Dual Equilibrium and Growth Cycle in Argentina

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Argentina’s wide macroeconomic fluctuations in 1953-2006 are discussed. Foreign exchange is growth limiting ‘factor’. Comparative advantage is in agriculture. Manufacturing exports, however, grow much faster than agriculture exports. Two growth equilibria co-exist. With uncertainty GDP fluctuates. The large income elasticity of demand for imports undersupplies and oversupplies dollars in expansions and recessions, respectively. The start and the end of the devaluation set the cycle’s floor and ceiling. Thus, such elasticity destabilises the macroeconomic balance near equilibrium but limits GDP divergences far from equilibrium. The cycle harms institutions decelerating growth. A high and stable $AR/$US facilitates convergence to the high equilibrium.

I. Introduction

There is in the literature no explanation of Argentina’s full cycle and long-term decline relative to the rest of the world including similar economies such as Australia. This paper aims at filling that gap.

As agents perceive its convenience an equilibrium attracts their resources (Pareto 1906). An example is a comparative advantage equilibrium with its corresponding purchasing power parity (PPP) exchange rate. In the dynamic comparative advantage literature (Redding 1999) the economy has an existing low growth equilibrium associated with its comparative advantage sector (say agriculture) and also a high growth equilibrium that would be unleashed if temporary tariff protection allowed the ‘infant industry’ to grow to face competition in the future. In our argument for Argentina, with existing fast growing external demand for manufactures the industrial equilibrium needs no tariff protection to pull the economy out of its comparatively advantageous agricultural position where unemployment is high and capital goods’ domestic prices are low. Higher growth and the large income elasticity of demand for imports raise the exchange rate towards its industrial equilibrium that provides landowners with liquidity that is disposed of with agricultural equilibrium preferences, which attracts the economy back towards its comparative advantage position, and so on in continuous instability. Argentina’s dual equilibrium since the mid-fifties is a function of its two remarkably different PPP exchange rates that relate,

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1 The dynamic comparative advantage explains Argentina’s industrialisation during the trade disruptions at times of world wars and economic slumps in Europe, and protectionism during import substitution in the first half of the last century. By the 1950’s all this had happened.
in turn, to two different sets of labour demands, relative prices, wages, rent income and external demands.\(^2\) The evidence suggests that the industrial equilibrium tends to prevail through time although the cycle disturbs this process.

In semi-industrialised Argentina (labour abundance and imported critical capital goods and technology) foreign exchange becomes growth’s limiting “factor” (Diaz Alejandro 1963 and Braun & Joy 1968) as in other development economics models (i.e. Chenery & Bruno 1962 and McKinnon 1964).

Institutional quality allows risks to be contractually hedged (Barro 1991). Some natural-resource abundant economies with high institutional quality (i.e. Australia)\(^3\) joined the post World War II industrialised economies prosperity. With poor institutional quality and specialization in wage good exports, Argentina stands out with a long-term weak and widely fluctuating\(^4\) growth performance that, since 1958, appears correlated with the exchange rate variations as in Figure 1. Diaz Alejandro (1963) and Braun & Joy (1968) argued that Argentina’s growth was constrained by such recessive devaluations.\(^5\) Based on these authors we model the cycle’s ceiling.

\(^2\) The idea of historically dated equilibrium we borrow from econometrics. For example, in Engle and Granger (1987) a relationship among similarly trending variables is an equilibrium relationship. Also the nineteen-thirties’ growth cycle literature modelled dynamic equilibria based on ‘facts of economic life’ (Tinbergen 1935).

\(^3\) Traditionally, Australia exported minerals and food but only the latter produce recessive devaluation. After the II World War Australia reduced its food to total exports ratio. By 1974 this ratio in Australia was 30% and in 2006 it was 12% (www.abs.gov.au). In Argentina it was 75% and 52% in those same years (www.indec.gov.ar).

\(^4\) During 1900-50 Argentina was among the 10 higher per-capita income countries but below the top 40 in 1996-2006 (oil-exporters excluded) - data from Maddison (2001) updated with IFS-IMF. Among 13 highly volatile developing countries, Argentina had the largest output and consumption volatilities in 1980-2003 (Aguir & Gopinath 2007).

\(^5\) With inelastic exports and different consumption propensities from profits and wages Krugman & Taylor (1978) model recessive devaluations in semi-industrialised countries.
In the ‘Dutch Disease’ an *exogenous* rise in natural resource exports produces an unsustainable *rise* in non-tradeables that displaces the positive externalities of manufactured exports (Corden & Neary 1982). We differ in that Argentina’s *endogenous* cyclical rise in the domestic currency export revenues produce *recessions* that depress growth. We coincide in that the comparative advantage appreciates the currency and displaces manufactured exports weakening growth⁶ although our positive externalities are in world demand (Matsuyama 1992). The ‘Dutch Disease’ tends to occur in ‘fractionalised’ (Hodler 2006) and/or low institutional quality (Mehlum et. al. 2006) countries. In this, our argument is that Argentina’s institutional quality is partially endogenous, as a result of the cycle.

This paper’s model is designed to depict Argentina’s economic structure. Agents are rational and have, in their equilibrium, perfect foresight but we do not use the standard real business cycle constant returns aggregate production function (RBC) with fluctuations responding to exogenous shocks around a full employment equilibrium path. This would not serve our purpose because the numerous deviations from the RBC implied by Argentina’s “out of equilibrium” high income and low price elasticities, foreign exchange as a growth limiting “factor”, high uncertainty, structural duality, permanent unemployment, lack of capital mobility into Argentina’s agriculture, and factor prices out of line with marginal productivities would all obscure the presentation. Moreover, because dual equilibrium produces high uncertainty and, hence, self-feeding expectations, we use the multiplier-accelerator to depict GDP fluctuations as pre-World War II writers did (e.g. Kalecki, Tinbergen and Hicks). Instead of explaining why reality differs from the RBC theory we use the established Ricardian-Keynesian theory that explains Argentina’s reality. Mathematics is a simple skeleton to discuss more complex issues. The cycle is not parametrically modelled.

Kydland (2006:1380) finds “discrepancy between [RBC] model predictions and data” for Argentina. According to Kydland & Zarazaga (1997:26-27) the deviation from trend of GDP and consumption in 1970-1996 in Argentina “is unusually high by international standards” […] and] “the volatility of consumption is larger than that of output, although theoretically the opposite should hold” [because with single equilibrium and perfect foresight the permanent income hypothesis must hold]. Kydland & Zarazaga (2002) also find “discrepancies” between model and data in 1980-2000 but still argue that fluctuations resulted from exogenous inconsistent policies. Since the fifties military and civilian governments tried every recipe in the book and occasionally pursued outrageous fiscal and monetary policies⁷ that lead to hyperinflations and defaults with corruption ranking high in the international charts but, if our argument is correct, there is more to it than the severe damage caused by irresponsible policies and dictatorships overruling the law. Kydland’s exogenous fluctuations do not allow for Argentina’s erratic policies as being, in part, the outcome of inconsistent attempts to overcome the endogenous cycle.⁸

Our model is not tested. Testing aggregate models for Argentina has always yielded meagre results. This may be due to poor quality data, as suggested by Kydland and/or to Argentina’s high volatility. The only econometric estimates ever obtained are for the

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⁶ Sachs & Warner (2001) find that natural-resource abundant economies have a higher PPP average exchange rate to market exchange rate ratio than the rest of the economies, thus their comparative advantage weakens manufacturing competitiveness.

⁷ See Della Paolera & Taylor (2003) and Chudnovsky & Lopez (2007) for an account of economic policies in Argentina’s history.

⁸ The IMF stabilisation policies adopted at the start of the recessive devaluation when foreign reserves are low, deepen the recession. Postponing the adjustment by increasing public foreign debt, worsens the recession when it happens. Thus, policies are inconsistent unless they account for the dual equilibrium problem.
imports’ elasticities, which we use. In this situation, our structural modelling—seldom used in scientific research nowadays—would not seem inappropriate for it allows highlighting Argentina’s main behavioural relationships and illustrating them with the available data. Unlike Kydland, we did not observe “discrepancies” between our theory and the data, for high consumption volatility is to be expected in a wage exporting economy of dual equilibrium.

II. The long run

A century ago Argentina specialized in agriculture. Since then it has been the world’s leading per capita food exporter. Its industrial production, however, grew faster, and was twice as large as its agricultural production in the 1950s, and more than three times larger by 2006. Let us date Argentina’s equilibrium in 1953-2006 when manufactured exports grew faster than agricultural exports, and consumer goods imports were less than 4% of total private consumption.

Consider a simple Ricardian comparative advantage scheme in which Argentina exports two bundles of goods—food and low technology manufactures—and has no influence over world prices and quantities:

\[
\begin{align*}
\psi_i &= \frac{p_i^a}{p_i^w} \\
\psi_2 &= \psi_1 = \psi_2 \\
\psi_1 &= \psi_2
\end{align*}
\]

where

i : \{1 (food) ; 2 (industry)\}

a : Argentina

w : rest of the world

p : price

\psi : purchasing power parity exchange rate

Equation (2) indicates that world prices of a unit of equivalent output are equal (say a ton of soya produced abroad trades for a simple engine in the world market). At \( \psi_2 \) Argentina’s manufactures competitively trade in the world market (the above mentioned engine trades for a similar engine produced in Argentina). Argentina’s strong comparative advantage, however, is in agriculture\(^9\) and \( \psi_1 < \psi_2 \) in (3).

Assume now a continuity of goods each one with its own PPP exchange rate ranging from \( \psi_1 \) to \( \psi_2 \). In every economy, at any point in time, different sectoral PPP exchange rates co-exist and resources tend towards the comparatively most advantageous one,\(^10\) thus maximising trade, output and income (Ricardo 1821). This process did not operate as in the standard case, since Argentina de-specialised in agriculture with \( \psi_1 \) and \( \psi_2 \) attracting resources in opposite directions. This is discussed below.

\(^9\) In line with Ricardo (1821, p.136) the lack of international capital mobility into Argentinean agriculture determines its comparative advantage.

\(^10\) Rogoff (1996) and Taylor (2002) present evidence of the long-term convergence of the market exchange rate to the PPP average value in several countries excluding Argentina.
An equilibrium exists when all agents maximize the intertemporal welfare that their resources would enable them to obtain if perfect foresight allowed no mistakes in their decisions (Hahn 1984). To the extent that agents perceive its convenience an equilibrium attracts their resources. As the economy has two remarkably different maximization functions, one appropriate for agriculture and one for industry, two attracting equilibria co-exist associated with $\psi_1$ and $\psi_2$, respectively. To discuss this assume macroeconomic balance and that the following relationships hold – as will become clear in the solutions when $i=2$ a fixed $\psi_1$ in (5) and (15) yields the duality.

(4) $\hat{N} = f[(1-x_1),\omega_2]$ with $\delta f/\delta (1-x_1) > 0$; $\delta f/\delta \omega_2 > 0$; $\hat{N} / \hat{N} > 1$ if $\hat{N} > 1$ and $\hat{N} / \hat{N} < 1$ if $\hat{N} < 0$

(5) $\psi_1 \omega_2 = 1 - \psi_1 \omega_1 - \psi_1 \pi - \psi_1 \lambda$

(6) $\lambda = x_1 \lambda_0(\omega_1, x_1, 0) + (1-x_1) \lambda_0(\omega_1)$ with $0 < \lambda_0 < \lambda_2$; $\delta \lambda / \delta (\omega_1, x_1) > 0$; $\delta \lambda / \delta Q = 0$

(7) $x_1 = X_1 / X$ with $x_1 = 0.97$ in 1953-1960

(8) $\hat{X}_2 = \hat{X}_1^d + \epsilon_{\psi,x} \rho$

(9) $\epsilon_{\psi,x} = (\hat{X}_2^d - \hat{X}_1^d) \psi_2 / (\psi_2 - \psi_1)$

(10) $\hat{X}_1(\psi_l) = \hat{X}_1^d$

(11) $\hat{X}_1^d < \hat{X}_2^d$ with $\hat{X}_2^d \approx 2 \hat{X}_1^d > 0$

(12) $X = X_1 + X_2$

(13) $\hat{M} = \epsilon_{y,m} \hat{Y} + \epsilon_{\rho,m} \rho$; $\epsilon_{y,m} \approx 3.4$; $\epsilon_{\rho,m} \approx -0.46$

(14) $\hat{\rho} = \rho (M-X)$

(15) $x_{1,t} \psi_1 \hat{X}_1 + (1-x_{1,t}) \psi_1 \hat{X}_2 = \psi_i \hat{M}$

(16) $M_0 = X_{1,0} + X_{2,0}$

(17) $Y = Q$

Endogenous variables:
M imports volume
N employment
Q potential output
X exports volume
$x_1$ food exports to total exports
Y national income and GDP
$\epsilon_{\psi,x}$ exchange rate elasticity of supply of exports
$\lambda$ Ricardian land rent share in national income
$\rho$ foreign currency market exchange rate (ARS/US$)
$\omega_2$ manufactured wage goods demand to GDP ratio
Exogenous variables:

\[ X^d \] demand for exports volume

\[ \varepsilon_{y,m} \] income elasticity of demand for imports

\[ \varepsilon_{p,m} \] exchange rate elasticity of demand for imports

\[ \pi \] profit share in national income

\[ \omega_1 \] food wage goods demand to GDP ratio

\[ \hat{} \] a line above a variable indicates its equilibrium value

\[ \dot{} \] a hat above a variable indicates its rate of change over time

\[ d,s \] ‘d’ and ‘s’ as superscripts indicate demand and supply respectively

Argentina’s land abundance and fertility imply labour demand per unit of internationally equivalent output much lower for agriculture than for manufacturing. Capital goods and non-wage earners consumer goods are mostly imported. Thus, the demand for labour (4) is a direct function of the industrial production share in GDP that results, in turn, a function of \( \omega_2 \) and \((1-x_1)\). Argentina is open to immigration from countries with structural unemployment and low wages. Therefore, labour supply is growth elastic \((\hat{N}/\hat{N}>1)\), although it is not completely price elastic and wages are above subsistence level. Immigration barriers in higher wage countries lock-in structural unemployment within Argentina for labour would, naturally, not migrate back to low wage countries. Hence, whenever employment falls \((\hat{N}<0)\) labour supply becomes relatively growth inelastic. All capital goods embodying new technology are imported from and produced for the industrialised markets. This prevents the choice of labour-intensive techniques to deal with structural unemployment (Findlay 1970). Thus, for simplicity let us assume constant technical coefficients within the relevant production range.

In (5) income is distributed among wages, profits and Ricardian land rent. Each one of these components is converted onto domestic prices at the relevant PPP rate. Food wage consumption is inelastic (constant \(\omega_1\)). In equilibrium, landowners value their income \(\lambda\) at \(\psi_1\) and entrepreneurs facing international costs value their income and costs at \(\psi_2\). A similar duality appears in the foreign trade (15) where each flow \((X_1 \text{ and } X_2)\) is valued at the corresponding PPP rate.

At any point in time, agriculture shows diminishing returns that generate land rent. Thus \(\dot{\lambda}\) (6) changes with the share of food in total production \([\delta\lambda/\delta(\omega_1, x_1)]>0\). For clarity, technological change in agriculture is such that \(\delta\lambda/\delta Q=0\).\(^{11}\)

Following Ricardo, landowners’ incentives differ from entrepreneurs’ incentives in that the former need not re-invest earnings in order to stay in business. Following Modigliani & Miller (1958) and Wood (1975), entrepreneurs aim to a stable assets-liabilities ratio to prevent lenders interference. Intertemporally, landowners aim at maximizing \(\lambda\). Given \(\omega_1\), wage earners aim at maximizing \(\omega_2\) and employment. Given \(\pi\), entrepreneurs aim at maximizing total profits and output.

\(^{11}\) \(\delta\lambda/\delta Q=0\) along with \(\dot{X}_r < \dot{X}_d\), imply increasing returns in world manufacturing. Assuming diminishing returns in agriculture and constant returns in manufacturing would not change the argument.
In 1953-2005, world trade in manufactures grew twice as fast as world trade in food (see Figure 2); thus \( \hat{X}^d_2 \approx 2 \hat{X}^d_1 \) in (11)\(^{12}\).

Industrial development is depicted in the share of manufactured exports of industrial origin in total exports \((1-x_i)\) that reduces land rent share in national income \(\lambda\) (6) which, in turn, increases the demand for manufactured wage goods \(\omega_2\) (5).

Imports are mostly capital and intermediate goods demanded by industry. Import demand elasticities in (13) are simple averages of Duarte, Nicolini & Paya (2007) co-integration and error correction estimates for 1970:Q1–2004:Q4 obtained applying Engle & Granger’ OLS and Johansen & Juselius’ Maximum Likelihood. Figure 3 illustrates the correlation between imports and GDP (note the scale difference in the vertical axes). A high \(e_{x,m}\) occurs because new manufactures have an income elasticity higher than unity (non-homothetic preferences) and an import coefficient larger than the economy’s average in their input production chain (Vernon 1966). The market exchange rate \(\rho\) in (14) adjusts instantaneously to changes in \(X\) and \(M\), since \(X=M\).

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\(^{12}\) World exports volume p.a. growth rates in 1953-2005 were 3.6% and 7.5% for food and manufactures respectively. World GDP volume grew at 3.8%. This evidence is in line with Flam & Helpman 1987, Krugman 1989 and Matsuyama 2000 and indicates a lower world income elasticity of demand for staple goods than that for manufactures (roughly \(\approx 1\) and \(\approx 2\) respectively in our ‘back of the envelope’ calculation). In Argentina in 1953-2005 the p.a. growth rates were 8.6% and 3.4% for volumes of food and manufactures of industrial origin, respectively. Sources as in Figure 2.
From (7) (8) (9) (10) (12) (13) (14) (15) (16) (17) and assuming $\hat{\varphi} = \psi$, potential equilibrium output grows at

$$\hat{Q}_t = \frac{x_{1,t} X_1^d \frac{\psi_1}{\psi_i} + (1-x_{1,t}) [X_1^d + \eta_{\psi,x} (\psi_i - \psi_1)] - \varepsilon_{\varphi,m} (\psi_i - \psi_1)}{\varepsilon_{\gamma,m}}$$

(18)

where food exports $x_1$ grow with external demand $X_1^d$ weighted by the exchange rate ratio $\psi_i/\psi_1$, that equalises domestic and international relative prices to comply with the ‘law of one price’ as in $p_1^a = \frac{\psi_1}{\psi_i} \frac{p_1^w}{p_2^w}$. With $i=2$, the exchange rate elasticity $\varepsilon_{\psi,x}$ (9) enables a higher growth rate $\hat{X}_2^d$ for manufactured exports $(1-x_1)$ and hence for $Q$ (18). Foreign debt service $\theta D$, capital outflow $H$ and international reserves accumulation $dR$, for simplicity here assumed to be nil, would all reduce net imports and hamper $\hat{Q}_t$.

Consider $t \to \infty$, with full capital mobility the marginal land fertility equals that of the rest of the world and $\psi_1 \to \psi_2$ where all domestic and international relative prices meet. If $i=1$, $x_1$ and $\lambda$ increased proportionally to $(\psi_2-\psi_1)$ and Argentina then (at $t=\infty$) restarts its industrialisation. If $i=2$, $x_{1,t} \to 0$, with full industrialisation $\hat{Q}_t$ reaches a maximum. At $i=2$ food is mostly consumed internally, thus $\lambda \to$ minimum $\lambda_{\lambda}(\omega_1)$ in (6). Wage demand mostly includes manufactures (low $\omega_1/\omega_2$). Intertemporally, with a given discount rate and perfect foresight, $i=1$ maximises landowners income share, whereas $i=2$ maximizes employment, wages, manufactured output and total profits. Landowners on the one side, and entrepreneurs and wage earners on the other side, have different equilibria.

In what follows, to depict the 1953-2006 period, assume no particularly high values for “$t$” (constant $\psi_1, \psi_2$). With $i=1$, $\varphi = \psi_1$ in (18) and exports grow at the world demand for food...
rate $\hat{X}_1^d$, industry supplies mostly the domestic market and manufactured exports remain a constant fraction $(1-x_1)$ of total exports. Food accounts for a large fraction of wages – high $\omega_1/\omega_2$ in (5). As a function of the relatively high $x_1$, land rent share $\lambda$ remains large and constant (6) and labour demand grows sluggishly (4) keeping unemployment high and the real wage $(\omega_1+\omega_2)$ low. The abundant supply of foreign exchange validates the low exchange $\rho=\psi_1$. At $i=1$ agriculture is in equilibrium for $\lambda$ remains high. Industry, however, is not. With high unemployment, low labour costs (low real wages and low domestic food prices) and reduced domestic prices of imported capital goods, those firms with their own $\psi$ relatively close to $\psi_1$ find resources readily available to meet a fast growing external demand for manufactures. Capital goods imports, faster GDP growth and the large $\epsilon_{y,m}$ raise $\rho$ towards $\psi_2$, drawing additional firms into the export market. Thus, $i=1$ is not stable.\(^{13}\)

Now, $i=2$ (18) yields the dual equilibrium rate

$$\hat{Q}_i = \frac{x_{1,i} \psi_1 \hat{X}_1^d + (1-x_{1,i}) \hat{X}_2^d - \epsilon_{y,m} (\psi_2 - \psi_1)}{\epsilon_{y,m}}$$

that gradually rises as $x_1$ declines. If $\rho=\psi_1$ industry’s imports would raise $\rho$ towards $\psi_2$ as discussed above. If $\rho=\psi_2$, two disequilibrating effects occur. First, the manufactured wage goods share is lower by

$$\Delta \omega_2 = -\lambda(x_{1,i}) (\psi_2-\psi_1)/\psi_2$$

which implies lower manufacturing employment growth (4). Second, with $\rho=\psi_2$ (18.1) yields a higher growth rate

$$\hat{Q}_i = \hat{Q}_i + \varphi_i \quad \text{with} \quad \varphi_i = \frac{x_{1,i} \hat{X}_1^d - (\psi_2 - \psi_1)}{\epsilon_{y,m} \psi_2}$$

where $\varphi$ captures the agricultural sector’s excess foreign exchange. To avoid lenders’ control firms do not borrow $\varphi$. This implies an oversupply of foreign exchange and $\rho\rightarrow\psi_1$. Therefore, the equilibrium $i=2$ is not stable either. Attracted by $\psi_1$ and $\psi_2$, that under and over supply foreign exchange in an uncertain way, $\rho$ is in permanent instability. Thus, let us postulate

$$(19) \quad \bar{\sigma}(\rho) = \sigma[x_1, (\psi_2-\psi_1)] \approx \sigma(\rho)^{14} = 45.2 \% \quad \text{in 1953:1-2005:4}$$

$$\delta \bar{\sigma} / \delta(x_1) > 0 \quad \delta \bar{\sigma} / \delta(\psi_2-\psi_1) > 0 \quad \sigma(\rho): \% \text{SD of the real exchange rate}$$

\(^{13}\) If real wages were high at $i=1$, non-homothetic demand would imply fast growing demand both for imported manufactures and for those produced domestically with a high import coefficient. Thus, whatever the real wage at $i=1$, imports would rise faster than exports putting pressure on the exchange because $\epsilon_{y,m}$ is large and manufacturing demand grows faster than food exports.

\(^{14}\) Large variations in the real exchange imply variations in the prices of tradeables relative to non-tradeables (Burstein et. al. 2005). CPIs includes mostly non-tradeables and is used to calculate the real exchange rate as ARS*UScpi/US$*ARcpi. Considering the much higher SD of the nominal exchange rate (see Figure 1) would only reinforce the argument. In the period 1969:Q3-2005:Q4 $\sigma(\rho)$ was 16.7% for Australia’s nominal exchange rate, [www.rba.gov.au](http://www.rba.gov.au) and 52.2 % for Argentina’s real exchange rate (data as in Figure 4).
The erratic fluctuations in $\rho$ are illustrated in Figure 4 that also shows food exports growing fast during the prolonged 1991-2000 period of a remarkably low exchange rate,\textsuperscript{15} indicating that $\psi_1$ might be near this value. The upper values of $\rho$ go beyond the possible value of $\psi_2$ for they correspond to currency crises. Neither $\psi_1$ nor $\psi_2$ are associated with a position or phase in the GDP’s cycle that correlates with changes, not levels, in $\rho$ (see Figure 1) as we shall discuss later. The extent to which $\sigma(\rho)$ over-estimates $\overline{\sigma}(\rho)$ depends on the cycle’s feedback into the equilibria, which we shall not discuss.

Because Argentina exports wage goods, $\rho$ affects most variables in the economy. Therefore, we assume endogenous uncertainty about future quantities and prices as a direct function of the relative importance of the agricultural sector captured in $x_1$, $\lambda(x_1)$ and $(\psi_2-\psi_1)$ that determine $\overline{\sigma}(\rho)$.

III. The short-medium run

With high uncertainty aggregate demand easily diverges from its dual equilibrium that cannot be reasonably forecast. Thus equilibrium conditions are removed and the equilibrium path (18.1) is kept as an exogenous analytical benchmark. From the previous section we keep the import function (13) and $\rho$’s standard deviation (19) only. Let us assume a fixed $\lambda$, re-write (5) (12) (14) and (17), and add new equations for consumption, investment, savings and the balance of payments. Moreover, regard as constant the international rate of interest, the single export demand growth rate, the terms of trade and domestic vis-à-vis foreign productivity differentials. This should allow us to focus on variables that depend mostly on local private agents’ decisions. In Argentina, the cycle generates endogenous inflation and hence additional uncertainty that feeds back into the cycle. However, for simplicity we take uncertainty as a fact and assume all variables are in

\textsuperscript{15} In 1990-2001 there were strict free trade policies and the terms of trade were not particularly favourable.
real terms\textsuperscript{16} (deflated by their relevant price index). “Devaluation” and “exchange rate appreciation” are synonymous (AR$\times$UScpi/US$\times$ARcpi).

(5') \quad \omega_2 = 1 - \rho \omega_1 - \rho \pi - \rho \lambda

(12') \quad \hat{X} = \hat{X}^d + \varepsilon_{p,x} \rho \quad \text{with } \varepsilon_{p,x} \approx 0

(14') \quad \rho = \rho \ (BP)

(17') \quad S = I_d + I_x + \rho X - \rho M

(20) \quad Y \equiv S + c Y

(21) \quad c = \rho \omega_1 + \omega_2 + c_x \pi + c_x \rho \lambda; \quad c_\lambda, \ c_\pi \in [0,1]

(22) \quad I_d = I_d(Y,\theta D/X,q)

(23) \quad I_x = I_x(\hat{X}^d, \rho^*, \theta D/X, q)

(24) \quad \rho^* = \rho^* \pm \sigma(\rho) \quad \text{and} \quad \delta\rho^*/\delta\rho \approx 0

(25) \quad q = q(\sigma(\rho)) \quad q' < 0

(26) \quad BP \equiv X - M - \theta D + dD - H - dR \equiv 0

<table>
<thead>
<tr>
<th>New endogenous variables</th>
<th>New exogenous variables</th>
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<tbody>
<tr>
<td>BP balance of payments</td>
<td>c_\lambda land owners propensity to consume</td>
</tr>
<tr>
<td>c propensity to consume</td>
<td>c_x entrepreneurs propensity to consume</td>
</tr>
<tr>
<td>I_d investment in domestic production</td>
<td>D foreign public debt</td>
</tr>
<tr>
<td>I_x investment in exportable goods</td>
<td>H private capital outflow</td>
</tr>
<tr>
<td>dR Central Bank reserves variation</td>
<td>\varepsilon_{p,x} exchange rate elasticity of supply of exports</td>
</tr>
<tr>
<td>S private savings</td>
<td>\lambda land rent share in national income</td>
</tr>
<tr>
<td>q institutional quality</td>
<td>\theta discount rate = international interest rate + country’s risk</td>
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Notation
- \( e \) expected value
- \( * \) long term value
- \( a \) historical average

Food is tradeable and has a low price elasticity and a low income elasticity of demand, consequently domestic food prices adjust rapidly to the exchange \( \rho \). Thus, domestic wage

\textsuperscript{16} Accounting for inflation would reinforce the argument. With downward nominal price rigidity the change in relative prices during devaluation generates inflation (Olivera 1964) that generates uncertainty contributing to recession which generates the trade surplus that moves the real exchange rate in the opposite direction that again moves relative prices which induces further inflation and so on. Persistent inflationary expectations would only weaken the growth path.
food demand $\omega_1$ and land rent $\lambda$ are priced in dollars in (5’). With capital mobility firms’ profits are also in dollars.

Manufactured goods demanded by wage earners $\omega_2$ are produced domestically with a lower import coefficient than those demanded by non-wage earners. These goods ($\omega_2$) represent a large fraction of total domestic manufactured output and are marginally tradeable depending on the exchange rate. Thus their domestic prices adjust slowly to the exchange and $\omega_2$ in (5’) is valued in pesos. Relative to food, these goods ($\omega_2$) have a high domestic price elasticity and a high income elasticity of demand.

Let us assume that government deficits are financed only with foreign debt and that all foreign debt is public and continuously refinanced. This enables us to exclude the government accounts from the mathematics and work with the balance of payments (26) only. Private capital outflow $H$ earned interests remain abroad.

The expected long term exchange rate $\rho^e$ in (24) is formed with the historical average $\rho^{e*}$ and a margin error of $\pm \sigma(\rho)$. Given foreign prices and demand, export investment $I_x$ in (23) is function of the expected long term exchange rate $\rho^e$. A high $\sigma(\rho)$ leads to $\partial \rho^e / \partial \rho \approx 0$ and makes investment unresponsive to short-medium term exchange rate variations.\textsuperscript{17}

Thus $e_{rho} \approx 0$ in (12’) and exports grow at the single export demand rate $x^d$. Argentina’s foreign trade research has repeatedly yielded not significant estimates for $e_{rho}$. Figure 4 illustrates this lack of correlation.\textsuperscript{18}

In Argentina imported consumer goods are relatively unimportant as a share of total private consumption. Assume that investment in the production of importable consumer goods and of non-tradeables have the same neutral foreign exchange balance effect for a given GDP.\textsuperscript{19} This enables us to aggregate both types of investment as “domestic investment” $I_d$.

The individual agent does not share information with competitors. With high uncertainty about future prices and quantities, domestic investment $I_d$ in (22) easily diverges from the equilibrium and current demand becomes the main source of information about whether or not past decisions were correct. Thus, if the economy grows above (below) its equilibrium, individual agents perceive that their investment was insufficient (excessive). In correcting their individual “mistakes” agents drive aggregate demand further away from the equilibrium as in the Keynesian multiplier-accelerator.

Both domestic and export investments are: a) negatively related to the exposure to changes in the international financial markets captured by $\theta D/X$ (Corden 1988 & Helpman 1989), and b) positively related to institutional quality $q$ that allows risks to be contractually hedged (Levine & Renelt 1992). Institutional quality $q$ in (25) is, in turn, function of $\sigma(\rho)$ that produces conflict over the distribution of income affecting the rule of law, government effectiveness and political stability (Persson & Tabellini 1994, Tornell & Velasco 1992 and Venieris & Gupta 1986).

\textsuperscript{17} If the high volatility of international food prices was considered, the resulting cautious export investment in food exports would reinforce the low export supply elasticity argument.

\textsuperscript{18} Quarterly data of exports, disaggregated by product and exchange rate variations net of terms of trade changes do not show significant correlations either.

\textsuperscript{19} If “import substitution” raises income elasticity of imports the argument is reinforced.
IV. The cycle

With the use of the above short-medium term model, let us discuss the cycle around a given GDP trend as illustrated in Figure 5 that also shows the cycle’s correlation with the trade account. The trend towards larger trade surpluses indicates foreign debt accumulation.

In Argentina, the exports to GDP ratio X/Y was 10.6% in 1953-2006\(^{20}\) which is low for international standards. For lack of data on I\(x\), let us assume I\(x/I\approx X/Y\) which implies that the multiplier-accelerator has a strong influence in GDP dynamics through a large I\(d/I\).

The upswing

The initial conditions are in the fifties with, arbitrarily, t=0, i=2 and \(\rho=\psi_1\) in (18.1). Assume that GDP starts growing above such equilibrium and that it further diverges through the multiplier-accelerator. Through the high income elasticity of demand for imports \(\varepsilon_{y,m}\) such disequilibrium is amplified in a trade account disequilibrium (see Figure 5). Whenever dR=0 and dD=0, such trade deficit is corrected by

\[
(27) \quad BP_0 + dBP = 0
\]

Assume, for simplicity, H\(_0\)=0, X\(_0\)=M\(_0\) and \(\rho_0=1\). From (12’), (13), (26) and (27) the devaluation that stabilises the balance of payments (the stability devaluation) is

\[\quad \text{(20)} \quad \text{Using nominal exchange rate and prices. In Australia } X/Y=12.5\% \text{ in } 1960-2006 \text{ www.rba.gov.au. In Argentina, at constant 1993 prices and current real exchange rate, } X/Y=12.3\%.\]
$$d\rho^s = \frac{-X^d + \epsilon_{y,m} \hat{Y} + (\theta D + dH) / X}{\epsilon_{\rho,x} - \epsilon_{\rho,m} - \theta D/X} > 0$$

(27')

Here the low $\epsilon_{\rho,x}$ and $\epsilon_{\rho,m}$ imply a **severe** stability devaluation$^{21}$ that is positively related with GDP growth $\hat{Y}$, with the foreign debt to export ratio $\theta D/X$ and with the capital outflow to export ratio $dH/X$.

The stability devaluation $d\rho^s$ raises the supply of savings for a given $Y$ by

$$\delta S / \delta \rho = [(1-c_\pi) \pi + (1-c_\lambda) \lambda] Y \quad \text{from (5')} (20) \text{ and (21)}$$

(20')

The devaluation raises the consumption of non-wage earners by $(c_\pi \pi + c_\lambda \lambda) d\rho$ in (21), which is spent mostly on goods with a higher than average import coefficient. The fall in the propensity to consume (21) that matches such increase in savings (20') comes through the fall in wages (5'). Given the price inelastic domestic demand for food relative to manufacturing – constant $d_0$ in (5') – it is mostly the quantity of domestic manufactured demand that decreases by

$$\delta \omega_2 / \delta \rho = -(\omega_1 + \pi + \lambda)$$

(5')

This induces a decline in domestic investment by $\frac{\partial I_d}{\partial \omega_2} \frac{\partial \omega_2}{\partial \rho} d\rho < 0$ for a given $Y$. If a government budget constraint was considered, feasible government expenditure would decline by $\theta D d\rho$ (the rise in the public foreign debt servicing).

**The ceiling and the recession**

Export investment demand $I_x$ does not increase because $\rho^*/\delta \rho \leq 0$ (24) and $\epsilon_{\rho,x} \approx 0$ (12'). Thus, exporters do not demand the additional savings (20').

Assume, momentarily, $dH=0$ and the condition for $\delta Y / \delta \rho = 0$ is$^{22}$:

$$[\pi(1-c_\pi) + \lambda (1-c_\lambda)] d\rho - Y^{-1} \frac{\partial I_d}{\partial \omega_2} \frac{\partial \omega_2}{\partial \rho} d\rho = [X^d + (\epsilon_{\rho,x} - \epsilon_{\rho,m}) d\rho] X/Y$$

(28)

the foreign trade balance positive effect on $Y$ of the RHS is too weak compared to the decline in $Y$ due to both the rise in savings (first term) and the drop in $I_d$ (second term). Condition (28) cannot be fulfilled and the recession is inevitable: $\delta Y / \delta \rho < 0$.

$^{21}$ With export demand and import supply both perfectly elastic and all trade denominated in dollars, devaluation can only have a positive effect in the trade balance. With $X_0=M_0$, devaluation (27') would have a positive effect on BP if $X^d - \epsilon_{y,m} \hat{Y} - dH/X < \theta D/X < \epsilon_{\rho,x} - \epsilon_{\rho,m}$. If the RHS inequality is not fulfilled, the trade surplus resulting from devaluation is insufficient to compensate for the foreign debt service. If the LHS inequality does not hold, devaluation is not required. The recessive case (‘quantity adjustment’) $X^d - \epsilon_{y,m} \hat{Y} - dH/X > \theta D/X > \epsilon_{\rho,x} - \epsilon_{\rho,m}$ is ruled out in the above pure ‘price adjustment’. Such ‘quantity adjustment’ is discussed below with (27’).

$^{22}$ From (12') (13') (17') (20') (21) and (26)
The recession deepens due to the low income elasticity of domestic demand for food relative to manufactures. Entrepreneurs perceive having invested in excess and accelerate the decline. The GDP crosses its equilibrium from above. The large $\varepsilon_{ym}$ amplifies such recessive disequilibrium producing a large surplus in the trade account (see Figure 4) and, with $dH=0$, the Central Bank accumulates sufficient reserves and the devaluation eventually stops.

During a severe recessive devaluation bankruptcies increase (Goldstein 2005) and this affects the export sector that is connected with the rest of the economy through contractors and banks (Frankel 2005) which re-enforces $\varepsilon_{rpm} \approx 0$.

**The capital account accelerator**

Let us now allow for $dH(\rho) \neq 0$ and add the following equations:

\[ \rho^e_j = f(\alpha^e_j, \alpha^r_j) \]

\[ H = \sum_j h_j (\rho^e_j + \theta - \beta_j) \frac{DY_j}{\rho} \]

<table>
<thead>
<tr>
<th>j</th>
<th>agent</th>
<th>h</th>
<th>dollar preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>DY</td>
<td>disposable income</td>
<td>$\beta$</td>
<td>expected rate of return on expenditure used to decide upon consumption (rate of satisfaction) and domestic investment (rate of profit)</td>
</tr>
<tr>
<td>M3</td>
<td>money</td>
<td>$\alpha^*$</td>
<td>threshold below (above) which the Central Bank is unable (able) to defend the exchange rate</td>
</tr>
</tbody>
</table>

In general, agents in the foreign exchanges do not coordinate decisions for they compete for the premium in anticipating the start (end) of the devaluation (Morris & Shin 1998). In Argentina agents know:

a) that $\sigma(\rho)$ is large;
b) the sign but not the timing of the next large variation in $\rho$;
c) that the Central Bank tries to reduce $\sigma(\rho)$;
d) that the exchange rate holds an approximately stable long-term relationship with $\alpha$ (see Figure 6).

A high $\sigma(\rho)$ unables the use of the historical average exchange rate $\rho^a$ as a proxy to its average equilibrium value. In search of a benchmark in (29) each agent “$j$” sets a personal threshold $\alpha^*_j$ above (below) which they expect that the Central Bank will (will not) be able to defend the currency. When agent $j$ expects $\alpha^r_j$ to be below (above) their private threshold $\alpha^*_j$, they expect devaluation (appreciation) and if this exceeds (fails) the net return of their domestic expenditure ($\beta_j-\theta$) in (30), they arbitrage demanding (selling) dollars. Since each agent keeps their $\alpha^*_j$ and $\alpha^r_j$ to themselves, the current exchange is the main source of information about whether past decisions were correct (Bacchetta &

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23 The chronic nominal devaluation (see right axis in Fig. 1) led to the collapse of long term domestic capital market. Domestic credit was a small fraction of GDP in 1970-2006 (less than 20%) and concentrated in short term maturities in either foreign currency or high indexed real interest rates. This undermines the effectiveness of monetary policies.

24 This correlation is much less evident when using monthly data and it disappears with daily data; thus, $\alpha$ is not a substitute for the equilibrium exchange rate but it is the best available option.
Wincoop 2006), just as current demand is the main source of information about the appropriateness of past decisions in the accelerator-multiplier process. When a “critical mass” of agents expects $\hat{\rho}_j^c > \theta - \beta_j$ the run on the currency begins (Flood & Garber 1984 and Obstfeld 1996). This run triggers severe devaluation if the Central Bank is unable to defend the currency. Those who stayed in pesos perceive it as a mistake and purchase dollars, accelerating the devaluation. But the Central Bank may be able to defend the currency as occasionally happens (e.g. in 1995 with the “Tequila Crisis”). Therefore, a run on the currency may or may not anticipate the stability devaluation (Boinet et. al. 2005).

Nonetheless, output growth above its equilibrium rate depletes international reserves and eventually the threshold $\alpha^*$ is crossed, the severe devaluation starts and it accelerates with the currency run. Consequently, current private expenditure (including tax payments) is postponed in order to hoard foreign exchange. Thus, the recessive devaluation discussed above accelerates due to a twofold effect. First, because of the premium $(\hat{\rho}_j^c > \theta - \beta_j)$ for postponing current expenditure and hoarding foreign exchange ($H>0$). Second, because $H>0$ raises $\rho$ even further, re-enforcing the incentive to demand dollars. This process of devaluation and capital flight feeding each other stops when $\hat{\rho}_j^c < \theta - \beta_j$.

To illustrate this assume that capital flight is correlated with private-non-banking capital flows that are recorded in the balance of payments since 1988, and observe in Figure 7 its correlation with GDP. In the 1988:2Q-1990:2Q recession, the capital outflow accompanied the devaluation (Figure 1). In the 1995 (“Tequila”) and the 1999 (“Russia”) recessions, the Central Bank managed to sustain the currency’s value although a correlation between the fast deceleration of capital inflow and the drop in GDP began to take form. Finally, the severe devaluation of 2002:1Q was fully anticipated and a massive capital outflow produced a recession in 2001 that deepened with such devaluation.
With experience, agents increase the speed of response to large exchange rate variations. Thus the time lag between the accelerations in the exchange rate variations and those in GDP shortened through time (Figure 1) to disappear in 2001-2002 when the devaluation was anticipated.

**The floor and the recovery**

In Kalecki’s (1935) closed economy the recession’s floor is set when agents with liquidity face sufficiently attractive prices (high expected profitability). In our case, the recession produces enough dollars for both residents and the Central Bank to accumulate abundant reserves and the devaluation eventually stops. The end of the devaluation sets the cycle’s floor when domestic prices in foreign currency are sufficiently low so that expected return is sufficiently high to induce the resumption of the domestic expenditure postponed during the devaluation. The corresponding dishoarding of dollars (H<0) feeds further reserve accumulation and currency appreciation and the expansion begins with idle capacity mostly in the domestic sector. Such capital inflow accelerates (H'>0) as agents perceive that the appreciation reduces their net earnings and this accelerates both the appreciation and the recovery (Figures 1 and 7). The high income elasticity of domestic demand for manufactures relative to food boosts domestic manufacturing demand and employment. With the drop in inventories and idle capacity, \( I_d \) picks up. The GDP grows pulled by domestic absorption and crosses its equilibrium until a new devaluation occurs.

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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.
V. The cycle and the trend

The connections between the cycle, the trend and the equilibrium path are always complex; let us here briefly discuss those that seem most relevant.

**Industrialisation, exports and trend stability**

The export to GDP ratio X/Y rose from 11.4% in 1953-1962 to 16.2% in 1997-2006 and the manufactured exports ratio 27 (1-x1) from 3.2% in 1953-1962 to 30.6% in 1997-2006 – see also Figures 2 and 4. To the extent that this indicates a trend rise in Ix/I, it should have a stabilising effect since Ix is not part of the multiplier-accelerator. Moreover, such a rise in (1-x1) would tend to reduced the duality captured in x1(ψ2-ψ1) (19) and in λ(x1)(ψ2-ψ1) (5.1) and the uncertainty associated with it. But de-stabilizing forces also operate as discussed below.

**Debt, volatility, capital flight and trend**

The foreign debt to GDP ratio rose permanently from a 12% average in 1953-1974 to around 100% in 2002 before an unilateral debt reduction of almost 24%. Argentina had also defaulted in 1982-83. Throughout 1953-2004, except in periods of default, there was no fiscal surplus net of debt servicing. In 1999 according to the Ministry of Economy the stock of private flight capital was equivalent to the foreign public debt.

The recessions can be postponed with government expenditure matched with foreign indebtedness to prevent devaluation, 28 but the stability devaluation is deeper when it occurs (27”) rising the output and the exchange rate volatilities – see Figures 1, 4 and 5. The corresponding debt service reduces long-term net imports depressing the actual trend below its potential equilibrium path (18.1). In addition, the tax pressure to service the debt (Calvo 2003) and the rising volatilities feed capital flight and the actual trend further declines.

If the foreign debt θD exceeds the threshold (ε_m-x,ε_m)X during the stability devaluation in (27”) the price adjustment is insufficient and the recessive adjustment must fulfil

\[
\dot{Y} < \left[ \dot{X}^d - (\theta D + dH)/X \right] / \epsilon_{y,m}
\]

If the recession is too deep the economy may get trapped in a vicious circle of over-adjustment that disrupts its repayment capacity. The result would be an adjustment in the value of stocks (default) including a reduction in θD that, in combination with the recessive devaluation, enable accumulation of foreign reserves. Consequently, the devaluation stops and the recovery starts as described above. The debt reduction feeds the

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26 At nominal prices. Alternatively, with constant 1993 prices and GDP converted to dollars using the 1953-2006 average real exchange rate, the X/GDP ratio in 1953-1962 was 10.4% and in 1997-2006 was 27.1%. Data from INDEC of Argentina, Economic Commission for Latina America, Central Bank of Argentina, Fundación de Investigaciones Latinoamericanas, IFS-IMF and Bureau of Labor Statistics. Australia’s X/GDP was 7.9% in 1960-1962 and 18.9% in 1997-2006, www.rba.gov.au

27 Manufactured exports of industrial origin to total exports including fuels and minerals. The latter where nihil in 1953-1962 and 11.2% of total in 1997-2006. Data at constant 1993 prices from INDEC of Argentina and Economic Commission for Latina America.

28 The alternative of letting the devaluation occur and of attempting to avoid the recession with public deficits increased inflation and produced recession nevertheless (Heymann & Sanguinetti 1994).
recovery but its long-term net effect on the growth trend would depend on the extent to which the default of legal contracts affects institutional quality.

**Income distribution, institutional quality and trend**

With the devaluation, domestic food prices increase and real wages $\omega_2$ fall (5”). **Figure 8** shows the remarkable correlation between poverty (that captures both the employment and the wage effects) and the severe exchange appreciation\(^29\) of 1988 and of 2002.

![Figure 8: Exchange Rate and Population in Poverty, 1988-2006](image)

The distributive conflict resulting from such regressive distribution of income feeds (through inflation) relative prices’ variability producing further uncertainty, which affects institutional quality for it reduces the agents’ possibilities of both hedging risks with legal contracts and of carrying out the surveillance of public expenditure (Ades & Di Tella 1999).

A very different set of relative prices and economic policies corresponds to each of the two equilibrium exchange rates $\psi_2$ y $\psi_1$. Agents align accordingly. Thus, whatever the exchange rate market value is, conflict is likely to emerge. The great variety of policies since the fifties suggests that no permanent consensus was reached. This policy instability led to a further deterioration of institutional quality and growth trend below its potential equilibrium path (18.1) fuelling structural unemployment that rose, at the cycle’s peaks, from 4% in 1963-1989 to 11% in 1990-2006.

**VI. Policy implications**

A policy to stabilise the long-term expected exchange rate at a high value that would accelerate manufactured exports’ growth and thus facilitate the convergence to the high equilibrium would require:

1. Fiscal surpluses sterilising current account surpluses enabling the Central Bank to accumulate sufficient reserves to prevent peso devaluation;

\(^{29}\) No data prior 1988
b) rising fiscal surpluses to sterilise rising capital inflows attracted by increasingly large Central Bank’s reserves, to prevent peso appreciation to its high agricultural equilibrium value \((1/\psi_1)\) that we estimate near the 1991-2001 value;
c) agents expecting the above to be sustainable allowing to hedge risks with legal contracts.

These are restrictive economic conditions. Moreover, political resistance in the past arose either from wage earners and entrepreneurs because of high food prices and low demand (see 5.1 and 5’1) or from landowners as the government taxed their excess export revenue \(-\phi\) in (18.2) – to prevent domestic food prices and unemployment from rising.

After 2004 international food prices have been high, foreign debt was reduced, international rates of interest have kept relatively low and world demand has grown fast. High international prices enabled the government to tax food exports and, along with lower debt payments, run a surplus that enabled to purchase the current account surplus and keep the exchange rate high and domestic food prices low. Twin surpluses, high exchange rate and low domestic food prices had never simultaneously occurred in Argentina. If this situation persists and agents discount such policy as sustainable, the convergence to the high equilibrium would accelerate.

### VII. Conclusions

Argentina’s manufacturing exports demand grows much faster than food exports demand, and the land rent share in national income tends to decline while investment in exportable manufactures tends to increase. This should reduce the destabilising effect of the dual equilibrium. Therefore, pulled by external demand the economy would converge to the high growth equilibrium. The evidence indicates that this is a slow process subject to cyclical setbacks because dual equilibrium produces high uncertainty that depresses the exchange rate elasticity of supply of manufactured exports. The cyclical peso devaluation along with wage goods exports, generate conflict over income distribution and strain institutions decelerating the growth trend. Postponing recessions with fiscal deficits and foreign debt raises volatility that further depresses growth. A ‘twin surpluses’ policy of taxing food exports to stabilise both a low currency rate and low food prices, would facilitate convergence to the high equilibrium. Similar policies met strong opposition from Argentina’s agricultural sector in the past, mirroring Ricardo’s ‘corn laws’ debate.

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