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Dual equilibrium and growth cycle in Argentina

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Argentina's GDP growth cycle, tracing the high exchange rate volatility in 1970–2008, is discussed. Growth depends on foreign exchange availability. The country's comparative advantage is in agriculture, but manufactured exports grow faster. Two remarkably different PPP exchange rates coexist – one appropriate for agriculture and one for manufacturing – destabilising the market exchange rate. Thus, two unstable growth equilibria coexist generating GDP fluctuations. Currency devaluation sets the cycle's ceiling and the end of devaluation sets the cycle's floor. Chronic government deficits widen the cycle, harming institutions and decelerating growth. A land tax to finance rural investment would facilitate a high and stable exchange rate (AR$/US$) and convergence to the high growth equilibrium.

Keywords: Argentina; business cycle; dual equilibrium; growth; balance of payments; development

JEL Classifications: E32, F4, O1

1. Introduction

The purpose of this paper is to explain Argentina's GDP growth cycle, tracing the large exchange rate variations in 1970–2008 (see Figure 1). The milder GDP fluctuations during the 1991–2001 fixed exchange rate period would require a different analysis. The explanation offered combines some features common in developing countries, such as the predominant import of technology and capital goods and growth constrained by foreign exchange availability, with some specifically Argentinean features such as a strong comparative advantage in agriculture and Ricardian land rent abundance. The analysis begins in 1970 when the first quarterly GDP data were available. The duality between highly fertile agriculture and fast growing manufacturing, however, can be traced to the early twentieth century (Olivera 1924) when Argentina ranked among the leading economies in terms of both per capita income and GDP growth rate, with industry attracting massive immigration (Maddison 2001 and Nicolini Llosa 2008).

Endogenous determinants of the cycle are discussed. We depart here from the 'real business cycle' (RBC) approach that imputes to exogenous shocks Argentina's cycle around an un-verifiable full employment path (Kydland 2006).[1] Such exogenous shocks being, for example, the great variety of unquestionably inconsistent economic policies pursued in Argentina for decades (Della Paolera and Taylor 2003;

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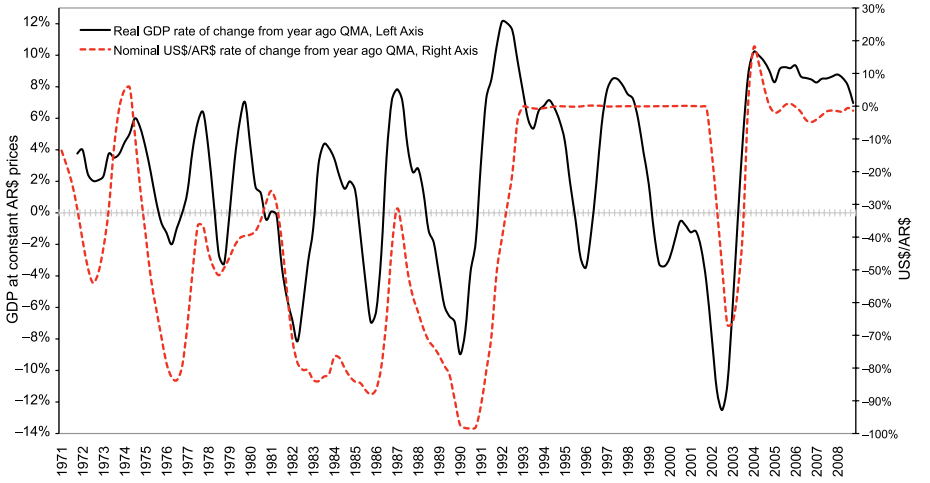

Figure 1. Argentina's GDP at constant 1993 AR$ prices and nominal exchange rate – quarterly. Source: GDP 1970–79 from Central Bank of Argentina www.bcra.gov.ar, 1980 onwards Ministry of Economy of Argentina www.mecon.gov.ar- Free Market Exchange Rate prior 1998 from FIEL, www.fiel.org.ar, from 1998 onwards from Central Bank of Argentina. Quarterly Moving Average rates are $QMA(x)_t/QMA(x)_{t-4}-1$.

Chudnovsky and Lopez 2007). We first abstract from economic policies and later discuss how their inconsistency partially resulted from the cycle itself.

Kydland (2006, 1380) acknowledges 'discrepancy between RBC model predictions and data' for Argentina. According to Kydland and Zarazaga (1997, 26–27) in 1970–1996 in Argentina 'the volatility of consumption is larger than that of output, although theoretically the opposite should hold' [because with single full employment equilibrium and perfect foresight the permanent income hypothesis should hold]. Kydland and Zarazaga (2002) and Kydland (2006) argue that such 'discrepancies' with the RBC model result from Argentina's poor quality data. We argue that such high consumption volatility[2] occurs because Argentina exports mostly wage goods (food) and has an extended industrial labour force. With highly volatile food prices wage earners do not have the saving capacity to 'smooth' their income through time. Hence Kydland's 'permanent income hypothesis' could not hold.

Data on wages, production costs and profits in Argentina are scarce, incomplete and discontinuous. Agricultural sector's data on land rent income, employment and investment are lacking. This situation prevents us from testing our complete model, but the main behavioural relationships are illustrated with the available data. Complete quarterly data on imports and GDP, however, are available and the demand for imports function – of key importance in the model – is tested. No discrepancies were observed between our model and the available data.

According to Sachs and Warner (2001) in economies with abundant and booming fuel and mineral exports, the low Purchasing Power Parity (PPP) exchange rate depresses the market exchange rate, crowding out manufactured-exports-increasing-returns and hampering growth. Mehlum et al. (2006) argue that such 'Dutch Disease' (Corden and Neary 1982) is stronger in low institutional quality countries. Argentina is not quite a 'Dutch Disease' case for it has (a) long-term sluggish not 'booming' food exports; (b) a highly volatile rather than depressed exchange rate; and (c) not completely exogenous but partially endogenous institutional quality harmed by the GDP cycle.

2. The dual equilibrium

In every economy at any point in time every good has its own PPP defined as domestic vis-à-vis foreign cost-price measured in some international unit of account. Let us assume that non-tradable goods compete internationally as exportables' inputs, and we define an economy's PPP equilibrium exchange rate β as a weighted average by volume of exports of a continuity of PPPs corresponding to individual exportable products with resources tending towards the comparatively most advantageous one, thus maximising profits, trade and output measured in internationally equivalent units. Among economies with similar Consumer Price Index (CPI) bundles, such β could be approximated by the real exchange rate defined as the ratio of domestic vis-à-vis foreign CPIs converted to US$. In fact, aggregating individual inputs' Purchasing Power Parities, Parsley and Wei (2007) calculate their internationally equivalent Big-Mac bundle PPP exchange rate and find that it correlates with Rogoff's (1996) and Taylor's (2002) CPI-based real exchange rate through time and across a large group of countries. In Argentina, this process of CPI-based real exchange rate determination did not operate in such a standard way, since there was a shift away from comparatively advantageous agriculture, while the remarkably different agricultural and industrial PPP equilibrium exchange rates destabilised the CPI-based real exchange rate, prices and output. This is discussed below.

Argentina's most distinctive feature is its strong comparative advantage in agriculture, based on its fertile land abundance (not on inexpensive non-tradables or labour abundance). In fact, for more than a century, Argentina has been a world leader in terms of (a) per capita food exports and (b) food exports as a share of both the country's total exports and the country's total food production. To highlight this consider the following simplified Ricardian scheme. Argentina exports two bundles of goods – food and low technology manufactures – with no influence on world prices and/or quantities. Assume that similar wage rates and mark-up pricing rule in Argentina and its competitors. With fixed input–output coefficients the same amount of resources (capital goods, labour and intermediate goods) is employed in the production of (a) the manufactures bundle both in Argentina and abroad, and (b) the food bundle in the marginal land abroad. Argentina's marginal land, however, employs substantially fewer resources to produce the internationally equivalent output unit (the food bundle):

$$\beta_j = P_j^{ar} / P_j^{w} \tag{1}$$

$$P_2^{ar} = P_1^{w} = p_2^{w} \tag{2}$$

$$\beta_1 < \beta_2 \quad \text{strong inequality} \tag{3}$$

where

ar = Argentina,
w = rest of the world,
j = {1 food; 2 manufactures},
p = cost-price in internationally equivalent output units,
β = internationally equivalent output PPP equilibrium exchange rate.

Equilibrium exchange rates β_1 and β_2 in equation (1) are weighted averages by volume of Argentinean exports of a continuity of PPPs corresponding to individual goods.

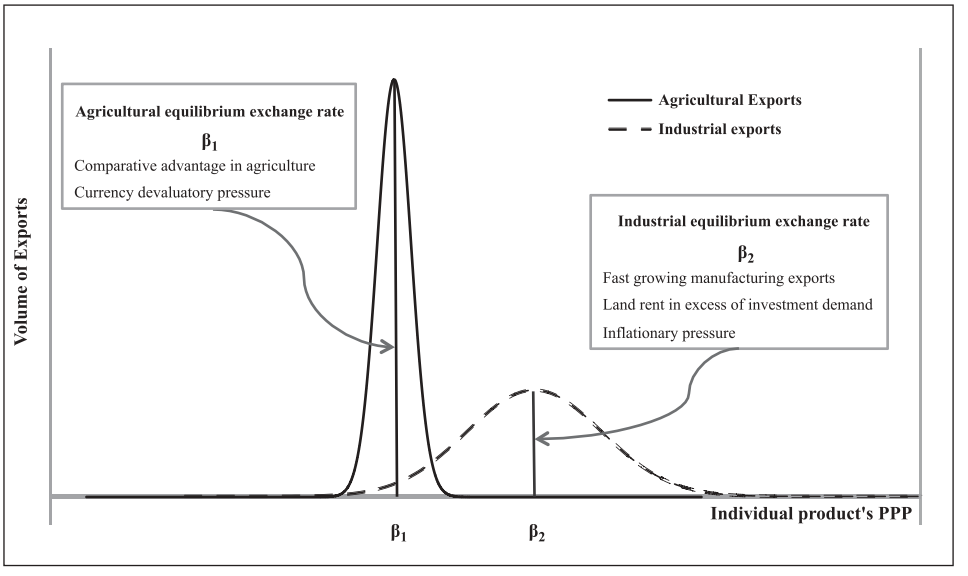

Figure 2. Theoretical distribution of Argentina's exports according to individual products' PPP.

Figure 2 illustrates a theoretical distribution of Argentina's PPPs and the corresponding equilibrium exchange rates. Equation (2) indicates that world equilibrium prices per unit of internationally equivalent output are equal. At β_2 Argentina's manufactures competitively trade in the world market. In equation (3), $\beta_1 < \beta_2$ indicates Argentina's strong comparative advantage in agriculture, which implies a permanent lack of capital mobility into this Argentinean sector (Ricardo 1821, 136).

During the first half of the twentieth century, all Argentinean exports were agricultural. In 1953–1963 agricultural exports were 96.3% of the total and manufactures of industrial origin 3.7%. In 1998–2008, agricultural exports had fallen to 58.7% of the total and manufactures of industrial origin had increased to 32.2%. Industry also increased as a share of GDP: industrial production was twice as large as agricultural production in the 1950s, and more than three times larger in 2000–2007 (www.mecon.gov.ar).

Assume now that the following equilibrium relationships hold. The duality hinges both on a fixed β_1 in equations (5), (7) and (11) and also on the remarkably different manufactured and agricultural export growth rates.

$$\hat{N} = f(w_2, x_1, \beta_1, \hat{Q}) \qquad \delta f/\delta x_1 < 0; \quad \delta f/\delta(w_2, \beta_1) > 0 \tag{4}$$

$$w_2 = 1 - \beta_1 w_1 - \beta_j \pi - \beta_1 \lambda \tag{5}$$

$$\lambda = x_1 \lambda_a(w_1, \beta_1) + (1 - x_1)\lambda_b(w_1, \beta_1); \quad 0 < \lambda_b < \lambda_a < 1; \delta\lambda/\delta(w_1, x_1, \beta_1) > 0 \tag{6}$$

$$\hat{X}_1 = \begin{cases} \hat{Y}^w + \varepsilon_{\beta, x_1} \hat{\beta}_1 & \text{with} \quad \hat{\beta}_1 = 0 \quad x_1 > \min(x_i) \\ \hat{X}_2 & x_1 \min(x_i) \approx 0.05 \end{cases} \tag{7}$$

$$\hat{X}_2 = \hat{Y}^w + \varepsilon_{\beta,x_2}(\beta_j - \beta_1)/\beta_1 \tag{8}$$

$$\varepsilon_{\beta,x_2} = (\hat{X}_2^d - \hat{Y}^w)\beta_1/(\beta_2 - \beta_1) \qquad \hat{X}_2^d \approx 2\hat{Y}^w > 0 \tag{9}$$

$$\hat{M} = \varepsilon_{\text{y,m}}\,\hat{Q} + \varepsilon_{\text{p,m}}\,\hat{\rho} \qquad \varepsilon_{\text{y,m}} \approx 2;\ \varepsilon_{\text{p,m}} \approx -0.4 \tag{10}$$

$$x_1\beta_1\hat{X}_1 + (1-x_1)\beta_j\hat{X}_2 = \beta_j\hat{M} \qquad \text{with initial} \quad X = M \tag{11}$$

$$x_1 = X_1/X; \quad x_1 = 0.963 \text{ in } 1953-1963 \quad \text{and} \quad x_1 = 0.685 \text{ in } 1998-2008^3 \tag{12}$$

$$X = X_1 + X_2 \tag{13}$$

Endogenous variables:

M	imports volume
N	employment
Q	GDP and income in internationally equivalent output units
X	exports volume
x_1	food exports to total exports
ε_{β,x_2}	exchange rate elasticity of supply of manufactured exports
λ	Ricardian land rent share in national income
w_2	manufactured wage goods and services to national income ratio

Exogenous variables:

X^d	demand for exports volume
Y^w	world GDP volume
w_1	food wage goods to national income ratio
$\varepsilon_{y,m}$	income elasticity of demand for imports
ε_{β,x_1}	exchange rate elasticity of supply of food exports
$\varepsilon_{\rho,m}$	real exchange rate elasticity of demand for imports
λ_a ; λ_b	max and min values of λ when x_1=1 and x_1=min(x_1), respectively.
π	profit share in national income
ρ	market real exchange rate AR$*UScpi/US$*ARcpi. 'Currency devaluation' and 'exchange rate appreciation' are synonymous.
d	'd' as superscript indicates demand
∧	a hat above a variable indicates its rate of change over time

Argentina has labour and natural resources in abundance. Critical capital goods and technology are imported. Thus, foreign exchange is growth's limiting 'factor' (Diaz Alejandro 1963; Braun and Joy 1968) as in other development economics models. All capital goods embodying new technology are imported from and designed for the industrialised markets. This prevents the choice of labour-intensive techniques to mitigate structural unemployment (Findlay 1970). Thus, for simplicity, constant technical coefficients within the relevant production range are assumed.

Given the strong inequality $\beta_1 < \beta_2$ in equation (3) labour demand per unit of internationally equivalent output is much lower for agriculture than for manufacturing. Capital goods and non-wage earners' consumer goods are mostly imported. Thus, the demand for labour, equation (4), is a direct function of the industrial production share in GDP that results, in turn, a function of w_2 and $(1-x_1)$. Argentina is open to immigration from countries with structural unemployment and low wages. Therefore, labour supply is relatively income elastic if labour demand increases, although it is not completely price elastic and wages are above subsistence level. When labour demand weakens, labour supply becomes relatively income inelastic because labour does not migrate back to low wage regions. Consequently, immigration barriers in higher wage countries lock-in unemployment within Argentina's growing urban poverty areas.

Income is distributed among wages w, profits π and Ricardian land rent λ in equation (5). Food is tradable and valued in foreign exchange and w_1 and λ are converted onto domestic prices at the agricultural exchange rate β_1 – for simplicity profits in agriculture are not in the mathematics in equation (5). Profits in manufacturing subject to international competition are valued in foreign exchange and converted at the manufacturing exchange rate β_2. Food wage consumption w_1 is price inelastic. Manufactured wage goods and services demand w_2 is price elastic, equation (5), and represents a large fraction of total domestic manufactured output that is marginally tradable depending on the exchange rate, equation (8). Albeit rising, X/Y is small (0.055 in 1953–1963 and 0.129 in 1998–2008).[4]

In equation (6), agriculture shows diminishing returns ($\lambda_a > \lambda_b$) that generate land rent λ, which varies with food production ($\delta\lambda/\delta\,(w_1,x_1)>0$) and with marginal land use ($\delta\lambda/\delta\beta_1>0$). For simplicity $\delta\lambda/\delta Q=0$. Industrialisation is depicted in the slow fall in x_1 and in the even slower decline in w_1.

Landowners' incentives differ from entrepreneurs' incentives in that the former need not re-invest earnings in order to stay in business (Ricardo 1821; Walras 1896). Intertemporally, landowners aim at maximising λ because this maximises their political and social influence, minimising land taxation. Given w_1, wage earners aim at maximising w_2 and employment. With the profit rate set by international competition and a given capital-output ratio, i.e. with a given π, entrepreneurs aim at maximising output.

Argentina's sectoral exports growth follows the world pattern[5] (see Table 1). Manufactured exports grew approximately twice as fast as both food exports and world GDP in 1953–2007.[6] Thus, $\hat{X}_1 = \hat{Y}^w$ in equation (7) and $\hat{X}_2^d \approx 2\hat{Y}^w$ in equation (9). The $\min(x_1)=0.05$ is set by the percentage of processed food exports with a world income elasticity of demand similar to that of manufactures (i.e. powdered milk).

Given $\beta_1<\beta_2$ in equation (3), capital and intermediate goods' imports are mostly demanded by industry that supplies, in turn, most of the consumer goods – in 1993–2007 consumer goods imports represented 15.1% of total imports with an annual SD=3.27%, the remaining 84.9% were capital and intermediate goods (www.indec.gov.ar). Thus, $\varepsilon_{\rho,m}$ is small in equation (10). The $\varepsilon_{y,m}$ in equation (10) tends to be large as a result of industrialisation because new domestically manufactured goods face an income elasticity of demand higher than unity (non-homothetic preferences) and an import coefficient larger than the economy's average in their input production chain (Vernon 1966). For example, the abrupt modernisation in consumption and production resulting from the financial and commercial liberalisation policies in 1990–1991 further raised $\varepsilon_{y,m}$ – not $\varepsilon_{\rho,m}$ – as the econometrics below indicate.

Table 1. 1953–2007 p.a. percentage growth rates.

	Volume	US$
World GDP	3.7	
World Agricultural Exports	3.7	6.8
Argentina's Agricultural Exports (includes processed food)	3.7	6.0
World Minerals and Fuels Exports	3.9	10.1
World Manufactured Exports	7.5	10.9
Argentina's Manufactured Exports of Industrial Origin	8.8	11.5

Source: World Trade Organization, International Trade Statistics, Appendix Tables, Table A1a "World merchandise exports, production and gross domestic product, 1950–2007"; Economic Commission for Latin America and Instituto Nacional de Estadistica y Censos of Argentina "Indices de valor, precio y cantidad de las exportaciones, importaciones, y términos del intercambio".

Table 2. Chow breakpoint test.

	1990	1991				1992			
Quarter	4	1	2	3	4	1	2	3	4
F-statistic	18.49	21.99	23.03	26.62	27.85	26.26	23.75	22.02	18.28
Probab.	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Data on Q in internationally equivalent units are lacking. Let us, however, estimate the long-term value of $\varepsilon_{y,m}$ and $\varepsilon_{\rho,m}$ in equation (10) by using data on GDP in constant domestic prices and ρ, respectively. The large $\varepsilon_{y,m} \approx 2$ and the small $\varepsilon_{\rho,m} \approx -0.4$ are supported by the following tests.[7] A structural change was detected in 1991 (Table 2). Table 3 indicates non-stationary and unit root I(1) series. Engle and Granger's OLS long run equation indicate a large $\varepsilon_{y,m}$ and a small $\varepsilon_{\rho,m}$ (Table 4); the ADF test to the OLS residuals rejects the null of no cointegration. The short-term values converge to the long term equations in the Error Correction Model; serial correlation, heteroscedasticity or misspecification were not detected (Table 5).

From equations (7), (8), (10), (11), (12) and (13), potential equilibrium output measured in internationally equivalent output units grows at

$$\hat{Q} = \frac{x_1 \hat{Y}^w \frac{\beta_1}{\beta_j} + (1 - x_1)[\hat{Y}^w + \varepsilon_{\beta,x_2} \frac{(\beta_j - \beta_1)}{\beta_1}] - \varepsilon_{p,m} \hat{\rho}}{\varepsilon_{y,m}} \tag{14}$$

where food exports are weighted by $\frac{\beta_1}{\beta_j} = \frac{p_1^{ar}}{p_j^{ar}} \frac{p_j^w}{p_1^w}$ from equations (1) and (2), to comply with the 'law of one price'. Foreign public debt servicing, for simplicity here assumed to be nil, would hamper $\hat{Q}$. The capital account shall be discussed later with the short-medium term business cycle model.

The agricultural and the manufacturing equilibrium paths are j=1 and j=2.

In equation (14), j=1 yields:

$$\hat{Q}_1 = \frac{\hat{Y}^w}{\varepsilon^*_{y,m}} \qquad \forall t \text{ with } \varepsilon^*_{y,m} < \varepsilon_{y,m} \tag{14a}$$

Table 3. Unit root tests I(1).

	Phillips-Perron		Augmented Dickey-Fuller					
	1970:Q1–2008:Q3		1970:Q1–1983:Q4		1970:Q1–1991:Q4		1992:Q1–2008:Q3	
	with trend	without trend	with trend	without trend	with trend	without trend	with trend	without trend
Log M	−2.39 (0.38)	−0.80 (0.82)	−1.71 (0.73)	−1.78 (0.39)	−1.83 (0.68)	−1.78 (0.39)	−1.86 (0.66)	−1.56 (0.50)
Log Y	−1.38 (0.86)	0.40 (0.98)	−1.66 (0.75)	−1.95 (0.31)	−2.46 (0.35)	−2.19 (0.21)	−1.41 (0.85)	−0.25 (0.93)
Log RO	−2.52 (0.32)	−2.48 (0.12)	−1.83 (0.68)	−1.84 (0.36)	−1.89 (0.65)	−1.90 (0.33)	−2.54 (0.31)	−1.39 (0.58)
D(Log M)	−10.81 (0.00)	−10.83 (0.00)	−7.48 (0.00)	−7.52 (0.00)	−8.36 (0.00)	−8.37 (0.00)	−3.52 (0.046)	−3.54 (0.01)
D(Log Y)	−9.39 (0.00)	−9.38 (0.00)	−6.46 (0.00)	−6.35 (0.00)	−8.19 (0.00)	−8.23 (0.00)	−4.02 (0.013)	−3.95 (0.00)
D(Log RO)	−10.62 (0.00)	−10.65 (0.00)	−5.48 (0.00)	−5.52 (0.00)	−8.28 (0.00)	−8.29 (0.00)	−5.27 (0.00)	−5.32 (0.00)

Null hypothesis: series are non-stationary; p-values within brackets. Automatic lags based on Schwartz Info Criterion.

Table 4. OLS long-run demand for imports function. 1970:Q1–2008:Q3; dummy in 1992:Q2–2008:Q3.

Log(M) = *–29.03 – 23.19 Dummy + 1.72 Log(Y) + 1.23 Dummy*Log(Y) – 0.377 Log (ρ)*				
(5.39)	(6.33)	(0.28)	(0.33)	(0.033)
Adjusted R^2=0.96		SER=0.170	ADF(0)=–5.14 with p-value=0.00	

SE of the coefficients within brackets.
The dummy on ρ was not significant at 95% level.

Table 5. OLS error correction model. Dependent variable Δlog(M), 1970:Q1–2008:Q3.

Ecm(t-1)	–0.24 (0.00)	LM(2)	(0.26)
Δ Log M(t-4)	0.35 (0.00)	LM(3)	(0.37)
Δ Log M(t-6)	–0.25 (0.00)	LM(4)	(0.49)
Δ Log Y(t)	2.23 (0.00)	ARCH(1)	(0.94)
Δ Log Y(t-1)	1.42 (0.00)	ARCH(2)	(0.89)
Δ Log ρ(t)	–0.15 (0.00)	ARCH(3)	(0.31)
Δ Log ρ(t-6)	–0.12 (0.015)	Normality	(0.15)
Adjusted R^2	0.61	Homoscedasticity	(0.26)
DW	2.19	RESET	(0.24)
SER	0.09		

p-values within brackets. SER is the standard error of the regression; LM is Breusch-Godfrey's Lagrange multiplier test for up to fourth-order serial correlation; ARCH is Engle's Lagrange multiplier test for autoregressive conditional heteroscedasticity; Normality of the residuals is tested with Jarque-Bera's test; RESET is Ramsey's test for regression's specification error.

In equation (14a), exports grow at the world GDP rate $\hat{Y}^w$. A small manufacturing sector supplies mostly the domestic market, albeit food accounts for a large fraction of wages – high w_1/w_2. Very few manufactured exports compete internationally, based mostly on inexpensive labour, inexpensive capital goods imports and their own PPP relatively close to β_1. Thus, manufactured exports remain a small and constant fraction $(1–x_1)$ of total exports, land rent share λ remains large and constant in equation (6), and labour demand grows sluggishly in equation (4) keeping unemployment high and the real wage (w_1+w_2) low. The $\varepsilon_{y,m}$ that we have approximated in equation (10) by using GDP data, corresponds to a period of industrialisation. Therefore, with low industrialisation in equation (14a) $\varepsilon^*_{y,m} < \varepsilon_{y,m}$.

With equations (9) and (14) and $j = 2$:

$$\hat{Q}_2 = \frac{x_1 \dfrac{\beta_1}{\beta_2}\hat{Y}^w + (1-x_1)\hat{X}_2^d - \varepsilon_{p,m}\hat{\rho}}{\varepsilon_{y,m}} \tag{14b}$$

and

$$\underset{t\to\infty}{\hat{Q}_2} = \max(\hat{Q}_2) \tag{14c}$$

because $2\,\hat{Y}^w \approx \hat{X}_2^d \underset{t\to\infty}{\to} x_1 = \min(x_1)$ in equation (14b).

With industrialisation as time elapses, $dw_1 < 0$ and $dx_1 < 0$. Therefore λ falls (towards its declining minimum λ_b) by

$$d\lambda = [\lambda_a(.) - \lambda_b(.)]\, dx_1 + (\delta\lambda_b / \delta w_1) dw_1 < 0 \quad \text{with} \quad \delta\lambda_b / \delta w_1 > 0 \qquad (6a)$$

from equation (6).

Moreover, with time w_2 would tend to rise by

$$dw_2 = -\beta_1[(1 + \delta\lambda/\delta w_1)dw_1 - (\delta\lambda/\delta x_1)dx_1] \qquad (5a)$$

from equations (5) and (6).

Note that in j=2 export industries find resources readily available to meet a fast growing external demand without subsidies or tariff protection. In this we depart from the dynamic comparative advantage literature (Graham 1923; Redding 1999) where the high growth equilibrium is activated only if temporary tariff protection/subsidies allow the 'infant industry' to grow.

Because $\varepsilon^*_{y,m} < \varepsilon_{y,m}$; $\hat{Q}_1$ in equation (14a) may be higher or lower than $\hat{Q}_2$ in equation (14b) but the employment growth rate $\hat{N}$ rises towards a maximum in $j = 2$ as $t \to \infty$ in equation (4). Indeed on path $j = 2$, as time elapses, $\hat{Q}_2$ moves away from a low employment $\hat{Q}_1$ towards a high employment $\underset{t\to\infty}{\hat{Q}_2}$ in equation (14c). Because $\hat{X}_2^d \approx 2\hat{Y}^w$ and β_1 is fixed, this transition contains two remarkably different equilibria with their own structure of production, domestic and external demand, set of relative prices and distribution of income.

Intertemporally, given the rate of profits and a capital–output ratio (i.e. the profit share) and given a discount rate, path $j = 1$ maximises landowners income share λ, whereas path $j = 2$ maximises manufactured output, wages and employment growth. Landowners on the one side and wage earners and entrepreneurs on the other side, have different equilibrium paths (Matsuyama 1992).

3. The short-medium term GDP cycle

To discuss the short to medium term business cycle we must express prices in monetary terms and hence convert the internationally equivalent output equilibrium exchange rate β onto the market real exchange rate ρ.[8] The market ρ can equal only one or none β_j at the time. Let us re-write equations (1), (5) and (13) and add a balance of payments identity as follows.

$$p_{1(\text{AR\$/ARcpi})} = (\rho - \tau_x)^{p_1^w} \qquad (1')$$

$$w_{2(AR\$/ARcpi)} = 1 - \rho(w_1 + \pi + \lambda); \qquad \hat{w}_1 = 0;\ \hat{\pi} = 0;\ \hat{\lambda} = 0 \qquad (5')$$

$$\hat{X} = \hat{X}^d + \varepsilon_{\rho,x}\hat{\rho}; \qquad \varepsilon_{\rho,x} \approx 0 \qquad (13')$$

$$Y^{ST} = f(w_{2(AR\$/ARcpi)}); \quad Y^{HP} = Y^{ST}(\rho_{hp}); \quad \delta Y^{ST} / \delta w_{2(AR\$/ARcpi)} > 0 \qquad (15)$$

$$\rho = er / cpi \tag{16}$$

$$\widehat{cpi} = \mathrm{f}[\widehat{er}_{t-n}(\rho - \tau - \beta_1); \qquad \delta\widehat{cpi} / \delta\widehat{er}_{\mathrm{n}} > 0; \quad \delta\widehat{cpi} / \delta(\rho - \tau_{\mathrm{x}}) > 0 \tag{17}$$

$$\widehat{er} = \mathrm{f}(\mathrm{d}D) \tag{18}$$

$$X - M - \theta D - \mathrm{d}H - \mathrm{d}R \equiv -\mathrm{d}D; \qquad \delta(\mathrm{d}H) / \delta R < 0 \tag{19}$$

New endogenous variables

cpi	$\mathrm{AR}_{cpi}/\mathrm{US}_{cpi}$
D	foreign public debt
H	private capital held abroad by Argentinean residents
er	nominal market exchange rate (AR$/US$)
$p_{1(AR\$/ARcpi)}$	domestic price of food at constant domestic monetary prices
Y^{HP}	Hodrick-Prescott GDP trend at constant domestic monetary prices
Y^{ST}	annual quarterly moving average GDP at constant domestic monetary prices
$w_{2(AR\$/ARcpi)}$	is w_2 at constant domestic monetary prices

New exogenous variables and definitions

R	Central Bank reserves
n	time lag
$\varepsilon_{\rho,x}$	short-medium-term exchange rate elasticity of supply of exports
θ	discount rate = international interest rate + country's risk
ρ_{hp}	is ρ corresponding to current account balance
τ_x	food exports duty (reduces profitability at the marginal land)

At $(\rho - \tau_x) = \beta_1$ in equation (1') the domestic monetary food price $p_{1(AR\$/ARcpi)}$ equals its domestic equilibrium price in international equivalent output units $p_1^{ar} = \beta_1 p_1^w$ in equation (1); at $\rho = \beta_2$ all domestic monetary prices equal their international equilibrium prices in international equivalent output units p_1^w in equation (1), and $p_{1(AR\$/ARcpi)}$ is above its domestic equilibrium by p_1^w $(\beta_2 - \beta_1)$. Inflation $\widehat{cpi}$ in equation (17) is a lagged function of tradables' prices $\widehat{er}$ (see Figure 3). With nominal prices inflexible downwards (Olivera 1970, 1984 and Figure 3), inflation is also directly proportional to the size of the relative price disequilibrium $(\rho - \tau_x - \beta_1)$.

In the short to medium term, exports are fairly price inelastic, because of the high endogenous uncertainty, in equation (13′). In fact, Argentina's foreign trade research has repeatedly found negligible estimates for $\varepsilon_{\rho,x}$ in the short-medium term. Figure 4 illustrates this lack of correlation.

Equations (5′) and (15) set real monetary national income and real monetary GDP (i.e. GDP at constant domestic prices). Dual equilibria prevent us from using observed GDP data to approximate equilibrium output Q; for whatever the value of GDP, both relative prices and also the composition of GDP would be out of equilibrium, even if external balance is fulfilled – this is discussed later. As an analytical benchmark to

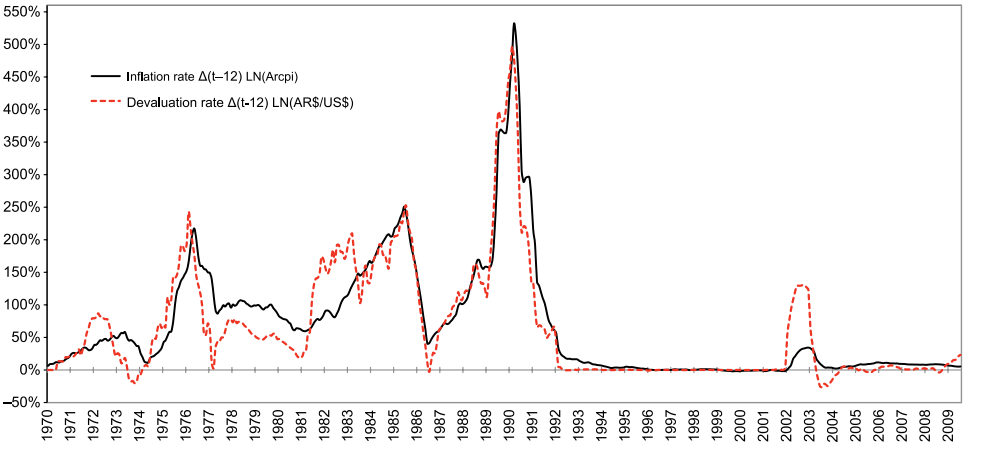

Figure 3. Argentina's nominal currency devaluation rate and inflation. Percentage change from a year ago – monthly data.
Source: Free Market Exchange Rate: Period 1953–97 from FIEL, www.fiel.org.ar, from 1998 onwards from Central Bank of Argentina www.bcra.gov.ar - CPI from INDEC of Argentina.

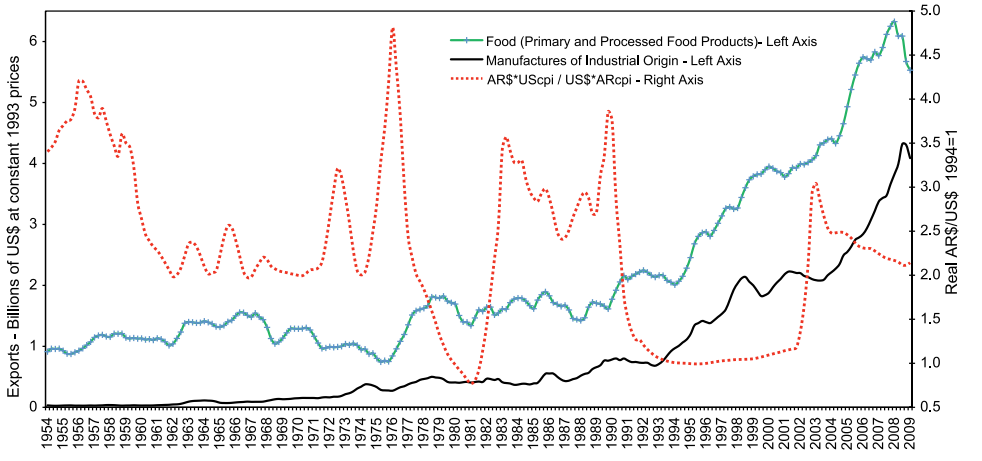

Figure 4. Exports (excluding fuels) and real exchange rate. Constant 1993 prices – 4 quarter moving average.
Source: Free Market Exchange Rate: 1953–97 FIEL, www.fiel.org.ar; 1998–2004 Central Bank of Argentina. Exports and prices: Instituto Nacional de Estadistica y Censos of Argentina www.indec.gov.ar and Economic Commission for Latin America www.eclac.org; USA prices www.bis.gov.

discuss output stability, however, let us use a Hodrick-Prescott (HP) trend. The short to medium-term aggregate demand Y^{ST} fluctuates around its trend Y^{HP} in equation (15). With a given export demand, Y^{ST} is mostly driven by domestic manufacturing wage demand $w_{2(AR\$/ARcpi)}$. Let us initially assume that Y^{HP} equals Y^{ST} at $\rho_{hp}=\beta_2$ where the current account is in balance ($X–M=\theta D$) and the capital account is in balance (dD=dH+dR), thus $\widehat{er}$ =0 in equation (18). Note the trade account correlates

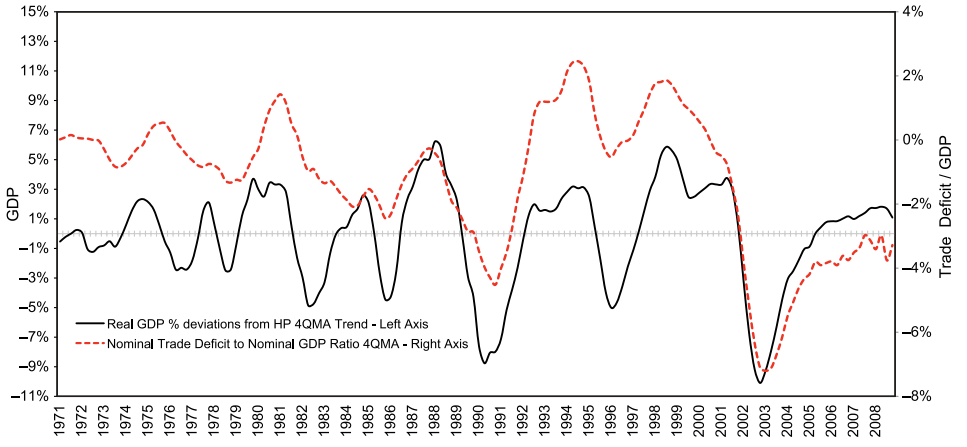

Figure 5. Argentina's GDP cycle and the trade account deficit to GDP ratio – 4 quarter moving average.
Source: GDP and Trade Balance until 1979 from Central Bank of Argentina, from 1980 onwards from Ministry of Economy of Argentina; Free Market Exchange Rate until 1997 from Boletín Informativo Techint, from 1998 onwards from Central Bank of Argentina. Trade data in US$. In the Trade/GDP ratio nominal GDP in AR$ was converted to US$ at the nominal free market exchange rate. GDP in constant 1993 AR$ was de-trended with a Hodrick-Prescott Filter (lambda 1600).

with the GDP cycle around the HP trend (see Figure 5).[9] The observed rise in the trade surplus through time corresponds to the endogenous rise in $\theta D/X$ to be discussed later.

Assume government deficits are financed only with foreign debt and all foreign debt is public and continuously refinanced. Thus, we exclude the government accounts from the mathematics and work with the balance of payments only, in equation (19). Capital outflow dH is an inverse function of the level of reserves R also in equation (19). Interest earned on H remains abroad (i.e. θH is not in the accounts). The international rate of interest and the terms of trade are treated as exogenous.

Consumer goods imports are a small fraction of total private consumption (4.7 % in 1993–2008). Assume that investments in the production of importable consumer goods[10] and of non-tradables have the same neutral foreign exchange balance effect for a given GDP. This enables us to aggregate both types of investment as 'domestic investment', which is a function of domestic absorption. The above-mentioned small X/Y indicates a large domestic investment relative to exportables' investment; therefore, to the extent that the multiplier-accelerator affects GDP dynamics it would do so proportionately to Y/X.

Note that manufactured exports and GDP grew fast in 2002–2008 when ρ tended to stabilise at its long term average $\rho \approx 1.90$ in 1994 prices (Figures 1 and 4 and Table 6). During that period $\theta D/X$ was relatively low (after the 2002 default and the subsequent debt reduction) and the Central Bank accumulated reserves suggesting that manufacturing profits were somewhat near equilibrium. Thus, let us postulate approximately $\beta_2 \approx 1.90$ in 1994 prices. Also, as an approximation, $\beta_1 \approx 1$ at 1994 prices since food exports grew fast during the prolonged 1991–2000 period of such remarkably low ρ (Figure 4) – and not favourable terms of trade.

At β_2 real monetary profits in manufacturing $\rho\pi$ are in equilibrium. Thus, if $\theta D/X$ is reasonably small and does not imply an excessive tax burden, we may initially

Table 6. The exchange rate and inflation in Argentina – monthly data.

	$\widehat{er}$ =	$\widehat{cpi}$ =	ρ =
	$\Delta_{t\text{-}12}$ LN(AR$/US$)	$\Delta_{t\text{-}12}$ LN(ARcpi)	er*UScpi/ARcpi (1999:4Q=1)
1970–2008			
Average	64.8%	69.2%	1.90
SD	89.8%	89.0%	94%
1970–1991			
Average	109.2%	117%	2.24
SD	95.6%	93%	100%
1992–2008			
Average	7.1%	6.8%	1.46
SD	28.2%	8.8%	63%

Source: ARcpi from www.indec.gov.ar of Argentina; UScpi from www.bls.gov; Free Market Exchange Rate prior 1998 from www.fiel.org.ar, from 1998 onwards from www.bcra.gov.ar.

assume $\rho_{hp}=\beta_2$ (this is later relaxed when discussing capital flight). Also, $\tau_x=0$ – to be relaxed when discussing economic policy.

The upswing

Assume the economy is initially at $\rho=\rho_{hp}=\beta_2$, $Y^{ST}=Y^{HP}$ and $D\approx 0$. From equation (14b) monetary potential output grows by

$$\hat{Q}_{(\rho=\beta_2)}=\hat{Q}_2+\varphi; \qquad \text{with} \quad \varphi=\frac{x_1\hat{Y}^w}{\varepsilon_{y,m}}\frac{(\beta_2-\beta_1)}{\beta_1} \tag{14b'}$$

φ agriculture's domestic real money balances in excess of equilibrium investment demand when $\rho=\beta_2$.

Even if $\rho=\beta_2$ was regarded by investors as permanent and hence the long run equilibrium exchange rate elasticity of supply of exports $\varepsilon_{\beta,x}$ fully applied, firms would not raise their borrowing rate by φ because in equilibrium entrepreneurs aim at a stable assets-liabilities ratio to prevent lenders' interference (Modigliani and Miller 1958, Wood 1975). Thus, potential monetary output growth $\hat{Q}_{(\rho=\beta_2)}$ is above equilibrium output growth $\hat{Q}_2$. Moreover, with $\rho=\beta_2$ real monetary land rent income $\rho\lambda$ is above equilibrium by $(\beta_2-\beta_1)$ and real monetary manufacturing wage demand $w_{2(AR\$/ARcpi)}$ is below equilibrium w_2 by $(w_1+\lambda)(\beta_1-\beta_2)$. The resulting relatively low propensity to spend – given the large $\varepsilon_{y,m}$ – takes the pressure off $\widehat{er}$ and the large $\rho-\tau_x>\beta_1$ causes high $\widehat{cpi}$ in equation (18) that depresses ρ towards β_1; i.e. β_2 is a source of price and output instability even if the external accounts are in balance and monetary manufacturing profits are in equilibrium $\rho\pi=\pi$.

As ρ declines away from β_2 the recessive effect due to the large $\rho\lambda$ and the low $w_{2(AR\$/ARcpi)}$ weakens and an expansionary effect builds up (i.e. domestic demand rises

above trend $Y^{ST}>Y^{HP}$ in equation (15) because of the domestic relative price elasticities effect – $\delta w_{2(AR\$/ARcpi)}/\delta\rho$ in equation (5′) – and wage earners relatively high propensity to spend. The standard high income elasticity of domestic demand for manufactures relative to food further boosts domestic manufacturing demand. The current account deficit increases in proportion to the large $\varepsilon_{y,m}$. With international borrowing the economy can sustain $\widehat{cpi} > \widehat{er} \approx 0$ and reach $\rho=\beta_1$. At β_1 $\widehat{cpi}$ becomes low since $\rho-\tau_x=\beta_1$, but monetary manufacturing profits are below equilibrium ($\rho\pi < \beta_2\pi$), monetary potential output growth $\hat{Q}_{(p=\beta_1)}$ is below its equilibrium growth rate $\hat{Q}_2$ in equation (14b), real GDP is above trend ($Y^{ST}>Y^{HP}$) and the current account is negative hence $D > 0$. Thus, β_1 is also a source of instability.

The downswing

At $\rho=\beta_1$ real GDP is above trend ($Y^{ST}>Y^{HP}$). Assume dR=0 and dD=0 at t=0. The resulting current account deficit must be corrected by

$$X_0 - M_0 - \theta D - \mathrm{d}(X - M) - \mathrm{d}H = 0 \tag{20}$$

Assume, for simplicity, $X_0=M_0$. From equations (10), (13′) and (19) the recessive devaluation rate that fulfils equation (20) is

$$\widehat{er}^{\,s} = \frac{(\varepsilon_{\rho,x} - \varepsilon_{\rho,m})\,\widehat{cpi} - \hat{X}^d + (\theta D + dH)/X}{\varepsilon_{\rho,x} - \varepsilon_{\rho,m} - \varepsilon_{y,m}\,\varepsilon_{er,y}} \qquad \text{with} \qquad \varepsilon_{er,y} < 0 \tag{20′}$$

In equation (20′) the numerator is positive; otherwise there would be no need for devaluation. The denominator is positive because the exchange rate elasticity of GDP $\varepsilon_{er,y}$ is negative for the following reasons (Diaz Alejandro 1963; Braun and Joy 1968). With $\widehat{er} > \widehat{cpi}$ the domestic food price $p_{1(AR\$/ARcpi)}$ in equation (1′) increases and the quantity of manufactures domestically demanded drops via the relative price elasticities effect, $\delta w_{2(AR\$/ARcpi)}/\delta\rho<0$ in equation (5′). Moreover, $\widehat{er}^{\,s}$ transfers income in favour of agents with a lower propensity to consume and the standard high income elasticity of domestic demand for manufactures relative to food reinforces such decline in $w_{2(AR\$/ARcpi)}$. The resulting recessive effect is not compensated by the weak foreign trade effect – low $\varepsilon_{\rho,x}$, $\varepsilon_{\rho,m}$ and X/Y. The fall in Y^{ST} is deeper the larger (θD + dH)/X is. If considered, government expenditure would decline by $\theta D\mathrm{d}\rho$, further depressing GDP. With a lag, $\widehat{cpi}$ tends to rise given $\widehat{er}_{t-n}$, see equation (17). If this is anticipated and inflationary expectations raise $\widehat{cpi}$ in the numerator, $\widehat{er}^{\,s}$ further increases to ensure equation (20), generating additional recession. During $\widehat{er}^{\,s}$ bankruptcies increase (Goldstein 2005) and this affects the export sector that is connected with the rest of the economy through contractors and banks (Krugman 1999; Frankel 2005), which reinforces $\varepsilon_{\rho,x} \approx 0$.

The $\widehat{er}^{s}$ raises ρ beyond β_2 and Y^{ST} crosses Y^{HP} from above to produce – through the large $\varepsilon_{y,m}$ – the additional surplus in the trade account required to service the debt accumulated during the previous expansionary deficit (Figure 5).

The upswing again

At $\rho>\beta_2$ with $\widehat{er} \approx 0$ and a high $\widehat{cpi}$ – due to both $\widehat{er}^{s}_{t-n}$ and a large $\rho-\tau_x>\beta_1$ in equation (17) – ρ begins to decline and the recovery starts as discussed above. As ρ falls, the gradual, albeit lagged, decline in $\widehat{cpi}$ reduces uncertainty, further stimulating growth. With low inventories domestic investment picks up. Domestic absorption boosts Y^{ST} that crosses its Y^{HP} from below.[11] Albeit declining, $\widehat{cpi}$ further depresses ρ that crosses β_2 towards β_1 until foreign lending (capital inflow) stops and a new $\widehat{er}^{s}$ occurs and $\rho \rightarrow \beta_2$.

The capital account accelerator

Capital flows can accelerate and widen the cycle as follows. If, during devaluation, herd expectations form (Bacchetta and Wincoop 2006; Morris and Shin 1998; Obstfeld 1996), ρ can overshoot through a large $dH>0$ financed out of domestic expenditure postponement, which deepens the recession. Reserves accumulation by the Central Bank eventually copes with devaluatory expectations and $\widehat{er}$ stops.

Capital flows accelerate the recovery if $\widehat{er}^{s}$ raised domestic purchasing power by dollar holders, domestic expenditure postponed during devaluation is resumed through $dH<0$ and idle capacity in the domestic sector. Such capital inflow accelerates ($dH'<0$) if dollar holders expect the decline in ρ to persist which would reduce their domestic purchasing power.

4. Price and output instability

The analytical benchmark $\rho_{hp}= \beta_2$ adopted throughout is somewhat arbitrary because of multiple equilibria. Assume a different ρ_{hp} does not change the main argument. Let us alternatively assume, for example:

(a) $\rho^*_{hp} = [\beta_1(w_1+\lambda)+\beta_2\ \pi]/(w_1+\lambda+\pi)$ where $w_{2(AR\$/ARcpi)} = w_2$
(b) $Y^{HP}=Y^{ST}\ (\rho^*_{hp})$, in equation (15)
(c) at ρ^*_{hp} monetary output growth $\hat{Q}_{(\rho)}$ meets equilibrium growth rate $\hat{Q}_2$
(d) at ρ^*_{hp} current account is in balance hence $\widehat{er} = 0$.

Clearly $\beta_1 < \rho^*_{hp} < \beta_2$. At $\rho = \rho^*_{hp}$ inflation would depress ρ towards expansionary $\rho=\beta_1$ until the current account deficit triggers the recessive currency devaluation raising ρ towards β_2 until the current account surplus halts currency devaluation and recovery begins with inflation depressing ρ back towards β_1 and so on. The main consequence of adopting the alternative ρ^*_{hp} instead of $\rho_{hp}= \beta_2$ would be reinforcing

the recessive instability effect at β_2 where $Y^{ST} < Y^{HP}$. Thus, β_1 andβ_2 are sources of price and output instability regardless the value of ρ. In fact, for all values of ρ in between β_1 and β_2 agricultural profits and agricultural savings are above equilibrium since $(\rho-\beta_1)\ (w_1+\lambda_1) > 0$ and manufacturing profits and manufacturing savings are below equilibrium since $(\rho-\beta_2)\pi < 0$. Equilibrium (i.e. permanent) borrowing is ruled out for landowners would eventually take over manufacturing firms. Such permanent monetary and output disequilibrium shows in the permanent inflationary-devaluatory pressure both in the upswing $0 \leq \widehat{er} < \widehat{cpi}$ as $\rho \rightarrow \beta_1$; and in the downswing $\widehat{er} > \widehat{cpi} \geq 0$ as $\rho \rightarrow \beta_2$. Thus, the observed instability in ρ (Table 6 and Figure 4) and the uncertainty in the whole system of prices and quantities can be theoretically expressed by

$$\sigma(p) = f[\lambda,(\beta_2 - \beta_1)] \qquad \text{with} \qquad \delta f/\delta[\lambda,(\beta_2 - \beta_1)] > 0 \tag{21}$$

where $\sigma(\cdot)$ = percentage standard deviation.

Note that if foreign lending was just about enough to keep ρ stable it would be at the cost of permanent inflationary–devaluatory pressure that could be only temporarily repressed. With a large current account deficit, devaluatory pressure would prevail near β_1 as during the 1990s (bursting in 2002); whereas with a large $\rho-\tau_x>\beta_1$ inflationary pressure would prevail near β_2 as during the 1980s and the first half of the 1970s.

5. The cycle and the trend

The connections between cycle and trend are always complex; let us briefly discuss the relevant ones.

Industrialisation and exports

The *X/Y* ratio rose from 0.055 in 1953–1963 to 0.129 in 1998–2008 and $(1-x_1)$ from 0.037 in 1953–1963 to 0.315 in 1997–2007 (www.indec.gov.ar and www.eclac.org). The corresponding rise in export investment in relation to domestic investment should have had a stabilising effect since only the latter feeds into the cycle. Such a rise in $(1\text{-}x_1)$ would also reduce λ and hence the instability captured in $\sigma(\rho)$, equation (21). Moreover, equilibrium GDP growth $\hat{Q}_2$ in equation (14b) would trend away from low employment GDP growth $\hat{Q}_1$ in equation (14a) towards high employment GDP growth $\hat{Q}_2$ in equation (14c). But the following regressive and de-stabilising forces also operate.

Poverty and institutional quality

With $\widehat{er}^s$ unemployment rises and the real wage falls as ρ appreciates dramatically $\delta w_{2(AR\$/ARcpi)} / \delta \rho < 0$ in equation (5′). Figure 6 shows the remarkable correlation between poverty[12] (that captures both the employment and the real wage effects) and the two jumps in ρ corresponding to $\widehat{er}^s$ in 1988 and in 2002. Such a massive redistribution of real income in favour of agents with dollar denominated income/assets, who can postpone expenditure in pesos until $\widehat{er}^s$ stops, raises dH, deepening the follow-

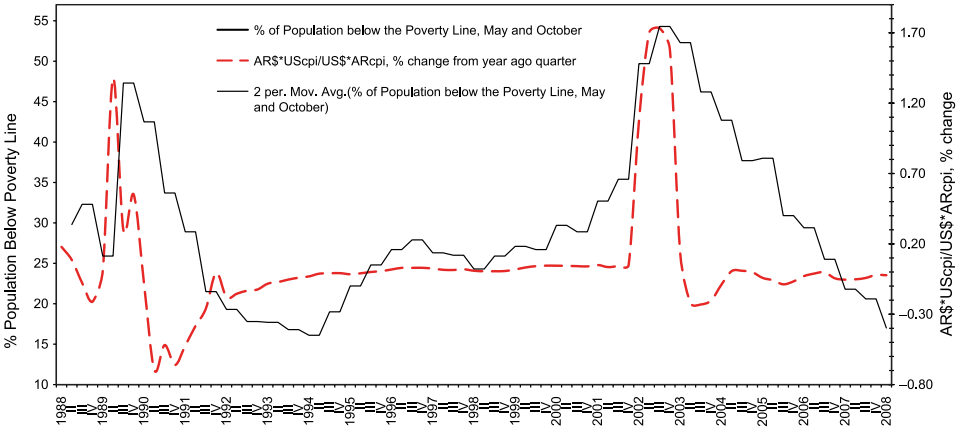

Figure 6. Real exchange rate and population in poverty in Argentina.
Source: People living below the poverty line in Buenos Aires and Great Buenos Aires, "Encuesta Permanente de Hogares" www.indec.gov.ar; no data prior 1988. Exchange rate from www.BCRA.gov.ar.

ing recession, which further re-distributes income. This widens the poverty gap as the cycle repeats and agents with dollar denominated income/assets learn to anticipate it. There is not much that peso-wage earners with a high propensity to spend on basic needs can do about it, even if they also learn to anticipate the cycle. Figures 1 and 5 show the floor's decline through time, except in 1995–1996 when the devaluation was averted. Thus, structural unemployment rose at the cycle's peaks from 4% in 1963–1989 to 8.6% in 2008 after an unprecedented 23 quarters uninterrupted GDP growth of 8.1% p.a. The severe distributive conflict and the contract defaults resulting from $\widehat{er}^{s}$ weaken institutional quality hampering investment.

The speed of response, correlations and causality

Agents learn the cycle and compete to anticipate the endogenous inflationary-devaluation and arbitrage foreign currency vis-à-vis domestic expenditure in pesos, until inflation becomes unbearable and the government is forced to shock expectations (as with the dollarisation in 1990). Nevertheless, the anticipation of the cycle raised the speed of response, reduced time lags, and increased correlations among the exchange rate, GDP growth, inflation, the trade account and poverty as shown by Figures 1, 3, 5 and 6. With the anticipation of the cycle, however, the causality from variations in *er* to changes in GDP is lost in 2001–2002, as Figure 1 illustrates.

Foreign Public Debt

Government expenditure matched with foreign indebtedness allows postponing $\widehat{er}^{s}$ in equation (20´) until lending stops, either because debt is perceived as too high or because of a global credit constraint. The larger $\theta D/X$ the larger $\widehat{er}^{s}$ becomes, further lowering the cycle's floor and the trend. If $\widehat{er}^{s}$ is too strong the economy's repayment capacity is disrupted. The resulting cut in D would enable $\widehat{er}^{s}$ to operate. The long-term effect on growth would depend on the contracts' default effect on

institutional quality, which would be captured by a rise in the country's risk and θ, thus $\theta D/X$ would not fall proportionally to the cut in D.

D/X rose permanently from a 1.7 average in 1953–1969 to a 4.8 average in 1992–2008. Moreover, D/Y rose continuously from a 0.11 average in 1953–1969 to 0.54 in December 2001 and 1.6 in December 2002.[13] This sharp rise in D/Y in 2001–2002, resulting from both the drop in real Y and the rise in er, illustrates the RBC's agent difficulties when calculating their Argentinean equilibrium trend values with a large $\sigma(\rho)$. In December 2004, D was unilaterally reduced from US$ 191 billion to US$ 129 billion. Argentina had also defaulted in 1982–1983.

Capital outflow

As $\theta D/X$ rises in the long run, the exchange rate compatible with external balance ρ_{hp} rises above the exchange rate compatible with industrial equilibrium β_2, which implies a growing tax pressure to service the debt generating capital flight. In 1999, the stock of flight capital was equivalent to the foreign public debt (www.mecon. gov.ar). The sources for such capital flight are the severe income redistribution during the $\widehat{er}^s$ and the corruption linked to public expenditure in a weakening institutional environment.

6. Economic policies

Let us discuss some economic policy issues relevant to Argentina's dual equilibria.

Inconsistent objectives and policies

Private agents face conflicting short and long term objectives, as discussed above. In the short run, close to β_1 wages and industrial output are high and landowners' income is low, whereas close to β_2 the opposite occurs. In the long run, this relationship reverses. Fixing ρ close to β_1 by rising foreign debt (as in 1977–1982, 1985–1988 and 1990–2001) the government would maximise short-term GDP and employment but jeopardise long term growth, and ρ would eventually burst (as in 1983, 1989 and 2002). Fixing ρ close to β_2 and setting food export duty[14] at $\tau_x = (\beta_2 - \beta_1)$ in equation (1′) the government could partially offset inflationary pressure. Capital, however, would not move to the agricultural frontier thus perpetuating a low β_1 – as in 1945–1955; 1967–1970; 1973–1976 and 2002–2008 until rural unrest fuelled a policy change. Finally, a floating exchange rate would face permanent inflation, devaluation and GDP disequilibrium as discussed above. Thus, inconsistent economic policies result from dual equilibria, whatever the exchange rate regime.

Trade and monetary policies

The endogenous inflationary-devaluatory pressure and the large $\sigma(\rho)$ in equation (21) seriously reduced the size of the financial system and the domestic capital markets. Therefore, in 1970–1990 chronic fiscal deficits were increasingly money financed, whereas government bonds in domestic currency were mostly compulsorily enforced (e.g. upon pension funds and retirees). After the traumatic hyperinflations in 1975–1976, 1984–985 and 1989–1990 somewhat more cautious monetary policies were adopted from 1990 onwards, but inflation remained above international

values. Olivera (1970) argues that below inflation's structural floor – in our model the inflationary-devaluatory pressure endogenous to the cycle[15] – money becomes endogenous and monetary policies have little effect on prices. However, such cautions monetary policies, plus the sharp import tariffs reduction in 1991 along with the trend rise in X/Y probably reduced the relative importance of the inflationary 'non-tradable effect' in the dynamics of ρ – Table 6 and Figure 3 show the decline in average $\widehat{cpi}$ and average $\widehat{er}$ in 1992–2008. Note, however, that $\sigma(\rho)$ did not decline proportionately.

Land tax and high growth

Duality persists because prices move faster (inflation) to correct for $\rho-\tau_x>\beta_1$ than what productive investment would move to take advantage of temporary higher agricultural profitability. Duality could be eliminated as follows. The key assumptions are the following.

(a) Agricultural sector's specialisation in the production of high-value-added and high-protein processed food with a high world income elasticity of demand (e.g. powdered milk). Therefore $\hat{X}_1 \rightarrow \hat{X}_2$ i.e. ε_{β,x_2} would apply to all exports which implies $x_1 \rightarrow \min(x_1)$.

(b) Large rural investment in schooling, utilities, health services, transportation and communications to attract massive labour migration away from urban poverty areas. Food production would increase until marginal costs equal those of the marginal land abroad. Therefore $\beta_1 \rightarrow \beta_2$.

Given (a) and (b), GDP could speed-up its convergence to its maximum equilibrium rate $\underset{t\rightarrow\infty}{\hat{Q}_2}$ in equation (14c).

If (b) above is fulfilled but (a) is not, Argentina's agricultural exports would increase during the process in which β_1 converges to β_2 gaining world market share, but equilibrium output growth would not reach its maximum $\underset{t\rightarrow\infty}{\hat{Q}_2}$ in equation (14c) as fast because $x_1>\min(x_1)$.

Rural investment could be paid for as follows. Re-write equation (5) as

$$\mathrm{d}(w_2 + w_r) = \mathrm{d}[1 - \beta_1 w_1 - \beta_2 \pi - \beta_1 \lambda(x_1, w_1, \beta_1)] + \tau_\lambda = 0 \qquad (5a)$$

with $\mathrm{d}w_1 = 0$ for simplicity.

w_r : Benefits from rural utilities, education, health, transportation and communications perceived by wage earners.

τ_λ : Land tax (i.e. tax on λ).

The fall in w_2 due to $(\beta_2-\beta_1)$ is compensated with a rise in w_r in equation (5a) that is paid for with the following land tax

$$\tau_\lambda = [w_1 + \lambda + \beta_1 \delta\lambda/\delta\beta_1]\, \mathrm{d}\beta_1 + \beta_1 \delta\lambda/\delta x_1\, \mathrm{d}x_1 \qquad (5b)$$

from equation (5a).

This would also reduce $\sigma(\rho)$ in equation (21), stabilising GDP growth. Food could be priced internationally without inflationary or destabilising consequences.

7. Conclusions

We have argued that landowners maximise their income net of land taxes in the low employment growth equilibrium corresponding to the comparatively advantageous agricultural PPP exchange rate β_1, whereas wage earners and entrepreneurs maximise their income in the high employment growth equilibrium corresponding to the industrial PPP exchange rate β_2. These remarkably different β_1 and β_2 generate a permanent devaluatory-inflationary pressure and drive the CPI-based real exchange rate ρ to extreme values: expansionary $\rho=\beta_1$ until current account deficit triggers the recessive currency devaluation raising ρ towards β_2 until current account surplus halts currency devaluation and recovery begins with inflation depressing ρ back towards β_1. Such a cycle generates inconsistent policies and conflict over income distribution, which strain institutions decelerating growth. Foreign debt to sustain expansions amplifies the cycle, depressing growth. Food export duties τ_x to sustain ρ near β_2 during expansions, perpetuate a low β_1. A land tax (virtually a tax on Ricardian land rent) to finance rural infrastructure would allow both to increase high-protein-high-value-added agricultural production with a strong foreign demand, and also to attract massive labour migration away from urban poverty areas raising marginal agricultural cost until $\beta_1 \rightarrow \beta_2$. This would facilitate convergence to the high growth path. Land tax projects have always been aborted in the past.

Acknowledgements

I am grateful to Ana Bus, Michael Ellman, Daniel Heymann, Julio H.G. Olivera, Malcolm Sawyer and two anonymous referees for their comments. Errors and omissions are my responsibility.

Notes

1. Without testing their RBC models, Aguiar and Gopinath (2007) also impute to exogenous shocks exclusively – 'country risk' in Neumeyer and Perri (2005) – the high consumption volatility in some developing countries.
2. Among a large sample of industrialised and peripheral economies, Argentina had the largest private consumption volatility in 1980–2003 (Aguiar and Gopinath 2007).
3. This 0.685 includes 0.587 of food, and 0.096 of oil, gas and minerals that Argentina began exporting in the 1970s (www.indec.gov.ar and www.eclac.org at constant 1993 prices).
4. For 1953–1963 annual data from Central Bank of Argentina: GDP from 'Sistema de Cuentas del Producto e Ingreso de la Argentina, Cuadros Estadísticos Vol II' published in 1975 and exports from 'Estimaciones Trimestrales del Balance de Pagos' (various issues). For 1998–2008 both GDP and exports data were from www.indec.gov.ar. All values were converted to AR$ 1993 prices with AR_{CPI} from www.indec.gov.ar and US_{CPI} from www.bls.gov. In 1993 AR$/US$=1. If the calculation is made with nominal values at the current exchange rate similar results are obtained. Free Market Exchange Rate prior 1998 from FIEL, www.fiel.org.ar, from 1998 onwards from Central Bank of Argentina.
5. World income elasticity of demand is ≈1 for staple goods, and ≈2 for manufactures, as in Flam and Helpman (1987), Krugman (1989) and Matsuyama (2000).
6. Data from www.wto.org , www.indec.gov.ar and www.eclac.org
7. EViews 5.0 software was used. GDP, imports (1986–2008) and AR_{CPI} from www.indec.gov.ar; Imports (1970–1985) from www.eclac.org; the free market nominal

exchange rate from Argentina's Central Bank as quoted in the IMF-IFS (for periods of exchange controls from Fundación de Investigaciones Económicas Latinoamericana www.fiel.org) and the US_{CPI} from www.bls.gov. All variables were deflated by the relevant price index. GDP adjusted with US Census Bureau, X-12 quarterly seasonal adjustment method.

8. The CPI basket is composed mostly of non-tradables that represent around 2/3 of GDP. Thus, changes in ρ resulting from *cpi* variations are also changes in tradables' vis-à-vis non-tradables' relative prices respectively (Kehoe 2007).
9. A very different GDP trend would result if calculated in US$, highlighting the lack of equilibrium trend values with Argentina's large $\sigma(\rho)$. Heymann and Sanguinetti (1998) discuss misperceived trends in Argentina also in the fixed exchange rate period starting in 1991.
10. The negative 'import substitution' effect on the trade account would only reinforce the argument.
11. De Gregorio et al. (2004) test a rapid increase in manufactures consumption at the end of each strong devaluation in Argentina and other economies with chronic currency instability.
12. Following World Bank methodology, INDEC of Argentina measures people in poverty as those not able to satisfy their basic needs of goods and services (www.indec.gov.ar/condiciones de vida/pobreza/linea de pobreza y canasta basica/metodologia).
13. Data from ministry of Economy of Argentina (www.mecon.gov.ar). D_{2001}=144; GDP_{2001}=267; D_{2002}=153; GDP_{2002}=99 in billions US$.
14. As different from a land tax, export duties do not require Congress approval.
15. In Olivera's (1990) closed economy structural inflation results from real wages above market equilibrium. For us, structural inflation (i.e. the inflationary-devaluatory pressure) results from a large $(\beta_2–\beta_1)$.

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