
Log inflation

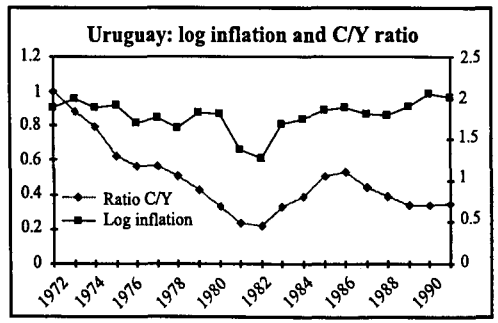

Brazil: log inflation and C/Y ratio
Ratio C/Y
Log inflation


Bolivia: log inflation and C/Y ratio
Ratio C/Y
Log inflation


Paraguay: log inflation and C/Y ratio
Ratio C/Y
Log inflation


Chile: log inflation and C/Y ratio
Ratio C/Y
Log inflation


Venezuela: log inflation and C/Y ratio
Ratio C/Y
Log inflation


Uruguay: log inflation and C/Y ratio
Ratio C/Y
Log inflation

negatively current changes in consumption, characterising the intertemporal substitution effect, as does lagged inflation (Δp_{t-1}). Changes in the foreign exchange premium ($\Delta\pi_t$ and $\Delta\pi_{t-1}$), consumer prices (Δp_t), and price acceleration ($\Delta\Delta p_{t-1}$) affect positively current changes in consumption. This suggests increased volatility of consumption in the case of widespread indexation and/or dollarisation. In general, one should expect the sensitivity of consumption to permanent income (dollar-denominated and/or indexed financial wealth) to be low, the lower the foreign exchange premium and/or the impact of lagged household income, *ceteris paribus*. Typically, this is suggestive of liquidity constraints, credit rationing, and/or capital market friction.

In fact, financial innovation in most Latin American countries facing persistently high inflation has not necessarily been associated with the need to improve efficiency in the commercial banking sector. The motivation has mainly been the need to upgrade existing indexation mechanisms in periods of accelerating inflation and circumvent legal restrictions on indexation contracting in periods of decelerating inflation. An additional factor related to the possibility of liquidity constraints and credit rationing has been Latin America's limited access to foreign capital markets in the 80's, which prevented the usual financing of domestic fiscal and current account imbalances via external borrowing, given the region's traditionally low savings rates.

The model with the ECM term (model 1) performs slightly better than its counterpart (model 2), but there are no significant changes in the remaining coefficients. The overall pattern is therefore consistent with our previous findings. The results suggest that consumers tend to save less in an environment of persistent or accelerating inflation. Model 3 introduces inflation and income surprise variables and presents equations estimated by the instrumental variables method (IV). Inflation surprise is captured by one-period-ahead values of the second derivative of prices ($\Delta\Delta p_{t+1}$). This means that consumers incorporate their predictions on future changes in inflation in their current consumption decisions (which is consistent with RE-PIH arguments). Income surprise ($\Delta\Delta W_t$) is defined by current values of the second derivative of real per capita income, which intends to capture the effect of growing income on consumers' spending behaviour. IV estimates are preferred due to the likely simultaneity of these two variables (Pagan, 1984), and the upward bias in the coefficient of the lagged dependent variable in panel data models (Hsiao, 1986).

Table 1

Panel data models of consumption behaviour in Latin America (with group dummy variables) (OLS estimates – sample: 1972-92)

	Model 1	Model 2	Model 3
Intercept			-2.2316
			(0.179)
Δc_{t-1}	-0.7395	-0.6985	
	(26.825)	(23.427)	
$\Delta\Delta W_t$			0.3973
			(12.274)
$\Delta\Delta p_{t+1}$			-0.0223
			(1.232)
$\Delta\Delta p_{t-1}$	0.0770	0.0987	
	(7.198)	(8.648)	
Δp_t	0.3246	0.3151	
	(20.616)	(18.245)	
Δp_{t-1}	-0.1896	-0.2504	0.0209
	(10.612)	(14.004)	(1.715)
$\Delta\pi_t$	0.2769	0.3051	
	(17.018)	(17.444)	
$\Delta\pi_{t-1}$	0.6146	0.6114	0.0669
	(19.449)	(17.594)	(1.556)
ν_{t-1}	-0.0642		-0.0183
	(8.211)		(4.18)
Adj. r^2	0.890	0.860	0.830
Amemiya criterion	8.714	8.901	9.076
Akayke criterion	0.357	0.430	0.513
RMSE	0.624	0.635	0.734

Note: All variables in logs. Values in parentheses are t-statistics. RMSE is the root mean square error. In model 3, lagged consumption, inflation, and income surprises were treated as endogenous. Instruments used in model 3 include the second lag of consumption, lag 1 and the current level of the inflation surprise variable, and lag 1 of the income surprise variable.

Model 3 fails to accept the inclusion of country dummy variables, which might be viewed as an indication that the countries in the panel present rather similar behavioural patterns. Price and income surprises attracted the negative and positive theoretically consistent signs, respectively, but inflation

surprise is not statistically significant. The ECM term is also negatively signed and suggests that the difference between perceived and observed income is low (ranging from 2% to 5%) in the region. This figure is much higher in the time series estimates presented below. Government spending does not appear significant in any of the specifications.

Lagged inflation (Δp_{t-1}) and lagged changes in the foreign exchange premium ($\Delta \pi_{t-1}$) have positive, significant coefficients. Under the RE-PIH, consumption is not reduced in the presence of inflation or if the premium is increasing. This suggests wealth effects because capital gains are incorporated into indexed and/or dollarised assets, thereby encouraging consumption. The conclusion is reinforced by the large coefficient of the income surprise variable. In this context, the black market premium might be capturing a wealth effect, rather than representing an excess demand for foreign currency.

In the three models, consumption was found to be insensitive to a variety of interest rates. This is not surprising, given that interest rates are scarcely market-determined in most countries in the region. The fact that government spending was found to be statistically insignificant, and was, therefore, eliminated from the three models above, is not suggestive of Ricardian equivalence in the region in the period under examination. Again, the finding is not surprising in the light of the widespread financial repression, limited access to international capital markets in the region in the 80's, and price/wage distortionary non-orthodox policymaking, which was pervasive in the largest economies of the region. In high-inflation economies, widespread indexation and/or dollarisation are expected to affect the underlying dynamics of budget financing (Barro, 1974; Phylaktis & Taylor, 1993; Rogers & Wang, 1993). This is because the persistence of high inflation, and hence widespread indexation and/or dollarisation, tend to reduce the monetary base as a share of GDP. Hence, financing budget deficits via seignorage requires high inflation rates to finance even very small deficits (Taylor, 1977, 1991).

4. Time Series Analysis

Time series analysis is carried out for the period 1966-91 for six countries of the panel (Argentina, Peru, Brazil, Uruguay, Paraguay, and Venezuela). Preliminary time series analysis was conducted on the data using unit root

tests. The results (not reported) show that the growth rates of consumption, prices, income, government spending, and foreign exchange premia for the six countries under examination are stationary around a linear deterministic trend.

If income changes are to have a similar impact on consumption in high-inflation economies, then we would expect the underlying responses of income to consumer spending to be broadly similar across the countries under examination (Carruth et alii, 1995). Ideally, we would like to compare the results of an underlying structural model for the whole region with individual estimates. But whilst our aggregate results obtained with panel data analysis might be suggesting some general applicability of our theoretical framework across the countries in the region, it does not seem that individual country consumption functions are identical. The analysis which follows illustrates this point.

For the time series analysis, we selected six countries that experienced persistently high inflation in the sample period (Argentina, Peru, Venezuela, Brazil, Uruguay, and Paraguay), and investigated two alternative consumption patterns. The differences in the specification of the equations in tables 2 and 3 reflect the particular experiences of each country group. Actually, the equations were initially specified with the same set of regressors, but the variables that were found to be insignificant were dropped and only our preferred specifications are reported. Table 2 reports the time series estimates for Argentina, Peru, and Venezuela, and highlights the role of government spending in determining consumption behaviour. Table 3 presents equations for Brazil, Paraguay and Uruguay, and highlights the role of the foreign exchange premium in explaining consumption behaviour. The Schwarz and the Hanna-Quin criteria defined the number of lags for each variable.

As argued by Charemza and Deadman (1997), if our interest is in the parameters of a short-run equation with an error-correction mechanism, it is essential that the marginal processes for the variables modeled in this short-run equation do not contain the same error-correction mechanism. In this case, weak exogeneity is guaranteed, as well as the robustness of the model. We have performed tests of weak exogeneity for changes in government spending and inflation, due to their possible endogeneity. The tests consisted of including the error-correction term of the conditional models in the marginal models

for these two variables and testing for the significance of the error-correction terms. In both cases, weak exogeneity of government spending and inflation was confirmed.[6]

In table 2, changes in government spending (Δg_t) are highly significant and, except for the case of Peru, are positively related to current changes in consumption per capita (see also the case of Canada in Craigwell & Rock, 1995). This is also consistent with the argument that, in indexed economies, financing public spending through seignorage creates significant wealth effects (Rogers & Wang, 1993). However, the negative coefficient for Peru in the case of lagged changes in government spending (Δg_{t-1}) could be indicating that, in that country, intertemporal substitution or complementarity effects are large enough to outweigh the corresponding wealth effect (Ingersoll Jr., 1992). It could also be the case that indexation is not so widespread or that dollarisation may be a more powerful explanatory factor, given the coefficients of the foreign exchange premia ($\Delta\pi_t$ and $\Delta\pi_{t-1}$). In all cases, the ECM term attracts the theoretically consistent negative sign and the test statistics are fairly favourable, suggesting excessive sensitivity in the cases of Peru and Argentina. In line with Hendry and von Urgern-Sternberg (1981), the significance of the ECM term measures deviations between perceived and observed income and explains the perverse consumption behaviour in the presence of persistently high inflation.

In Argentina and Peru, changes in the foreign exchange premium are negatively associated with changes in consumption per capita, unlike the panel data estimates. The positive coefficient in the panel suggests that the foreign exchange premium reflects less the excess demand for foreign currency, given the international liquidity constraints of most Latin American countries in the 80's and the extent of domestic financial repression, than the wealth effect due to dollarisation in particular countries of the region (Mello Jr. & Carneiro, 1997). Also, Peru and Argentina are notably the two most dollarised economies in the sample, and this might be representing evidence of excess

[6] *There is no general way to build the marginal equation. Following Ericsson et alii (1998), we have specified an autoregressive distributed lag model for each one of the variables and included the error correction term as an additional regressor in the ADL models (the parsimonious model was defined through the Schwarz criterion and had two lags). By means of a simple t-test we confirmed that the error correction term was not significant in these models and this was taken as evidence of weak exogeneity.*

demand for foreign currency. In the case of Argentina, this is even more likely and seems to conform well with figure 1. For the case of Venezuela, the ECM term is not significant and remains within a closer range when compared with the panel data results.

Table 2
Time series consumption behaviour in selected countries:
(OLS estimates – sample: 1972-92)

	Venezuela	Peru	Argentina
Intercept	-0.0093	0.0285	0.1583
	(0.482)	(1.322)	(2.525)
Δc_{t-1}	0.4614	0.8172	
	(4.239)	(2.949)	
Δp_t		0.3962	
		(1.607)	
Δp_{t-1}		-0.5442	
		(2.603)	
ΔW_t	0.4486	0.3962	
	(3.738)	(2.039)	
$\Delta \pi_t$		-0.032	-0.4168
		(0.896)	(2.794)
$\Delta \pi_{t-1}$	0.1415	-0.057	
	(3.734)	(1.404)	
Δg_t	0.1949		0.4311
	(1.947)		(7.907)
Δg_{t-1}		-0.307	0.1842
		(2.718)	(6.111)
$\Delta \nu_{t-1}$	-0.029	-0.419	-1.1822
	(0.334)	(2.87)	(3.822)
LM(1)	2.156	0.423	0.137
ARCH(1)	1.298	0.000	0.787
Normality	0.282	5.443	3.324
Het.	0.891		2.101
Reset(2)	0.202	0.743	1.096
Adj. r^2	0.880	0.990	0.950
D.W.	2.610	2.300	1.700

Note: All variables in logs. Values in parentheses are t-statistics.

Table 3
Time series consumption behaviour in selected countries
(OLS estimates – sample: 1972-92)

	Brazil	Paraguay	Uruguay
Intercept	1.6396	-0.0299	-0.0077
	(2.381)	(0.646)	(0.490)
Δc_{t-1}	-0.44	-0.4108	0.2545
	(2.743)	(1.932)	(1.43)
Δp_t			0.0182
			(1.416)
Δp_{t-1}	5.6824	0.0839	
	(5.262)	(1.81)	
ΔW_t			0.4080
			(4.77)
ΔW_{t-1}	-11.062	0.4686	-0.2674
	(1.858)	(2.206)	(3.493)
$\Delta \pi_t$	-3.1962		
	(1.972)		
$\Delta \pi_{t-1}$	-4.13	-0.1131	0.0219
	(2.996)	(2.117)	(0.427)
ν_{t-1}	-0.7615	-0.0113	-0.0243
	(3.987)	(0.127)	(0.694)
LM(1)	0.107	3.360	0.665
ARCH(1)	2.358	0.048	0.053
Normality	3.383	0.360	1.552
Het.	11.049	0.207	
Reset(2)	1.311	2.316	0.272
Adj. r^2	0.720	0.520	0.780
D.W.	1.990	2.250	2.450

Note: All variables in logs. Values in parentheses are t-statistics.

Also differently signed are the coefficients of lagged changes in consumption in Venezuela and Peru, indicating some hysteresis in consumption in these two countries. Another difference *vis-à-vis* the panel data estimates is that the significance of surprise variables could not be established in the individual time series regressions. In the case of Peru, current changes in inflation affect positively current changes in consumption, but this effect would have been mitigated if inflation had been rising in the previous year. Current changes

in income affect positively consumption in both Venezuela and Peru, but are not found significant for Argentina.

In table 3, Brazil is the only case in which the ECM term is high and significant. The other coefficients for Brazil are also very high, suggesting more complex dynamics and/or the absence of other relevant variables which could not be incorporated in the model. In the case of Paraguay, current changes in consumption are negatively related to lagged changes in consumption, while lagged changes in inflation and income are positively associated with current consumption. In this country, lagged changes in the foreign exchange premium present a negative and significant coefficient, suggesting that any excess demand for foreign currency depresses domestic consumption.

The opposite situation is found for the case of Uruguay, where the coefficient of the foreign exchange premium is positive and statistically insignificant, suggesting significant wealth effects. Also, consumption tends to increase with increasing inflation and income, but, again, this would have been mitigated if income had been growing in the past (as suggested by the negative coefficient of lagged changes in income). It could be argued that the Keynesian consumption hypothesis is mitigated, at least in part, by the RE-PIH. Parameter stability was confirmed for most of the countries by a one-step-ahead Chow test (results of which available from the authors). Argentina and Brazil, however, presented structural breaks in 1988 and 1987, respectively, which might be associated with macroeconomic stabilisation plans and/or monetary reforms.[7]

5. Conclusion

Usual RE-PIH consumption models posit that private consumption depends on permanent income (financial wealth) and that liquidity constraints and capital market friction, such as high transaction costs, labour income risk and short sale or borrowing constraints, may increase the sensitivity of consumption to transitory income changes. It is also known that persistently high inflation leads to perverse consumption behaviour since perceived income may be significantly different from observed disposable income.

[7] *In Brazil, 1987 was the year of the Bresser Plan, which was characterised by very high real interest rates with the aim of slowing down consumption, but which actually had the opposite effect (a clear evidence of a dominant wealth effect).*

In this paper, we show that, in the presence of persistently high inflation, widespread backward-looking indexation and/or total or partial foreign currency substitution via dollarisation lead to consumption volatility. As far as the empirical findings are concerned, if external shocks are to have a similar impact on high-inflation countries in Latin America, we would then require that the underlying consumer spending responses to shocks should be broadly similar. Ideally, we would like to compare the results of an underlying structural model for the whole region with individual country estimates. Against this background, the results of our panel data analysis suggests some general applicability of our theoretical framework across the several countries of the region. However, it does not seem to be the case that individual country consumption functions are identical.

Significant wealth effects due to dollarisation are found in the panel of Latin American countries and in individual time series estimates for the case of Uruguay and Venezuela. On the other hand, in Brazil, Argentina, Peru, and Paraguay, excess demand for foreign currency seems to outweigh the wealth effects of dollarisation. Wealth effects due to indexation are observed in the panel and in individual time series in the case of Brazil, Paraguay, Uruguay, and Peru. The time series results also suggest that shocks across the region are subject to different propagation mechanisms. These results emphasise the complex dynamic and behavioural patterns of key macroeconomic aggregates in high inflation economies. In this context, the implications in terms of economic policy are not straightforward. There is certainly an enormous challenge for the region's consolidating economic integration process.

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