

# The real exchange rate, structural change and economic growth

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# Plan of the presentation

- Empirical research
- RER levels vs. variations
- Mechanisms
- Three key levels of the RER in LA

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- 1 Empirical research
- 2 RER levels vs. variations
- 3 Mechanisms
- 4 Three key levels of the RER in LA

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# 1. Empirical Research

# Growth Regressions

- The most common empirical strategy has been to run growth regressions of the Barro-type:

$$growth_{it} = \alpha_0 + \alpha_1 \ln y_{it-1} + \beta \ln Underval_{it} + kX_{it} + v_{it}$$

with  $Underval = RER/RER^*$ . The **main hypothesis** is that  $\beta > 0$ .

- $RER^*$  is either estimated as a **PPP** adjusted for the **Balassa-Samuelson effect** or as a **fundamental equilibrium RER**.

PPP adjusted :  $\ln RER_{it} = \gamma_0 + \gamma_1 \ln y_{it} + \varepsilon_{it}$

FERER:  $\ln RER_{it} = \delta_0 + \delta_1 \ln y_{it} + \rho Z_{it} + e_{it}$



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# Empirical evidence: Growth Regressions

- A good deal of econometric studies have found a **positive** association between RER levels and medium term growth and a **negative** association between RER volatility and economic growth.
- The association is stronger for developing countries and the effect appears to be symmetric: overvaluation hurts growth and undervaluation accelerates growth.
- Results appear to be robust to changes in:
  - ① the independent variable as well as the dependent variable
  - ② the estimation methodology: cross-section, panel data, dynamic panels (GMM), cointegration panels, non-linear techniques,
  - ③ Periods and regions
  - ④ Extreme values.

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# Empirical evidence: Other methodologies

- The marginal contribution of new growth-regression is very low.
- Other types of studies
  - 1. Interest payments, FX reserve accumulation (Pillarovich and Pagan, 2002), FX intervention (Lay-Veyat et al 2012), Foreign savings (Prasad et al 2007), Capital accumulation (Azari et al, 2012).
  - 2. Growth surges (Hausmann et al 2006), export surges (Prasad and Peralta, 2012), investment surges (Solman et al 2016).
- Case studies have been underexploited so far. Good quality case studies could be very useful and influential. *O milagre econômico brasileiro* as an example.

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## 2. What are we talking about?

## RER variation vs. RER level effects

*RER variations and output level* : a rise (fall) of the RER usually leads to a contraction (expansion) in the output level due to a rise (fall) in the real wage and thus in households spending. The balance-sheet effect goes in the same direction. This is a short-run relationship.

*RER level and volatility and rate of change of output*: A high and stable (low and volatile) RER level accelerates (decelerates) —through mechanisms discussed below— the rate of economic growth. As a result, income and real wages end up being higher. This is medium/long-run relationship.

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# The RER and output in the short run

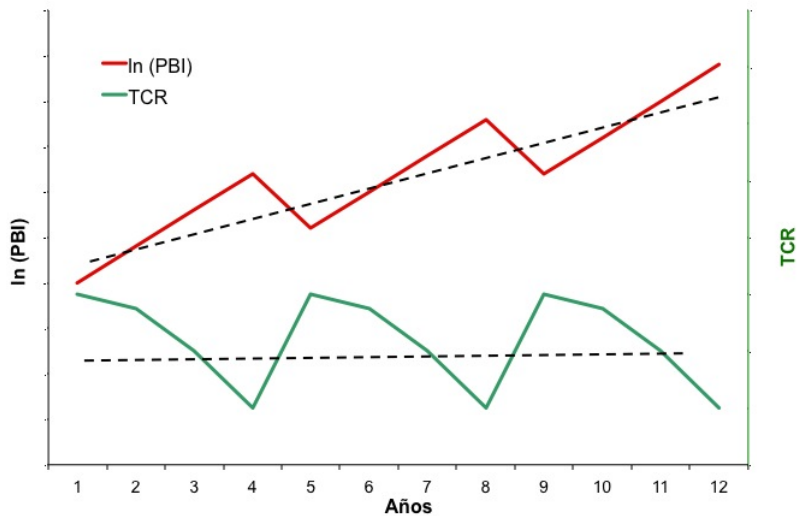


Figure : Short run



# The RER and output in the medium/long run

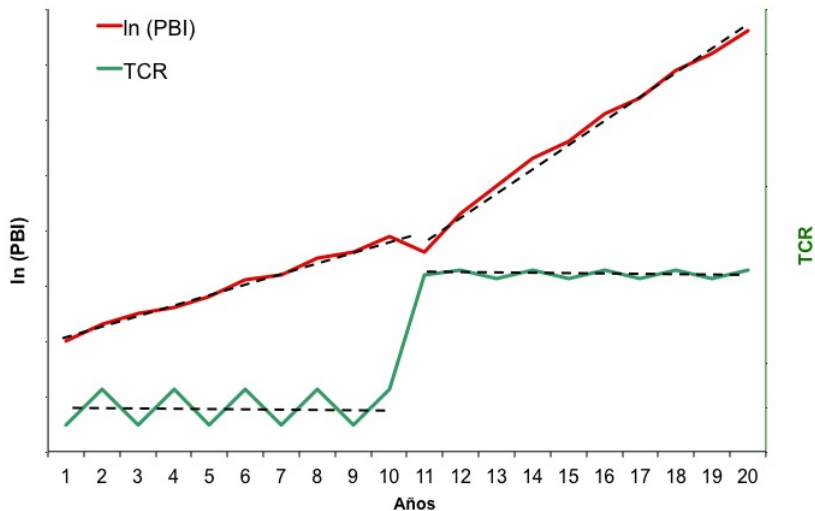


Figure : Medium/long run

# 3. Mechanisms

## Two main channels

### 2. The “foreign savings” or “macro-prudential” channel

This mechanism rests on three logical steps:

1. A higher RER leads to lower foreign saving and higher stocks of net international asset, which reduces the economy’s vulnerability to external shocks and the likelihood of crises. 2. Lower dependence on foreign finance and probability of crises reduce macroeconomic volatility and uncertainty. 3. Lower volatility and uncertainty increases *aggregate* investment and capital accumulation. The **RER** is in this mechanism **an instrument of macro-prudential policy**.

### 4. The “tradable-led-growth” channel

A higher RER leads to higher profit rates in tradable labor-intensive activities, induces capital accumulation in these activities and foster structural change and economic development. The **RER** is in this mechanism **an instrument of industrial policy**.

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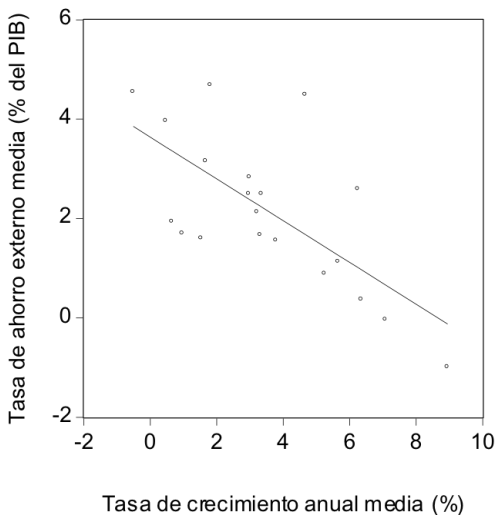
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# Foreign savings and growth

Ahorro externo y crecimiento  
20 economías emergentes entre 1975 y 2002



# The “tradable-led-growth” channel

- This mechanism perceives economic development as a process characterized by a rapid and intense structural transformation of the economy, mobilizing resources from low-productivity to high-productivity activities.
- These activities are tradable; traditionally manufactures, but now also some services (e.g., software).
- This channel consists on four elements:
  - ① Modern tradable activities are intrinsically more productive or operate under some sort of increasing returns to scale.
  - ② Given this trait, the reallocation of (current and future) resources to these activities – i.e. structural change – accelerates GDP per capita growth.
  - ③ Accumulation in these activities depends on their profitability, which in turn depends on the level of the RER.
  - ④ Rapid capital accumulation requires a sufficiently competitive (high) RER to compensate for the market failures caused by the increasing returns.

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# The RER & industrial policy

- 1 Traditional Economic Development Theory sees economic development as a process of structural change that involves the mobilization of resources (capital and labor) from low-productivity (backward) to high-productivity (modern) sectors.
- 2 This does not happen “naturally” because market failures make modern activities non-profitable under “equilibrium” prices.
- 3 Industrial policy provide transitory extra profits (or rents) to induce capital accumulation in those activities.
- 4 If they are 1) tradable and 2) labor-intensive, it can easily be shown that the **RER is an instrument of industrial policy.**

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# The RER & industrial policy: a formal setup

- Define the internal RER as the T-NT relative price

$$q_I = P_T/P_N \quad (1)$$

- The non-tradable price is fixed with a mark-up over unit labor costs

$$P_N = (1 + \mu) \frac{W}{y_N} \quad (2)$$

- The rate of profit of representative tradable firm,  $r_T$  is:

$$r_T = \frac{P_T Y_T (1 + s - t) - W L_T - P_N X_N - \sum_{j=1}^M P_j X_j - iD}{P_T K_T} \quad (3)$$

$$r_T = a_K \left[ 1 + s - t - (\phi_W + x_N) \frac{1}{q_I} - \sum_{j=1}^M \rho_j x_j - id \right] \quad (4)$$

# The “tradable-led-growth” channel vs. Thirwall’s law

- By increasing the production capacity of tradable activities, the tradable-led-growth mechanism anticipates that growth occurs with a relaxation of the BP constraint.
- This sounds like the prescription of a successful strategy under BP-constraint models, like Thirwall (1979). However, there are important differences:
  - In Thirwall-type of models, long-run growth is demand constrained (i.e. constrained by *foreign demand of domestic tradables*) and the RER is neutral on growth because only a continuous real depreciation can foster growth via substitution effects on a given rate of foreign demand growth.
  - Thirwall-type of models have been adapted to make the RER undervaluation good for growth. The trick is to make income elasticities of exports and imports depend on the RER. It is not clear, however, that the mechanism is right.
  - The tradable-led-growth mechanism, on the contrary, sees that the BP-constraint on growth depends on domestic supply factors. The RER relaxes the BP constraint by increasing the long-run supply of domestic tradables.

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# A graphical representation of the dispute

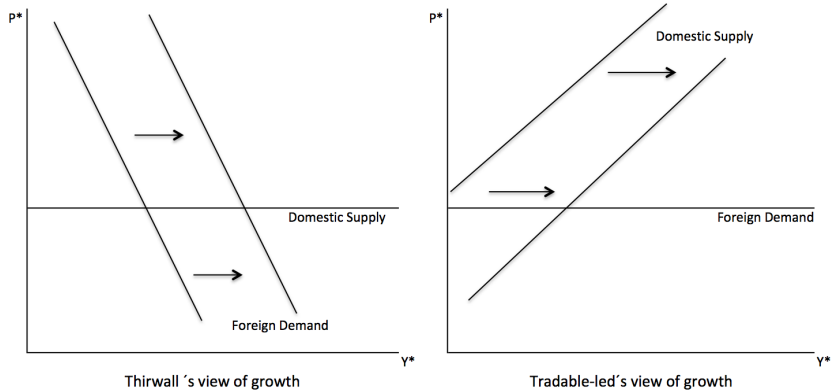


Figure :

## 4. Three key Levels of the RER

# A Latin American Structuralist model: main characteristics

- 1 The model represents the productive structure of a standard Latin American economy: a small open economy with three sectors, two of them, tradables.
  - 2  $X$  is an export of natural-resource commodities and it does not use labor.
  - 3  $M$  is an import of a manufactured tradable good, which requires labor. The  $M$  good can be used for consumption or investment.
  - 4  $N$  is a non-tradable sector that employs labor.
- 2 Labor is homogenous and gets paid a wage rate  $W$ , which is given in the short run.
- 3 Macroeconomic policy is conducted through two instruments: the nominal exchange rate,  $E$  and a domestic absorption instrument,  $\theta$ .
- 4 The real exchange rate is defined as the relative price between the foreign currency and labor:  $q \equiv E/W = (W/E)^{-1}$ . Since the wage rate is given in the short run, the RER is a policy variable in the short-run.
- 5 I neglect the financial side of the economy.

## A Latin American Structuralist model: main characteristics

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  - 1 **R** is net exporter of natural-resource commodities and it does not use labor.
  - 2 **M** is net importer of a manufactured tradable good, which requires labor. The M good can be used for consumption or investment.
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# Prices and production

$$P_R = EP_R^* \quad (5)$$

$$P_M = EP_M^* \quad (6)$$

$$P_N = (1 + \mu) \frac{W}{y_N} \quad (7)$$

$$q \equiv E/W \quad \rho^* \equiv P_R^*/P_M^* \quad (8)$$

$$Y_R = a_K K_R \quad (9)$$

$$Y_M = F(L_M, K_M) \quad (10)$$

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# Consumption

- I assume that wage-earners consume all their income and capital-owners save all their income.
- Income effect dominates substitution effect, which is actually nil.

$$C_R = C_R(q, \rho^*, L, \theta), \quad C_{Rq} < 0, C_{R\rho^*} < 0, C_{RL} > 0, C_{R\theta} > 0 \quad (12)$$

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# Employment

$$L \equiv L_M + L_N \quad (15)$$

- Employment in M is consistent with profit-maximizing and price-tacking behavior.

$$L_M = L_M(q) \quad L_{Mq} > 0 \quad (16)$$

- Employment in N is determined by demand of N goods.

$$L_N = \frac{1}{y_N} C_N(q, \rho^*, L, \theta) \quad (17)$$

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# Assets and rates of returns

- Capital-owners can invest in their own activity or in a safe financial asset with a rate of return,  $r^*$ .
- Capital-owners in tradable activities can also invest in their own activity abroad with a rate or return,  $r_R^*$  or  $r_M^*$ .

$$r_R \equiv P_R Y_R / P_M K_R = \rho^* a_K \quad (18)$$

$$r_M \equiv (P_M Y_M - W L_M) / P_M K_M = 1 / K_M \left[ F(L_M(q), K_M) - \frac{1}{q} L_M(q) \right] \quad (19)$$

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# Investment

- Besides  $r^*$ ,  $r_R^*$  and  $r_M^*$ , investment in each sector depends on sectoral's expected rate of profit, public policy ( $\theta$ ) and its own capital stock.

$$I_R = I_R(\rho^*, \theta, K_R) \quad I_{R\rho^*} > 0, I_{R\theta} > 0, I_{RK_R} > 0 \quad (21)$$

$$I_M = I_M(q, \theta, K_M) \quad I_{Mq} > 0, I_{M\theta} > 0, I_{MK_M} > 0 \quad (22)$$

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$$I = I(q, \rho^*, L, \theta) \quad I_q > 0, I_{\rho^*} < 0, I_L > 0, I_\theta > 0 \quad (24)$$

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# Short-run equilibrium

- The level of employment is determined by equation (25)

$$L = L(q, \rho^*, \theta) \quad L_q \leq 0, L_{\rho^*} < 0, L_{\theta} > 0 \quad (25)$$

- The balance of payments is determined by the current account and net capital inflows,  $Z$ , which I consider exogenous.

$$B = \rho^* [Y_R - C_R(q, \rho^*, L, \theta)] + [Y_M - C_M(q, \rho^*, L, \theta) - I(q, \rho^*, L, \theta)] + Z \quad (26)$$

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# Three key Levels of the RER

## Macroeconomic equilibrium RER

- Internal balance (IB) occurs when employment reaches the full employment level,  $\bar{L}$ .

$$\bar{L} = L(q, \bar{\rho}^*, \theta) \quad (27)$$

- External balance (EB) occurs when the current account calculated with a *sustainable* value of the terms of trade ( $\bar{\rho}^*$ ) is fully financed by a *sustainable* "flow" of foreign finance ( $\bar{Z}$ ).

$$0 = \bar{\rho}^* [Y_R - C_R(q, \bar{\rho}^*, L, \theta)] + [Y_M - C_M(q, \bar{\rho}^*, L, \theta) - I(q, \bar{\rho}^*, L, \theta)] + \bar{Z} \quad (28)$$

- Macroeconomic RER,  $q^E$  is the RER level that guarantees the simultaneous attainment of the internal and external balance.

$$q^E = q_E(a_K, K_R, K_M, \bar{\rho}^*, \bar{Z}) \quad (29)$$

with  $\partial q^E / \partial K_R < 0$ ,  $\partial q^E / \partial K_M < 0$ ,  $\partial q^E / \partial a_K < 0$ ,  $\partial q^E / \partial \bar{\rho}^* < 0$ , and  $\partial q^E / \partial \bar{Z} < 0$ .

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- Internal balance (IB) occurs when employment reaches the full employment level,  $\bar{L}$ .

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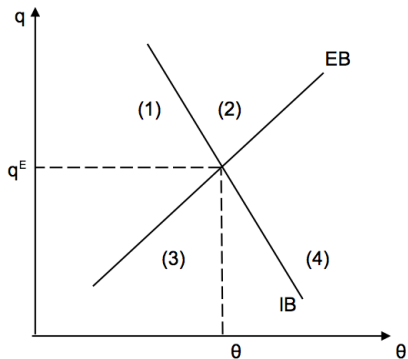
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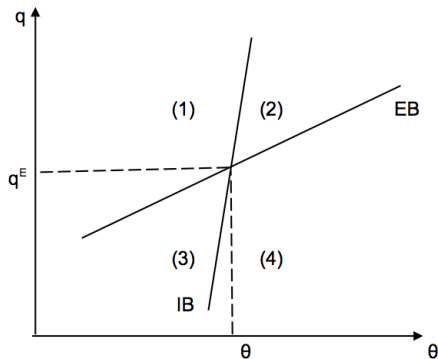
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# Macroeconomic equilibrium RER



(a)



(b)

Figure : Macroeconomic equilibrium RER in the  $q - \theta$  space

# Social equilibrium RER

- *Social equilibrium* is attained when workers in a situation of full employment successfully bargain a wage rate that fulfills their income aspirations represented by a bundle of goods  $\omega^S$  composed by the three goods.
- In social equilibrium, workers receive a wage rate:

$$W \geq P\omega^S \quad P \equiv P_R^\alpha P_M^\beta P_N^{1-\alpha-\beta} \quad (30)$$

- Solving equation (30) for  $q$ , we get the social equilibrium RER:

$$q^S = q_S(\omega^S, \rho^*) = \delta (\omega^S)^{-\frac{1}{\alpha+\beta}} (\rho^*)^{-\frac{\alpha}{\alpha+\beta}} \quad (31)$$

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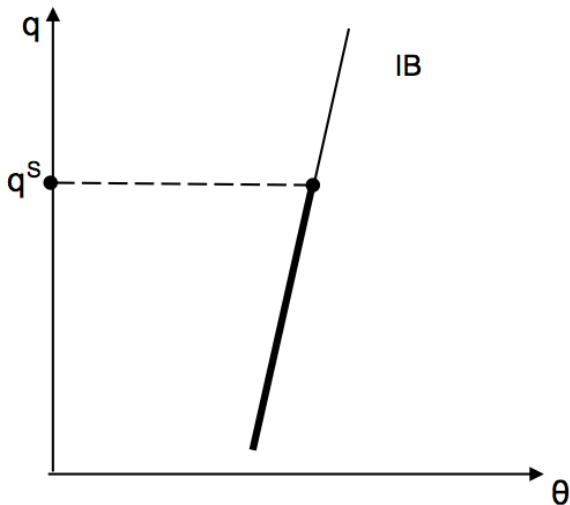


Figure : Social equilibrium RER in the  $q-\theta$  space

## Developmental RER

- If domestic and foreign capital-output ratios in sector M are similar, the parity of domestic and foreign rates of profit requires

$$w_E = \tilde{w}_E \equiv W^* \frac{y_M}{y_M^*} \quad (32)$$

- If one considers other factors —e.g., country risk premium— that make profitability of sector M higher in developed countries than in developing countries, then the parity condition requires:

$$w_E = \gamma \tilde{w}_E \quad 0 < \gamma < 1 \quad (33)$$

- This level of  $w_E$  guarantees a competitive rate of profit in sector M that provides incentives for sustained capital accumulation in this sector. I call the associated level of  $q$ : *developmental RER* ( $q^D$ )

$$q^D = q_D (y_M^*/y_M, \gamma, W^*) = (\gamma \tilde{w}_E)^{-1} \quad (34)$$

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# Profitability and labor productivity in M and the RER

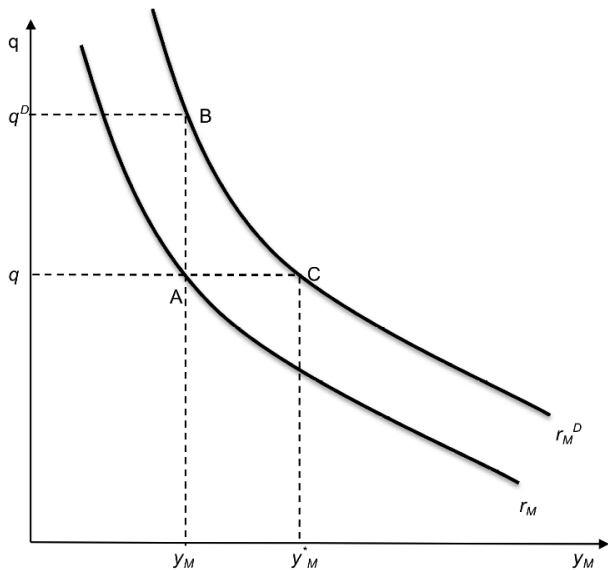


Figure : Iso- $r_M$  curves on the  $q - y_M$  space

# The three levels of the RER in Latin America

- There is no reason why these three key levels of the RER — $q^E$ ,  $q^S$  and  $q^D$ — must coincide.
- In Latin America, two configurations have frequently been observed:

- ① **Unbalanced economic structure:**  $q^E < q^D$

As productivity in sector R becomes relatively more productive than M, the more likely  $q^E < q^D$ . If sector M is where productivity gains are more prevalent, this configuration can lead to a type of underdevelopment trap due to the underdevelopment of sector M. Kaldor, Diamand, Bresser Pereira and others.

- ② **Structural distributive conflict:**  $q^E > q^S$

As social norms become more egalitarian, the more likely this configuration. A structurally conflictive country can experience continuous stop-&-go cycles, which jeopardize long-run growth and development. This can be conceived as another type of underdevelopment trap. Structural inflation. Sunkel, Olivera, Braun, Seers.

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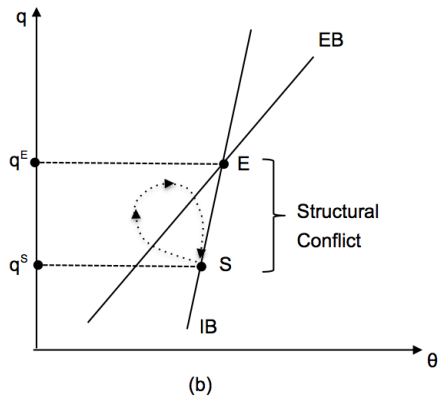
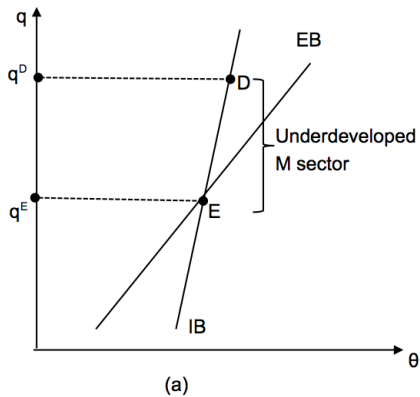


Figure :

# Three views about economic development in Latin America

- Our framework can help clarify three views in the LA debate on development that are associated with the three levels of the RER
- Developmentalism: Besides being 1) tradable and 2) labor intensive, sector M also 3) operates with some sort of increasing return to scale. Thus, a reallocation of resources towards M would imply structural change and a permanent increase of income per capita. Unless public intervention, in a country with an unbalanced productive structure M would remain underdeveloped. Setting  $q = q^D$  is a type of “industrial” policy that favors capital accumulation in M and economic development. Also due to macro-prudential reasons.
- Mainstream: The best that macro policy can do to promote development is to create and maintain a stable macroeconomic environment. In practice this means inflation targeting plus managed floating to avoid excessive volatility and RER misalignment.  $q = q^E$
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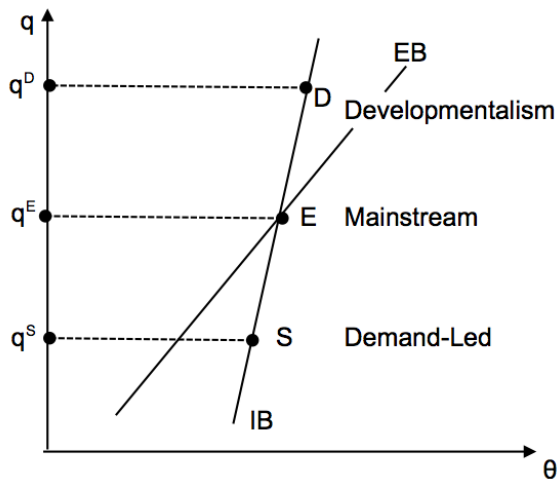
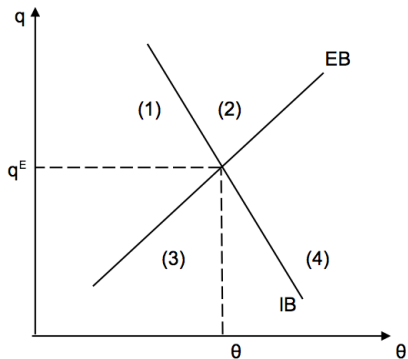
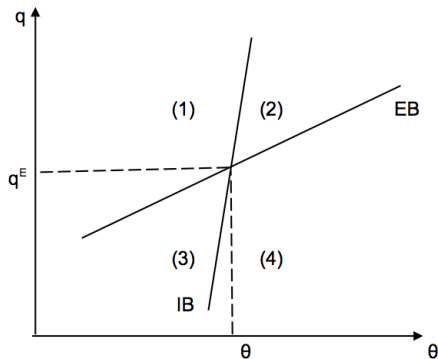


Figure :

# Macroeconomic equilibrium RER



(a)



(b)

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- In social equilibrium, workers receive a nominal wage rate
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- Consider the simplest case in which  $P_T = E$  and  $P_N = W$ , the RWR is  $\omega = q^{-\alpha}$
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- In social equilibrium, workers receive a nominal wage rate
$$W \geq P\omega^S \quad P \equiv P_T^\alpha P_N^{1-\alpha}$$
- Taking the RER as the relative price of tradables and non-tradables  $q = P_T/P_N$ , and assuming that the nominal exchange rate,  $E$ , is a key determinant of  $P_T$  and the nominal wage rate  $W$  is a key determinant of  $P_N$ , it is clear that there is a **negative relationship between the RER and the real wage rate (RWR)**  $\omega = W/P$ .
- Consider the simplest case in which  $P_T = E$  and  $P_N = W$ , the RWR is  $\omega = q^{-\alpha}$
- We can therefore define the RER level that is associated with  $\omega^S$  the **social equilibrium RER,  $q^S$** .

## Social equilibrium RER

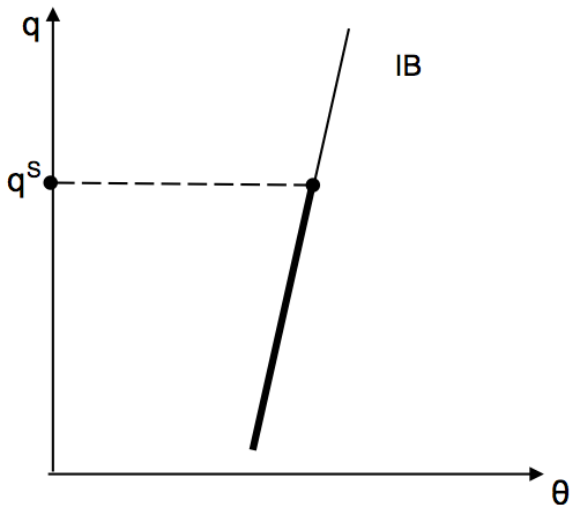


Figure : Social equilibrium RER in the  $q-\theta$  space

## Developmental RER

- As we saw, the RER is a key determinant of the profit rate in tradable and labor-intensive activities. Call them sector M.
- If domestic and foreign capital-output ratios in sector M are similar, the parity of domestic and foreign rates of profit requires that

$$w_E \equiv W/E = W^* \frac{y_M}{y_M^*} \equiv \tilde{w}_E \quad (35)$$

- If one considers other factors —e.g., country risk premium— that make profitability of sector M higher in developed countries than in developing countries, then the parity condition requires:

$$w_E = \gamma \tilde{w}_E \quad 0 < \gamma < 1 \quad (36)$$

- This level of  $w_E$  guarantees a competitive rate of profit in sector M that provides incentives for sustained capital accumulation in this sector. I call the associated level of  $q$ : *developmental RER* ( $q^D$ )

$$q^D = q_D (y_M^*/y_M, \gamma, W^*) = (\gamma \tilde{w}_E)^{-1} \quad (37)$$

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# Profitability and labor productivity in M and the RER

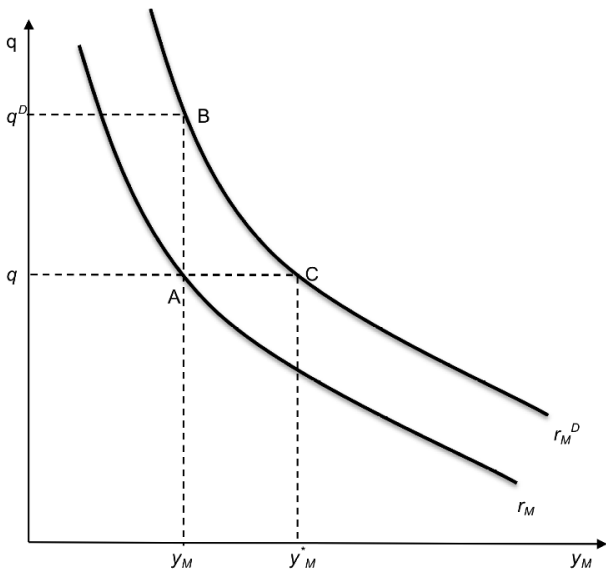


Figure : Iso- $r_M$  curves on the  $q - y_M$  space

# The three levels of the RER in Latin America

- There is no reason why these three key levels of the RER — $q^E$ ,  $q^S$  and  $q^D$ — must coincide.
- In Latin America, two configurations have frequently been observed:

- **Unbalanced economic structure:**  $q^E < q^D$

As productivity in sector R becomes relatively more productive than M, the more likely  $q^E < q^D$ . If sector M is where productivity gains are more prevalent, this configuration can lead to a type of underdevelopment trap due to the underdevelopment of sector M. Kaldor, Diamand, Bresser Pereira and others.

- **Structural distributive conflict:**  $q^E > q^S$

As social norms become more egalitarian, the more likely this configuration. A structurally conflictive country can experience continuous stop-&-go cycles, which jeopardize long-run growth and development. This can be conceived as another type of underdevelopment trap. Structural inflation. Sunkel, Olivera, Braun, Seers, Gerchunoff & Rapetti.

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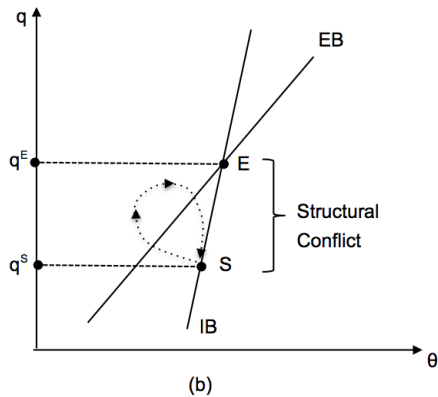
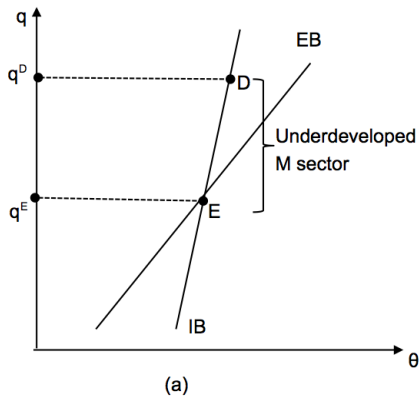


Figure :

# Three views about economic development in Latin America

- This framework can help clarify three views in the LA debate on development that are associated with the three levels of the RER
- Developmentalism: Besides being 1) tradable and 2) labor intensive, sector M also 3) operates with some sort of increasing return to scale. Thus, a reallocation of resources towards M would imply structural change and a permanent increase of income per capita. Unless public intervention, in a country with an unbalanced productive structure M would remain underdeveloped. Setting  $q = q^D$  is a type of “industrial” policy that favors capital accumulation in M and economic development. Also due to macro-prudential reasons.
- Mainstream: The best that macro policy can do to promote development is to create and maintain a stable macroeconomic environment. In practice this means inflation targeting plus managed floating to avoid excessive volatility and RER misalignment.  $q = q^E$
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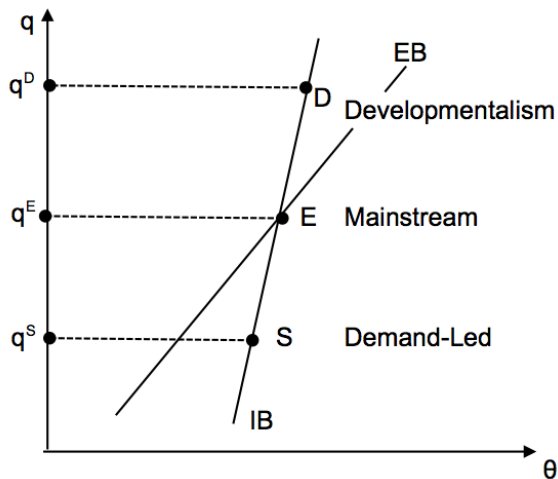


Figure :

# Conclusions



# The challenges

- Expand our portfolio of empirical evidence: more detailed and rigorous case studies.
- Stop confusing level with variations; short run with medium run.
- Have a clearer understanding of the mechanisms: is it demand-led or supply-led?
- Several aspects, but one in particular: The RER is an instrument of industrial policy —which by nature implies giving transitory rents— being funded by wage-earners. So, how does we make competitive RER compatible with social demands? Multiple exchange rates? Taxes on primary exports? Social Policy?

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**Thank you!**

# The SCRER strategy

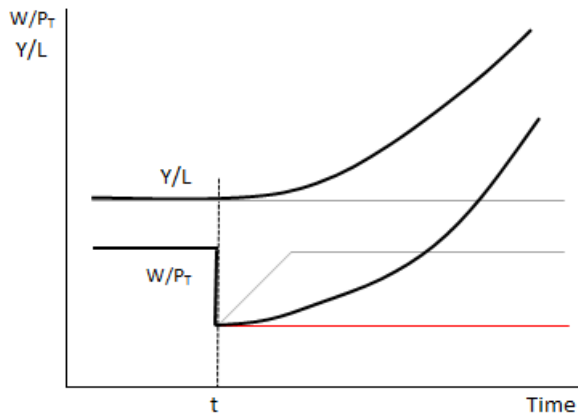


Figure : Different trajectories of  $W/P_M$  e  $y_M$ . Source: Rapetti (2012)