Determinants of the primary and manufacturing shares in GDP and the real exchange rate in Argentina

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Abstract

This paper focuses on the real exchange rate and the sectoral shares. In Argentina, real exchange rate appreciations are caused by productivity improvements in the primary and manufacturing sectors, while real depreciations are generated by additional government spending, terms of trade and debt services. The size of the primary sector increases due to productivity improvements in that sector and additional government spending. Improvements in the terms of trade and the primary and manufacturing sectors productivity and additional government spending diminish the size of the manufacturing sector. The real exchange depreciated by about 37% with an 21% overshooting at the end of 2001.

JEL Classification Numbers: F11, F3, F41, F43, C22

Keywords: Structural real exchange rate, factor productivity, factor endowments, primary and manufacturing goods share in GDP, Dutch disease, cointegration

Resumen

Este trabajo estudia el tipo de cambio real y el tamaño de los sectores transables en Argentina. Encontramos que mejoras de productividad en el sector primario y manufacturero aprecian el tipo de cambio real, mientras que aumentos del gasto público, términos de intercambio y servicios de la deuda lo deprecian. Aumentos en la productividad del sector primario y del gasto público aumentan el tamaño del sector transable. Mejoras en los términos de intercambio, en la productividad de los sectores transables y en el gasto público reducen el tamaño del sector manufacturero. La crisis del 2001 implicó una depreciación real del 37% con un overshooting del 21%.

Clasificación JEL: F11, F3, F41, F43, C22
Keywords: Tipo de cambio real estructural, productividad de los factores, dotación de factores, participación del sector primario y manufacturer en el PBI, enfermedad holandesa, cointegración

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I. Introduction

From the wide variety of characteristics that can reflect the economic structure of a country, this paper focuses on the determinants of the share of the primary and manufacturing goods sector in GDP[1] and their relationships with the real exchange rates. A model for small economies analizes the determinants of the primary and manufacturing shares and their relationship with the real exchange rate. In addition, the theoretical relationships are tested by reference to the Argentinean economy for the period between the third quarter of 1994 to the first quarter of 2011.

In developing economies the real exchange rate - defined as the relative price between tradable and non-tradable goods - is a key variable in determining their economic structure, given that it provides both an incentive for reallocating resources to the tradable sector and, given relative prices of the rest of the world, how productively the home country produces tradable goods.

Due to the scarcity of resources, primary, manufacturing and non-tradable goods producers compete for resources. As a result, sector productivities, terms of trade (relative price between primary and manufacturing goods) and resource endowments determine the relative sector production efficiency and, via their impact on real exchange rates, affect the intra-sectoral composition of an economy by changing the size of their different sectors. In other words, the allocation of resources is driven by the relative sector production efficiency, which in turn is influenced by sector productivities and the relative prices between the different sector of the economy.

A contribution is that in the empirical version of the model, in contrast to a number of recent papers focusing on Argentina, (see, for example, Baldi and Mulder (2004), Falbo and Gaba (2005), Garegnani and Escudé (2005), Montiel (2007), Padua and Mastronardi (2008), Bastourre, et al (2008), Carrera and Restout (2008), and Bello, et al (2010)), the size of the primary sector and manufacturing sectors is determined along the structural real exchange rate .

The remainder of this paper is organized as follows. Section II outlines a general theoretical model, which generates a equilibrium equations for the structural real exchange rate and the shares of the primary and manufacturing goods in GDP. Section III discusses the compilation and construction of the Argentinean data set and its time series properties. Section IV presents the empirical results from the estimated model and Section V offers some conclusions for policy.

II. A General Model

Following the seminal contributions of Swan (1955) and Salter (1959), we assume a world with three goods: two tradable goods and one non-tradable good. Tradable goods consist of *primary goods*, of which the surplus over home consumption is exported and *manufactured goods*, of which the deficiency between home consumption and home production is imported.

Assuming the law of one price holds, the terms of trade (*TT*) are defined as the quotient between the price of the primary goods (P_X) and the manufactured goods (P_M). The price of

[1] Branson et. al. (1998, pp. 5-6) provide a set of macroeconomic variables characterizing economic structure; e.g. variables, export-related variables, export product concentration, market power in world export markets, and financial market development.the sectoral composition of output, shares of investment to GDP, shares of savings and consumption to GDP, shares of government expenditures and revenues to GDP, inflation and money supply, overall trade- and import related variables, export-related variables, export product concentration, market power in world export markets, and financial market development.

non-tradable goods (P_N) are set by the local supply and demand conditions. In addition, structural real exchange rate (q) is defined as the quotient between the price of the tradable goods (P_T) and the non-tradable price, where P_T is a tradable price index equal to $P_T = \delta^{-\delta}(1-\delta)^{(1-\delta)} P_X^{\delta} P_M^{1-\delta}$, δ is the proportion of expenditure in primary goods in the expenditure in tradable goods .

The economy consists of three internally homogenous production sectors: primary (X), manufacturing (M) and non-tradables (N), all of which use labour and capital in their production processes. It is assumed that production factors are perfect substitutes in the non-tradable sector; factor prices are therefore equal to the value of the marginal product as follows: $w = qP_TA_N$ and $r = qP_TA_N$, [2] where A_N, w and r are the total factor productivity in the non-tradable sector, the domestic wage and the interest rate, respectively.

Like Rodrik (2006) the technology of both tradable sectors is Cobb-Douglas, and exhibits diminishing returns to scale. Taking into account that $w = r = qP_TA_N$, the tradable supply functions, which depend on on factor productivities, their prices, the domestic wage and the interest rate; see, for example, Varian (1986, p. 338), can be presented as follows:

$$X = \left[A_X \left(\frac{q}{A_N} \frac{P_X}{P_T} \right)^{\phi_X + \psi_X} {\phi_X}^{\phi_X} {\psi_X}^{\psi_X} \right]^{\gamma_X^{-1}} \quad (1)$$

$$M = \left[A_M \left(\frac{q}{A_N} \frac{P_M}{P_T} \right)^{\phi_M + \psi_M} {\phi_M}^{\phi_M} {\psi_M}^{\psi_M} \right]^{\gamma_M^{-1}} \quad (2)$$

where A is the total factor productivity of the factors employed, with the subscripts X and M referring to the primary and manufacturing sectors, respectively. ϕ_X , ϕ_M , ψ_X and ψ_M all lie between zero and one and denote the elasticity of the labour employed in the primary and manufacturing sectors, respectively. $\gamma_X = (1-\phi_X-\psi_X)$, $\gamma_M = (1-\phi_M-\psi_M)$ $\phi_X + \psi_X < 1$ and $\phi_M + \psi_M < 1$.

The income generated by all sectors is equal to the Gross Domestic Product, GDP ($=P_XX + P_MM + P_NN$). When there is full employment of the endowments of labour (L) and capital (K), the equilibrium of a perfectly competitive economy implies no extraordinary profits and therefore the income generated by all sectors, GDP, equals the factor rewards, $wL+rK$. Consequently, differentiating the share of the primary sector in GDP, θ_X ($= P_XX/(wL+rK)$), and the share in GDP of the manufacturing sector, θ_M ($=P_MM/(wL+rK)$) gives:

$$d(\theta_X) = \gamma_X^{-1}\theta_X \left[\widehat{A_X} - \left(\widehat{A_N} - \hat{q} \right) \right] + \gamma_X^{-1}\theta_X (1-\delta)\widehat{TT} - \theta_X \left(\theta_L \hat{L} + \theta_K \widehat{K} \right) \quad (3)$$

$$d(\theta_M) = \gamma_M^{-1}\theta_M \left[\widehat{A_M} - \left(\widehat{A_N} - \hat{q} \right) \right] - \gamma_M^{-1}\theta_M \delta\widehat{TT} - \theta_M \left(\theta_L \hat{L} + \theta_K \widehat{K} \right) \quad (4)$$

where θ_L and θ_K refer to the share of labour and capital in GDP and the hats denote the rates of growth of the respective variables; i.e. $\hat{z} = (dz/dt)(1/z)$.

Due to the scarcity of resources, primary, manufacturing and non-tradable goods producers compete for resources. Equations (3) and (4) display the optimal response of tradable producers along the production possibility frontier. According to these equation, a) the allocation of resources between the tradable and non-tradable sectors depend on the

[2] Non-tradable production can be thought of as N = $A_N(L_N+K_N)$, where L_N and K_N are the labour and capital employed by the non-tradable sector. Note also that this assumption implies constant relative factor prices.

structural real exchange rate, b) the resource allocation within the tradable sector depends on the terms of trade and c) sector productivities and resource endowments also impact on the sectorial structure of a country.

Equations (3) and (4) are not equilibrium relationships because the real exchange rate is also an endogenous variable. In this model it is assumed that the interaction between each individual sector of the economy and the rest of the world is through the real exchange rate. On the one hand, the non-tradable market clearing condition implies that the value of the non-tradable goods output equals the expenditure in non-tradable goods (private expenditure plus the government spending that falls on non-tradable goods), as given by equation (5):

$$P_N N = (1-\gamma)E + aG \tag{5}$$

where *E* is domestic private expenditure, γ is the budget share in tradable goods and *a* is the proportion of government spending (*G*) that is devoted to non-traded goods.

On the other hand, the current balance is the difference between domestic output (*GDP*) and total domestic expenditure (*E*+*G*) plus any invisible earnings and transfers, as given by equation (6):

$$\begin{aligned} CA &= GDP - (E+G) + r^{*}F + Tr \\ &= \left(P_X X + P_M M\right) - \gamma E + r^{*}F + Tr - (1-a)G \end{aligned} \tag{6}$$

Rearranging (with CA=0):

$$\theta_X + \theta_M = \gamma + (1-\gamma)DS + \left[(1-\gamma) - a\right] g \tag{7}$$

where r^* is the international interest rate*,* *F* is the net foreign asset position, *Tr* are the international transfers, *DS* =-(*r*F*+*Tr*)/*GDP* refers to the debt services minus transfers-to-*GDP* ratio and *g* (= *G*/*GDP)* is the government expenditure as a share of *GDP.*

Equation (7) refers to the consumption possibility frontier. It tells us that the tradable goods share in GDP must generate resources to fulfil the budget share in tradable goods adjusted by the influence of debt services and government spending. When the budget shares are constant, as in the Cobb-Douglas utility function case, the evolution of the tradable goods share in GDP, d(θ_T), is constrained by the following relationship:

$$d\left(\theta_X\right) + d(\theta_M) = \left(1-\gamma\right) d(DS) + \left[\left(1-\gamma\right) - a\right] d(g) \tag{8}$$

The substitution of equations (3) and (4) into equation (8) determines the equilibrium movement equation for the structural real exchange rate, while the substitution of such equilibrium equation into equation (3) and (4) determines the equilibrium movement equation for the equilibrium primary and manufacturing share in GDP. Formally:

$$\hat{q} = -\Phi_{11}\widehat{A_X} - \Phi_{12}\widehat{A_M} + \Phi_{13}\widehat{A_N} - \Phi_{14}\widehat{TT} + \Phi_{15}\hat{L} + \Phi_{16}\hat{K} + \Phi_{17}d(g) + \Phi_{18}d(DS) \tag{9}$$

$$d(\theta_X) = \Phi_{21}\widehat{A_X} - \Phi_{22}\widehat{A_M} - \Phi_{23}\widehat{A_N} + \Phi_{24}\widehat{TT} - \Phi_{25}\hat{L} - \Phi_{26}\hat{K} + \Phi_{27}d(g) + \Phi_{28}d(DS) \tag{10}$$

$$d(\theta_M) = -\Phi_{31}\widehat{A_X} + \Phi_{32}\widehat{A_M} - \Phi_{33}\widehat{A_N} - \Phi_{34}\widehat{TT} - \Phi_{35}\hat{L} - \Phi_{36}\hat{K} + \Phi_{37}d(g) + \Phi_{38}d(DS) \tag{11}$$

where the parameters are defined as follows:

$$\Phi_0 = \left(\gamma_X^{-1}\theta_X + \gamma_M^{-1}\theta_M\right)^{-1} > 0$$

$$\Phi_{11} = \Phi_0 \gamma_X^{-1}\theta_X > 0 \qquad \Phi_{21} = \frac{\Phi_{11}}{\Phi_0}\left(1-\Phi_{11}\right) \qquad \Phi_{31} = \frac{\Phi_{12}}{\Phi_0}\Phi_{11}$$

$$\Phi_{12} = \Phi_0 \gamma_M^{-1} \theta_M > 0 \qquad \Phi_{22} = \frac{\Phi_{11}}{\Phi_0}\Phi_{12} \qquad \Phi_{32} = \frac{\Phi_{12}}{\Phi_0}(1-\Phi_{12})$$

$$\Phi_{13} = \Phi_1 + \Phi_2 = 1 \qquad \Phi_{23} = \Phi_{21} - \Phi_{22} \qquad \Phi_{33} = (\Phi_{32} - \Phi_{31})$$

$$\Phi_{14} = \delta\Phi_{11} - (1-\delta)\Phi_{12} \underset{>}{\leq} 0 \qquad \Phi_{24} = \frac{\Phi_{11}}{\Phi_0}\left[(1-\delta)(1-\Phi_{11}) + \Phi_{12}\delta\right] \qquad \Phi_{34} = \frac{\Phi_{12}}{\Phi_0}\left[\Phi_{11}(1-\delta) + \delta(1-\Phi_{12})\right]$$

$$\Phi_{15} = \Phi_0 \theta_T \theta_L > 0 \qquad \Phi_{25} = \theta_L\left[(1-\Phi_{11})\theta_X - \theta_M \Phi_{11}\right] \qquad \Phi_{35} = \theta_L\left[(1-\Phi_{12})\theta_M - \theta_X \Phi_{12}\right]$$

$$\Phi_{16} = \Phi_0 \theta_T \theta_K > 0 \qquad \Phi_{26} = \theta_K\left[(1-\Phi_{11})\theta_X - \theta_M \Phi_{11}\right] \qquad \Phi_{36} = \theta_K\left[(1-\Phi_{12})\theta_M - \theta_X \Phi_{12}\right]$$

$$\Phi_{17} = \Phi_0\left[(1-\gamma) - a\right] \underset{<}{\geq} 0 \qquad \Phi_{27} = \frac{\Phi_{11}}{\Phi_0}\Phi_{17} \qquad \Phi_{37} = \frac{\Phi_{12}}{\Phi_0}\Phi_{17}$$

$$\Phi_{18} = \Phi_0(1-\gamma) > 0 \qquad \Phi_{28} = \frac{\Phi_{11}}{\Phi_0}\Phi_{18} \qquad \Phi_{38} = \frac{\Phi_{12}}{\Phi_0}\Phi_{18}$$

In equilibrium, the structural real exchange rate and the sector shares in GDP is determined by macroeconomic fundamentals such as sector productivities, terms of trade, factor endowments, government spending and debt shocks. The theoretical model is particularly well-suited for small, dependent economies like Argentina, where the primary and manufacturing sectors are mainly net exporters and importers, respectively. Next the theoretical relationships of the model are applied to Argentina.

III. Macroeconomic Variables

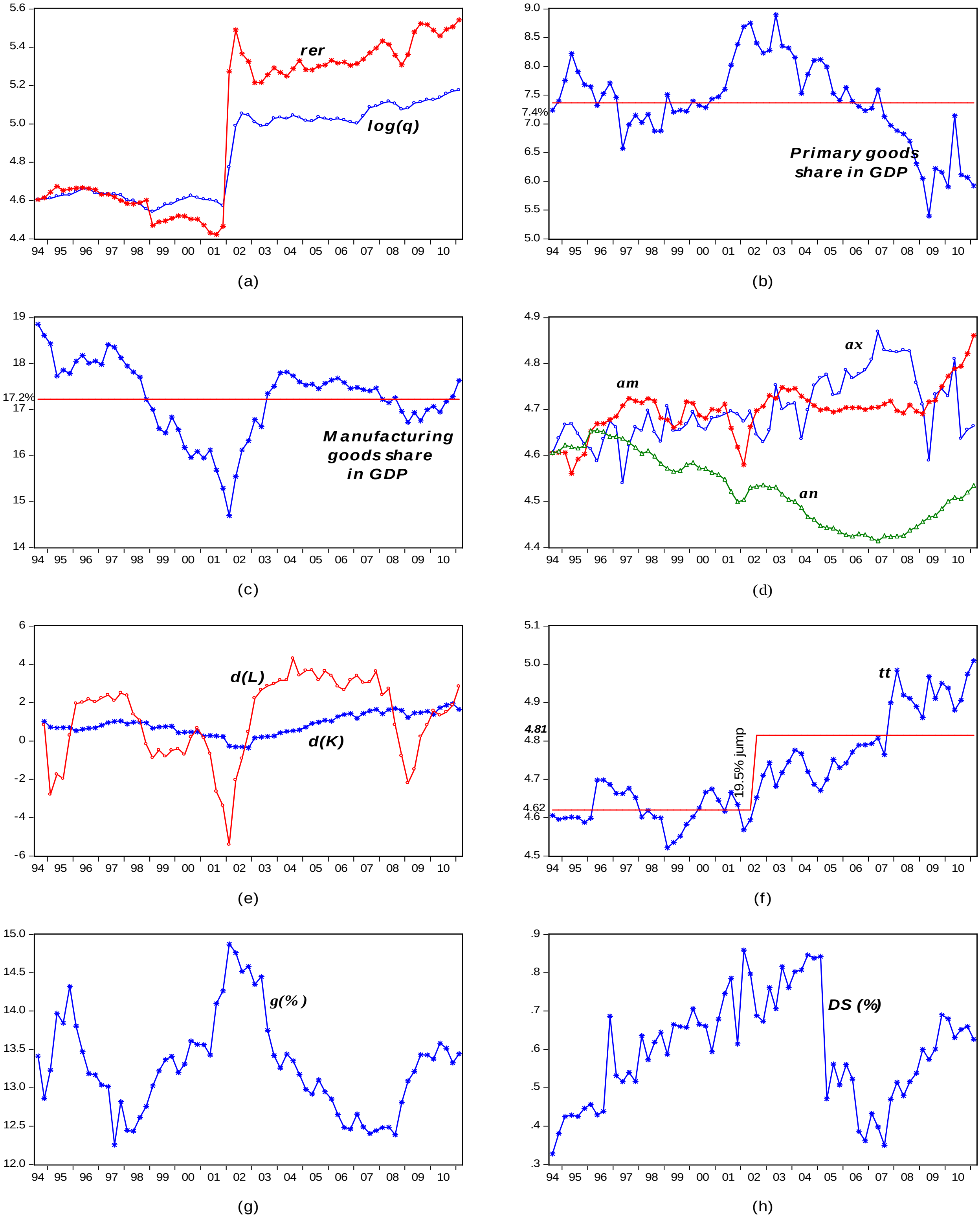
We first report the sources and construction of the series before identifying and discussing some of the main patterns in the data, see the section A of the Appendix. The dataset used for the estimation of the model includes 67 quarterly observations from 1994Q3 to 2011Q1 on the twelve variables plotted in Figure 1; all variables, except *g*, *DS* and the shares of the primary and manufacturing sectors have been transformed in indexes in which the third quarter of 1994 is the index reference base. Also, the section B of the Appendix describes how the sectoral *TFPs* are measured.

Taking into account that the wholesale and consumer price indexes predominantly measures traded and non-traded goods prices, respectively,[3] the structural real exchange rate is measured by the wholesale to consumer price index ratio, where the wholesale price index has been constructed to only include the prices of primary and manufactured goods.

At the beginning of this sample period Argentina's economic policy was constrained by a fixed exchange rate, whose fragility and contagious vulnerability became evident in the aftermath of the Mexican, Asian and Russian financial crises. At the end of 2001, Argentina abandoned it, triggering a severe economic crisis. This change in policy is starkly shown in Figure 1 panel (a) by the sharp depreciation of the structural and PPP real exchange rates in 2001; 40% and 123.9% respectively; *rer* refers to the logarithm of the PPP real exchange rate.

[3] See, for example, Edwards (1988), Faruque (1995), Hinkle and Montiel (1999) and Harberger (2004).

Figure 1: Macroeconomic Variables (1994Q3-2011Q1, base year 1994Q3)



* where *rer*, a_x, a_m, a_n, and *tt* are the logarithms of RER_{PPP}, A_X , A_M, A_N and *TT*, respectively.

The size of the tradable sector exhibit an average of 24.6%, 7.4% and 17.2% corresponding to the primary and manufacturing sectors, respectively; see the horizontal line in panels (b) and (c). The share of the primary sector contracted between the second quarter of 1995 and 1997, before expanding until the 2001 economic crisis, remained constant up to the third quarter of 2003 and decreased thereafter. The share of the manufacturing sector declined before the end of the fixed exchange rate, increased until the first quarter of 2004 and diminished up to the first quarter of 2009, before increasing thereafter.

Figure 1 panel (d) shows TFP in the primary sector (A_X) followed a slightly steady upward trend up to the third quarter of 2003, a positive trend until the third quarter of 2008 and a decreasing one thereafter. TFP in the manufacturing sector (A_M) remained almost constant between the third quarter of 1997 and the second quarter of 2001 and diminished by 14% the following three quarters. It increased until the third quarter of 2003, decreased until the first quarter of 2009 and increased thereafter. TFP in the same sector (A_N), which is assumed equal to the labour productivity, has been decreasing up to the second quarter of 2007, but increased thereafter.

The growth rate of the capital stock – panel (e) -declined up to the last quarter of 2002 but rebounded thereafter. The growth rate of the labour employed in the economy does not have a clear pattern. It was negative in the aftermath of the Tequila crisis (the first three quarters of 1995) and, except the third and fourth quarters of 2000 and the first quarter of 2001, from the last quarter of 1998 to the the end of the collapse of the exchange rate regime. It was also negative due to the international financial crisis, between the last quarter of 2008 to the second quarter of 2009.

The terms of trade (panel f) decreased between the second quarter of 1996 and the first quarter of 1999, and then embarked on a broadly upward trend until the end of the sample. After the 2001 economic crisis, the terms of trade jumped about 19.5% in average. Public consumption (as a share of GDP), *g*, in panel (g), fell until the second quarter of 1998, from where it picked up again. It reached a peak at the time of the exchange rate collapse and again contracted up to the fourth quarter of 2006. It was almost constant until the third quarter of 2008, but increased thereafter. The pattern of *DS* (panel h) increased up to the last quarter of 2004, when Argentina restructured its foreign obligations, but decreased substantially after.

IV. Econometric Results

Prior to estimating the postulated relationships the time series properties of the individual series need to be investigated. Following Plasmans, et al (2007, p. 2) the general-to-specific sequential testing procedure is used, starting with third order of integration and moving downwards to lower orders of integration. Each unit root test has three versions: an unrestricted model (including trend and intercept), a trend restricted model (including intercept but not trend) and a trend-intercept restricted model (neither trend nor intercept). The unit root models for the structural real exchange rate include a crisis dummy variable that captures the effects of the collapse of the fixed exchange rate regime at the end of 2001.

Table 1 provides the ADF (augmented Dickey-Fuller) statistic of each unit root test. There is no evidence of three unit roots in any series at the 1% significance level. The null hypothesis of two unit roots is rejected at the 1% significance level for all series, except for the capital series. If the one unit root test is applied to the capital series, the trend parameter of the unrestricted model is significantly different from zero at the 5% level, thus the capital stock series is a trend stationary process rather than a data stationary process.

Table 1 suggests that it is reasonable to proceed on the assumption that all series are I(1) processes. Consequently, Engle and Granger ‘87s formal two-step approach for cointegration analysis is applied to test each of the long-run relationships.[4]

[4] The section C of the Appendix shows provides some insights about the application of the Johansen cointegration test.

Table 1: Observed ADF statistics of the unit root test

	Three unit root tests			Two unit roots			One unit root		
Model	**Un**	**T**	**TI**	**Un**	**T**	**TI**	**Un**	**T**	**TI**
log(*q*)	-10.3***	-10.4***	-10.3***	-14.3***	-14.2***	-14.4***	-0.67	0.88	0.80
rer	-10.0***	-10.6***	-10.5***	-14.2***	-13.9***	-14.1***	-0.09	1.47	0.51
Xshare	-14.6***	-14.7***	-14.9***	-7.3***	-7.3***	-7.2***	-1.24	-0.76	-0.87
Mshare	-13.5***	-13.6***	-13.7***	-4.5***	-4.38***	-4.43***	-1.98	-2.17	-0.27
ax	-14,5***	-14,56***	-14,68***	-7,88***	-7,9***	-7,96***	-2,41	-2,01	-0,0004
a_M	-11,7***	-11,82***	-11,91***	-5,08***	-5,09***	-4,94***	-2,37	-1,40	1,19
$a_n = lp_n$	-10.1***	-10.1***	-10.2***	-4.7***	-4.3***	-4.3***	0.2	-1.4	-0.7
k	-8.1***	-8.14***	-8.19***	-1.55	-1.16	-0.30			
l	-10.9***	-11.04***	-11.15***	-2.48	-2.50	-2.01**			
tt	-12.0***	-12.1***	-12.2***	-6.99***	-6.94***	-6.74***	-2.15	-0.20	1.41
DS	-16.0***	-16.1***	-16.2***	-7.68***	-7.68***	-7.71***	-1.93	-2.01	0.14
g	-15.4***	-15.5***	-15.6***	-4.74***	-4.78***	-4.82***	-2.21	-2.18	-0.01

where
Xshare and *Mshare* are the shares of the primary and manufacturing sectors in GDP, respectively a_X, a_M, and a_N are the logarithms of the primary, manufacturing and non-tradable total factor productivities. *k* ,*l,* and *tt* are the logarithms of the capital stock (*K),* labour force *(L)* and the terms of trade, respectively
H_0= there are k(=3, 2 or 1, respectively) unit roots; Un, T and TI refer to the unrestricted, trend restricted and trend-intercept restricted models, respectively
(*), (**) and (***) indicate that the null of k unit roots is rejected at 10%, 5% and 1% significance levels, respectively

The long-run relationships are estimated first by the SUR (seemingly unrelated regression) model and if their residuals do not exhibit unit root behavior, their error correction or short-run models are estimated. The following relationships are estimated:

$$Xshare = \Phi_{0X} + \Phi_{1X}\left(a_X - (a_N - q)\right) + \Phi_{2X}tt - \Phi_{3X}\Delta(L) - \Phi_{4X}\Delta(K) + \Phi_{5X}DMI \quad (12)$$

$$Mshare = \Phi_{0M} + \Phi_{1M}\left(a_M - (a_N - q)\right) - \Phi_{2M}tt - \Phi_{3M}\Delta(L) - \Phi_{4M}\Delta(K) + \Phi_{5M}DMI \quad (13)$$

$$\log(q) = b_{10} - b_{11}a_X - b_{12}a_M + \left(b_{11} + b_{12}\right)a_N - b_{14}tt + b_{15}\Delta(L) + b_{16}\Delta(K) + b_{17}g + b_{18}DS + b_{19}DMI + b_{110}DMC \quad (14)$$

$$Xshare = b_{20} + b_{21}a_X - b_{22}a_M - b_{23}a_N + b_{24}tt - b_{25}\Delta(L) - b_{26}\Delta(K) + b_{27}g + b_{28}DS \quad (15)$$

$$Mshare = b_{30} - b_{31}a_X + b_{32}a_M - b_{33}a_N - b_{34}tt - b_{35}\Delta(L) - b_{36}\Delta(K) + b_{37}g + b_{38}DS \quad (16)$$

where, additionally, *DMI* is an intercept dummy variable (equal to one after the second quarter of 2002 and zero elsewhere) and *DMC* is a crisis variable taking a value of one during the time of the Argentinean crisis (i.e. in the first and second quarter of 2002)

Equations (12) and (13) display the sectoral shares-real exchange rate relationships postulated by equations (2) and (3), but adds an intercept dummy variable to take in shift effects due to the Argentinean crisis of 2001. Equations (14)-(16) describes, in line with equations (9) to (11), the real exchange rate and sectoral shares equilibrium relationships, adding an intercept and crisis variable; the crisis dummy variable aims to capture the structural real exchange rate depreciation of 20% and 21% in the first and second quarters of 2001. The estimated results are displayed in Table 2.

Table 2: Structural real exchange rate and sectoral shares in GDP: Cointegrated relationships

	Variables	*log(q)*	*Constant*	a_x	a_m	a_n	*Δ(L)*	*Δ(K)*	*tt*	*DS*	*g*	*DMI*	*DMC*	Statistics		ECF
Behavioural relationships		2,574	12,46	2,574		-2,574	7,753	-0,0002	-3,547			-0,931		**R^2**	0,823	-0,24
	Xshare	0,484	3,608	0,484		0,484	2,612	2,04E-05	0,637			0,335		**$AdjR^2$**	0,808	0,057
		***	***	***		***	***	***	***			***		**ADF**	-4,522**	***
		-5,715	38,337		-5,715	5,715	27,875	0,0002	1,1			2,653		**R^2**	0,74	-0,076
	Mshare	1,033	4,428		1,033	1,033	3,243	2,51E-05	1,001			0,567		**$AdjR^2$**	0,718	0,048
		***	***		***	***	***	***				***		**ADF**	-4,72**	
		-3,141	50,79	2,574	-5,715	-3,141	35,63	0,00002	-2,616			1,722				
	Tshare	1,176	6,09	0,484	1,033	1,176	4,47	0,00003	0,795			0,685				
		***	***	***	***	***	***		***			**		**ADF**	-4,52	
Equilibrium relationships			2,309	-0,014	-0,097	0,111	0,325	6,19E-06	0.417	0,022	0,026	0,374	0.108	**R^2**	0.988	-0,34
	log(q)		0,265	0,053	0,105	0,088	0,274	2,40E-06	0,057	0,038	0,01	0,018	0,022	**$AdjR^2$**	0.986	0,07
			***					***	***		***	***	***	**ADF**	-9,59***	***
			10,817	4,484	-3,897	-0,586	15,806	-0,0001	-1,881	-0,023	0,436			**R^2**	0.893	0,08
	Xshare		2,129	0,478	0,922	0,605	2,262	2.31E-05	0,522	0,355	0,087			**$AdjR^2$**	0.880	0,04
			***	***	***		***	***	***		***			**ADF**	-4,73**	**
			28,295	-1,775	-8,231	10,005	22,18	0.0001	-0,714	0,157	-0,566	1,353		**R^2**	0.873	0,01
	Mshare		2,942	0,592	1,175	0,955	2,908	2.74E-05	0,648	0,425	0,112	0,181		**$AdjR^2$**	0.855	0,06
			***	***	***	***	***	***			***	***		**ADF**	-4,96**	
			39,112	2,709	-12,128	9,419	37,986	-1.57E-05	-2,594	0,133	-0,13	1,353				
	Tshare		4,221	0,901	1,76	1,285	4,335	4.28E-05	0,985	0,66	0,167	0,181				
			***	***	***	***	***		***			***		**ADF**	-4,73**	

The relationships from the behavioural relationships refer to equations (12) and (13), while the equilibrium relationships refer to equations (14)-(16).
Tshare aggregates the *Xshare* and *Mshare* relationships, the statistical significance of its parameters is determined by the Wald-test,
The first row in each cell refers to the estimated parameters while values in parenthesis to its standard deviation,
(*), (**) and (***) indicate that the estimate is significant different from zero at the 10%, 5% and 1% significance levels

The behavioural relationships of Table 2 imply that a) the share of the primary sector in GDP, as expected, is positively related to the total factor productivity in the primary sector, the structural real exchange rate, but negatively related to the total factor productivity in the non-tradable sector and the capital stock, b) the share of the manufacturing sector, on the contrary to the expected, depends negatively on the total factor productity in the manufacturing sector, the structural real exchange rate, the factor endowments and the terms of trade and c) the impact of the structural real exchange rate on the tradable goods share in GDP is not as expected.

The estimated behavioural relationships are not spurious (their residuals are stationary), but they do not reflect equilibrium relationships. For instance, the terms of trade increase the size of the manufacturing sector at first, but depending on their influence on the structural real exchange rate, their overall effect can be different. An assessment of the final effects requires considering the structural real exchange as an endogenous variable. Consequently, equilibrium (or reduced-form) equations are estimated and shown by the equilibrium relationships of Table 2.

In line with the Balassa-Samuelson framework, productivity improvements in any of the tradable sectors appreciate the structural real exchange rate, while productivity improvements in the non-tradable sector depreciate it; though, none is statistically significant.

As expected, total factor productivity improvements in the primary sector increase the size of the primary sector and the tradable sector as a whole, despite their negative effects on the manufacturing goods share in GDP. Total factor productivity improvements in the manufacturing sector impact negatively on the primary goods share in GDP (as expected). Their effect on the manufacturing and tradable goods share in GDP is not expected and therefore cause a macroeconomic misalignment. Productivity improvements in the non-tradable sector reduce the size of the primary sector, but increase the size of the manufacturing and the tradable sector as a whole. Changes in the investment levels reduce the size of the primary sector, but increase the size of the manufacturing sector.

Terms of trade improvements depreciate the equilibrium structural real exchange rate, diminish the size of the primary and manufacturing sector as well as the size of the tradable sector as a whole. The negative effect of terms of trade on the manufacturing goods share in GDP refers to the Dutch disease, but our results are inconclusive because the corresponding estimates are not statistically significant.

When the debt service net of transfers increases, the structural real exchange rate depreciates, the manufacturing goods share in GDP increases and the share of the primary goods sector diminishes. As in Bastourre *et al.* (2008, p. 274) and Padua and Mastronardi (2008, p. 217), government spending is positively related to the structural real exchange rate. Also, additional government spending increases the size of the primary sector, but diminishes the size of the manufacturing sector and of the size of the tradable sector as a whole.

The intercept and crisis variable reveal that the structural real exchange rate was up by 37% with a 20% overshooting as a consequence of the exchange rate regime collapse. Due to the 2001 crisis, the manufacturing goods share in GDP shifted upwards by 1.3 points; the intercept dummy variable added to the primary goods share in GDP was dropped because it was not statistically significant, even at the 10% level.

Short-run relationships

The residuals of the behavioural and equilibrium relationships are stationary at the 5% level.[5] Thus, each cointegrated relationship has a matching error correction model (ECM), or short-run model. An ECM model is an equation specified with variables in first differences, except the labour force and capital stock series, which are expressed in second differences.

Each short-run model includes additionally an error correction factor (*ECF*, residuals from the cointegrated relationships lagged one period) as well as lagged values of the differences of the dependent variables. Each ECM model is estimated by the iterative SUR model, in which the matrix of covariances and coefficients is corrected due to heteroskedastic disturbances. Also, variables that are not significant at the 10% confidence level are, in general, dropped.

Table 3 displays the ECMs corresponding to each equation of the behavioural and equilibrium relationships of Table 2. Each cointegrated relationship has its corresponding short-run model because all the estimated parameters of the ECFs are negative as expected; except the ECF parameters of the manufacturing shares equations, they are statistically significant at the 10% level. All ECM models show that the adjustment to the equilibrium is not inmediate, but implies a learning process; the lagged variables are statistically significant at the 10% level.

The multilateral PPP real exchange rate and the sector shares in GDP

Alternatively, the theoretical relationships have been estimated using the multilateral PPP real exchange rate as a proxy variable of the structural real exchange rate. The results based on the PPP real exchange rate are in general similar to Table 2; see Table A.4 of the appendix.

Exceptions regarding the behavioural relationships are: a) the Mshare-terms of trade relationship has, in this case, the expected sign, but it is again not statistically significant even at the 10% level, and b) both intercept dummy variables are not statistically different from zero at the 10% level.

Exceptions regarding the equilibrium relationships are: a) the Balassa-Samuelson not only hold, but they are in this case statistically significant, b) government spending affects again positively to the real exchange rate, but the corresponding estimate is not statistically significant, c) the intercept and crisis dummy variable reflect, in this case, a 75% shift in the PPP real exchange rate, with a 114% overshooting at the end of 2001.

Also, the PPP based estimations are not spurious. Their corresponding residuals are stationary and their error correction factors negative.

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[5] The distribution of the student t-ratio that results from the residual regression depends on the number of coefficients estimated in the cointegrated relationship, apart from the coefficients representing deterministic exogenous variables (constant and dummy variables).

Table 3: Error correction models corresponding to the behavioural and equilibrium relationships

	Variables	*Δ(srer)*	*Δ(a_x)*	*Δ(a_m)*	*Δ(a_n)*	*Δ(Δ(L))*	*Δ(Δ(K))*	*Δ(tt)*	*Δ(DS)*	*Δ(g)*	*DMC*	*ECF*	*Δy_{t-1}*	*Δy_{t-2}*	*Δy_{t-3}*	**Statistics**	
Behavioural relationships	***Δ(Xshare)***		5,829			-5,079		-1,661				-0,232	0,108	0,11	0,203	**R^2**	0,88
			0,386			1,941		0,432				0,058	0,051	0,047	0,049	**AdjR^2**	0,87
			***			***		***				***	**	**	***		
	Δ(Mshare)	0,672		11,4	-5,35			0,666				-0,047	0,114	0,193	0,125	**R^2**	0,80
		0,422		0,9	1,86			0,38				0,044	0,058	0,058	0,058	**AdjR^2**	0,78
				***	***			*					*	***	**		
Equilibrium relationships	***Δ(srer)***				0,436		3.57E-06	0,156			0,205	-0,336	0,157		-0,095	**R^2**	0,91
					0,149		1.79E-06	0,041			0,01	0,071	0,044		0,039	**AdjR^2**	0,90
					***		**	***			***	***	***		**		
	Δ(Xshare)		5,987	-4,7				-1,06			0,229	-0,389	0,083	0,087	0,257	**R^2**	0,93
			0,304	0,634				0,34			0,079	0,058	0,041	0,039	0,041	**AdjR^2**	0,92
			***	***				***			***	***	**	**	***		
	Δ(Mshare)		-1,262	12,25	-5,623							0,013	0,145	0,175	0,098	**R2**	0,84
			0,273	0,82	1,663							0,059	0,05	0,05	0,052	**AdjR^2**	0,82
			***	***	***								***	***	*		

The first row in each cell refers to the estimated parameters while values in parenthesis to its standard deviation
(*), (**) and (***) indicate that the estimate is significant different from zero at the 10%, 5% and 1% significance levels
The variables Δy_{t-1}, $\Delta\ y_{t-2}$ and Δy_{t-3} refer to the first difference of the endogenous variable lagged one, two and three periods, respectively.

V. Conclusions

This paper analyses theoretically the determinants of the structural real exchange rate, defined as the relative tradable to non-tradable price, and the sectoral shares, and applies it by reference to the Argentinean economy. Table 4 summarizes the main relationships. The behavioural relationships are based on the producers' optimal decisions, assuming full employment. The equilibrium relationships take into account the behavioural relationships and the equilibrium of the current account.

The evidence from the behavioural relationships suggest that a) structural real exchange rate depreciations increase the size of the primary, but reduce the size of the manufacturing sectors, b) productivity improvements in the primary sector increase the size of the primary sector, c) productivity improvements in the manufacturing sector reduce the size of the manufacturing sector and d) terms of trade improvements reduce the size of the primary sector, but increase the size of the manufacturing sector.

Table 4: Real exchange rates and sector shares in GDP

Relationships	**Variables**	***q***	***A_X***	***A_M***	***A_N***	***L***	***K***	***TT***	***g***	***DS***
Behaviour	*Xshare (Θ_X)*	$+^{y}$	$+^{y}$		$-^{y}$	$-^{n}$	$-^{y}$	$+^{n}$		
	Mshare (Θ_M)	$+^{n}$		$+^{n}$	$-^{n}$	$-^{n}$	$-^{n}$	$-^{n}$		
Equilibrium	q		$-^{y}$	$-^{y}$	$+^{y}$	$+^{y}$	$+^{y}$	$?^{+}$	$?^{+}$	$+^{y}$
	Xshare (Θ_X)		$+^{y}$	$-^{y}$	$-^{y}$	$?^{+}$	$?^{-}$	$+^{n}$	$?^{+}$	$+^{n}$
	Mshare (Θ_M)		$-^{y}$	$+^{n}$	$-^{n}$	$?^{+}$	$?^{+}$	$-^{y}$	$?^{-}$	$+^{y}$
	Tshare(Θ_T)		$+^{y}$	$+^{n}$	$-^{n}$	$-^{n}$	$-^{y}$	$?^{-}$	$?^{-}$	$+^{y}$

The first two rows refer to equations (3) and (4), the next three rows refer to equations (9)-(11). The last row aggregates the relationship of the Xshare and Mshare relationships.
A "+" indicates a positive effect, a "-" a negative one and a "?" and ambiguous effect
The superscripts "y" or "n" reveal whether the sign of the estimated and expected parameters coincide or not.
A "+" or "-" superscripts reveal the sign of the estimates for wich the sign of the theoretical parameter is ambiguous.

The evidence from the equilibrium relationships suggest that a) total factor productivity improvements in the primary sector appreciate the structural real exchange rate, increase the size of the primary sector and reduce the size of the manufacturing sector, b) total factor productivity improvements in the manufacturing sector depreciate the structural real exchange rate, but reduce the size of both tradable sectors, c) government spending depreciate the structural real exchange rate, but diminish the size of the manufacturing and the tradable sector as a whole and d) terms of trade improvements depreciate the structural real exchange rate, reduce the size of both tradable sectors and perform Ducth disease effects; and d) the structural real exchange by about 37% with an 21% overshooting due to the collapse of the Argentinean currency at the end of 2001 depreciated.

This paper contributes to the theoretical and empirical understanding of the relationships between the structural real exchange rate, the sectoral shares and the economic fundamentals. The manner in which economic policies can affect total factor productivities, the government spending and the debt services net of transfers should be evaluated by their effects on the behavioural and equilibrium relationships.

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Appendix

A: The Data set

The price indices, sectoral value added, export and import price indices, government expenditure and capital stock series were obtained from the National Statistic office (INDEC, Instituto Nacional de Estadísticas y Censos). The Argentinean Central Bank provides series of the multilateral PPP real exchange rate (RER_{PPP}, the relative price between the foreign price level, expressed in domestic currency, and domestic price level), debt services and transfers. Labour market data were obtained from the Ministry of the Economy (Dirección General de Estudios y Estadísticas Laborales, Subsecretaría de Programación Técnica y Estudios Laborales).

The annual capital stock series are provided up to the year 2006. The quarterly data was obtained from the extrapolation of these series based on the depreciation to gross fixed investment ratio and the annual net investment series. Net investment series from 2006 onwards were obtained from applying the depreciation to gross fixed investment ratio of the year 2006 to the gross investment series.

Primary, manufacturing and non-tradable sectors have been classified based on the International Standard Industrial Classification Revision 3.1 (ISIC Rev.3.1) of the United Nations. The first sector includes agriculture, hunting, forestry, fishing and mining and quarrying sectors. The second includes all the manufacturing sectors (code D of the ISIC Rev. 3.1). The third includes, in line with Gay and Pellegrini (2003), electricity, gas and water, construction, wholesale and retail, hotel and restaurants, transport, storage and communication, financial intermediation, real estate and business services, public administration and defense, education, health and social work, other community, social and personal service activities and private households with employed persons.

Sectoral GDPs are expressed in volumes (constant prices of the base year 1993). Aggregate GDP series are the sum of primary, manufacturing and non-tradable production values. Sectoral value added (sectoral outputs) and labour employed have been calculated taking into account the sector classification criteria mentioned above.

Assuming that all variables follow a stochastic seasonal process, the XII-ARIMA model of the Census Bureau of National Statistics of the U.S. has been applied and where seasonality was found, the seasonally adjusted data were used to construct the relevant macroeconomic variables.

B: Measuring total factor productivities

The recent real exchange rate literature has focused on proxy variables for TFP as "data on sector TFP are unavailable for developing countries because its calculation involves data on sector labour and capital stocks, as well as estimates of sector labour shares in production, which are almost unavailable for most developing countries" (Carrera & Restout, 2008, p. 12). De Gregorio and Wolf (1994, p. 8) also note that most work on real exchange rates has relied on labour productivity rather than on TFP. This distinction is not innocuous since labour shedding may introduce substantial differences between changes in average labour productivity and TFP (De Gregorio, Giovannini, & Krueger, 1994) and the bias may be particularly important in the presence of unemployment. Recently for Argentina, Bastourre, Carrera and Ibarlucia (2008) use GDP per-capita as a TFP proxy while Bello, Heresi and Pineda (2010) measure TFP based on the GDP-to-labour force ratio, where GDP is expressed in constant dollars adjusted by the purchasing power parity.

TFP can be calculated by four different approaches: (a) the growth accounting approach, which requires the explicit specification of a neo-classical production function and identifies

TFP as the output that cannot be accounted for by the growth in inputs according to a specific production function (under Cobb-Douglas, TFP is commonly called the Solow residual); (b) the index number approach, which is an extension of (and complement to) growth accounting and involves dividing a (real) output quantity index by an input quantity index to obtain a measure of TFP, the critical issue regarding this approach is the choice of the appropriate index; e.g. the Fischer or Törnquist indices; (c) the distance function approach, which separates TFP into changes resulting from movements toward the production frontier (technical efficiency change) and shifts of this frontier (technical change); it requires full information about the state of technology at every point and identical production functions for all production units, and (d) the econometric approach, which involves estimating the parameters of an aggregator function (cost, profit or production function) and measures TFP in terms of the estimated parameters.

In this paper, the non-tradable sector technology assumption implies constant relative factor prices, which in turn imply constant capital-labour ratios in both tradable sectors. As a result, Argentinean sectoral TFP series have been constructed assuming a constant relative factor price.[6] Cobb-Douglas production functions are homothetic in the sense that the optimal capital / labour ratio depends only on the relative factor price. Thus, if the relative factor price is constant, the proportional change in the labour and capital employed are the same ($\%\Delta K_i = \%\Delta L_i$, where i refers to the sector under analysis). Consequently, the proportional change in the product ($\%\Delta y_i$) is equal to: (a) $\phi_i(\%\Delta Li) + \psi_i(\%\Delta K_i) + (\%\Delta TFP_i)$ or (b) $(\phi_i + \psi_i)^*$ $(\%\Delta L_i + \%\Delta TFP_i)$; where ϕ_i and ψ_i are the output elasticities of labour and capital employed in sector i, respectively. It means that only one factor - labour (available) in this case - can be used to calculate the proportional change in TFP as a residual; a special case of Solow residual. Assuming that TFP changes take one year (four quarters) to manifest itself, equation (A.1) has been estimated for the primary and manufacturing sectors.

$$\begin{aligned}\Delta(\log(y_t)) &= c_{11}\Delta(\log(L_t)) + c_{12}\Delta(\log(L_{t-1})) + c_{13}\Delta(\log(L_{t-2})) + c_{14}\Delta(\log(L_{t-3})) \\ &+ c_{15}\Delta(\log(y_{t-1})) + c_{16}\Delta(\log(y_{t-2})) + c_{17}\Delta(\log(y_{t-3})) + \varepsilon_t\end{aligned} \qquad \text{(A.1)}$$

Table A.1 displays the estimated results of equation (A.1.1); not statistically significant variables have been dropped. Equation (A.2) displays the expected variation of the sector output y_t^e after the TFP has manifested itself, while equation (A.3) describes the variation in output that cannot be accounted for by growth in 'capital' and labour.

$$\Delta(\log(y_t^e)) = \frac{c_{11}\Delta(\log(L_t)) + c_{12}\Delta(\log(L_{t-1})) + c_{13}\Delta(\log(L_{t-2})) + c_{14}\Delta(\log(L_{t-3}))}{1 - c_{15} - c_{16} - c_{17}} \qquad \text{(A.2)}$$

$$\Delta(\log(TFP_t)) = \Delta(\log(y_t)) - \Delta(\log(y_t^e)) \qquad \text{(A.3)}$$

[6] The ARKLEMS project measures Argentinean TFPs following the KLEMS (capital, labour, energy and intermediate inputs) methodology. Its data base refer, however, to annual TFP series between 1993 and 2006; see also Coremberg (2003) who, based on the Solow residual, measures the aggregate TFP for Argentina.

Table A.1: TFP measures, OLS estimations of %Δy_i =(ϕ_i + ψ_i)* (%ΔL_i)+(%ΔTFP_i)

Sector labour employed	Sector value added	
	Primary	Manufacturing
	$\Delta(\log(y_t))$	$\Delta(\log(y_t))$
$\Delta(\log(L_t))$		2.72*** (0.25)
$\Delta(\log(L_{t-1}))$		-1.03*** (0.36)
$\Delta(\log(L_{t-2}))$		-0.61** (0.24)
$\Delta(\log(L_{t-3}))$	0.14* (0.08)	
$\Delta(\log(y_{t-1}))$	-0.40*** (0.10)	
$\Delta(\log(y_{t-2}))$	-0.24** (0.10)	
DM2Q10	0.22*** (0.04)	
R^2	0.39	0.71
$R^2_{Adjusted}$	0.36	0.70

where:
values below each estimated coefficient refer to their corresponding standard error
(*), (**) or (***) shows statistical significances at the 10%, 5% or 1% levels, respectively
y and *L* variables refer to the sector value added and labour employed variables, respectively, while DM2Q10 refers to a dummy variable with one in the second quarter of 2010 and zero elsewhere

C: Johansen Cointegration Test

An alternative way to evaluate the relationships between the structural real exchange rate and the sector shares in GDP with their fundamentals is to rely on a VAR-based cointegration test using the methodology developed in Johansen (1991, 1995). Thus, a VAR of order p written in the form of an autoregressive error correction model can be presented as follows:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Bx_t + \varepsilon_t \qquad \text{(A.4)}$$

where $y_t = y_t\left(\log(q), Xshare, Mshare, a_X, a_M, a_N, \Delta(L), \Delta(K), tt, DS\right)$ is a vector of non-stationary variables,
$x_t (= x_t(DMI, DMC))$ is a vector of deterministic variables and ε_t is a vector of innovations

The short term dynamics are represented by the series in first differences, and the long-term relationships by the variables in levels. The optimal lag structured applied to the unrestricted VAR defined by Equation (A.4) suggests, based on the Schwarz criterion, one lag as optimal lag structure.

The most critical aspect of Johansen's cointegration approach is determining the rank of Π and, therefore, the number of cointegrated relationships. The order of cointegration depends on the trace (λ_{Trace}) and maximum eigen-values (λ_{Max}) statistics with respect to their critical values. Table A.2 suggests, in general, three cointegrated relationships at the 5% significance level for the unrestricted VAR model and for all assumptions regarding the data trend (none, linear, quadratic) and the test type (intercept, trend)

Table A.2: Number of cointegrated relationships at the 5% level

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	10	11	9	11	11
Max-Eig	3	3	3	3	3

*Critical values based on MacKinnon-Haug-Michelis (1999)

The Johansen cointegration, based on the λ_{Max} statistic, suggest three cointegrated relationships can be estimated. In order to estimated the equilibrium relationships, the Johansen cointegration test is applied taking into account the restrictions imposed by equations (12)-(14). Table A.3 implies, in most of the cases, more than three cointegrated relationships.

Table A.3: Number of cointegrated relationships ath the 5% level and for the restricted model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	7	8	6	7	6
Max-Eig	4	5	4	3	3

*Critical values based on MacKinnon-Haug-Michelis (1999)

A drawback of the Johansen method is that in the VAR system all variables are treated symmetrically, as opposed to the standard univariate models, including the SUR model, that usually have a clear interpretation in terms of exogenous and endogenous variables. Due to the existence of many options respect to the number of cointegrated relationships, the SUR model specified on theoretical grounds is applied. It allows us to estimate not only the behavioural relationships, but also the equilibrium relationships.

D: Argentinean Purchasing power parity real exchange rate and sectoral shares

Table A.4: PPP real exchange rate and sectoral shares in GDP: Cointegrated relationships

	Variables	*rer*	*Constant*	a_x	a_m	a_n	*Δ(L)*	*Δ(K)*	*tt*	*DS*	*g*	*DMI*	*DMC*	Statistics		ECF
Behavioural relationships		1,33	17,91	1,33		-1,33	8,38	-0,0002	-3,48			-0,6		R^2	0,8	-0,228
	Xshare	0,35	3,48	0,35		0,35	2,98	2,00E-05	0,68			0,38		AdjR^2	0,78	0,06
		***	***	***		***	***	***	***					**ADF**	-5,14**	***
		-0,04	25,8		-0,04	0,04	29,75	0,0001	-1,94			-0,3		R^2	0,6	-0,05
	Mshare	0,63	4,93		0,63	0,63	4,31	3,00E-05	1,09			0,59		AdjR^2	0,56	0,041
			***				***	***						**ADF**	-3,07**	
			43,71	1,33	-0,04	1-,29	38,137	-2.7E-05	-5,41			-0,907				
	Tshare		6,377	0,35	0,63	0,75	5,534	3.99E-05	1,35			0,729				
			***	***		*	***		***					**ADF**	-5,14	
Equilibrium relationships			1,694	-0,097	-0,605	0,702	0,446	1.96E-05	0,535	0,025	0,028	0,753	0,57	R^2	0,98	-0,18
	rer		0,672	0,133	0,267	0,223	0,692	6.08E-06	0,146	0,096	0,025	0,045	0,054	AdjR^2	0,97	0,12
			**		**	***		***	***			***	***	**ADF**	-10,4***	
			10,817	4,484	-3,897	0,586	15,806	-0,0001	-1,881	-0,023	0,436			R^2	0,89	-0,39
	Xshare		2,129	0,478	0,922	0,605	2,262	2.31E-05	0,522	0,355	0,087			AdjR^2	0,88	0,06
			***	***	***		***	***	***		***			**ADF**	-4,73**	***
			28,295	-1,775	-8,231	-10,005	22,18	0,0001	-0,714	0,157	-0,566	1,353		R^2	0,87	-0,10
	Mshare		2,942	0,592	1,175	0,955	2,908	2.74E-05	0,648	0,425	0,112	0,181		AdjR^2	0,86	0,06
			***	***	***	***	***	***			***	***		**ADF**	-4,96**	
			39,11	2,709	-12,128	9,419	37,986	-1.57E-05	-2,594	0,133	-0,13	1,353				
	Tshare		4,221	0,901	1,76	1,285	4,335	4.28E-05	0,985	0,66	0,167	0,181				
			***	***	***	***	***		***			***		**ADF**	-4,73	

The behavioural relationships refer to equations (12) and (13). The equilibrium relationships refer to equations (14)-(16).
The Tshare aggregates the Xshare and Mshare relationships; their statistical significance is determined by the Wald-test.
The first row in each cell refers to the estimated parameters while values in parenthesis to its standard deviation
(*), (**) and (***) indicate that the estimate is significant different from zero at the 10%, 5% and 1% significance levels