

# Exchange Rate Regimes and Dollar Demand

## The Bolivian Experience

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# Motivation

- Fixed exchange rate regimes typically accompanied by:
  - Domestic consumption boom
  - Sharp real exchange rate appreciation
  - Large external deficits
  - Vulnerability to external shocks
  - More often than not, fixed exchange rate regimes, fail.
- Bolivia: *de-facto* exchange rate regime in 2007 while experiencing a commodity boom
- Commodity bust has brought challenges to economic policy

## Two Questions

- Can we make sense of the Bolivian experience using a simple macroeconomic model?
- Can we understand why are fixed exchange rate regimes prone to failure?

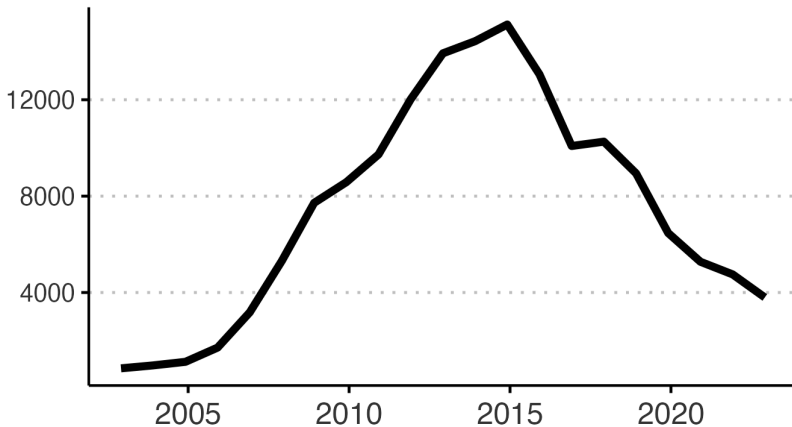
Stylized Facts

Nominal Rigidities and Exchange Rate Policy

## Bolivia: Large swings in foreign Reserves

### Reservas Internacionales Netas

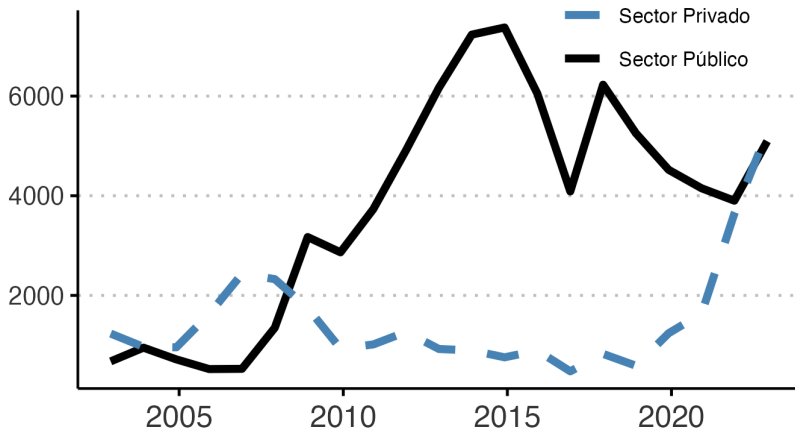
Millones de Dólares



# "Divisas" obtained through state-owned exports

## Generación de Divisas por Sector

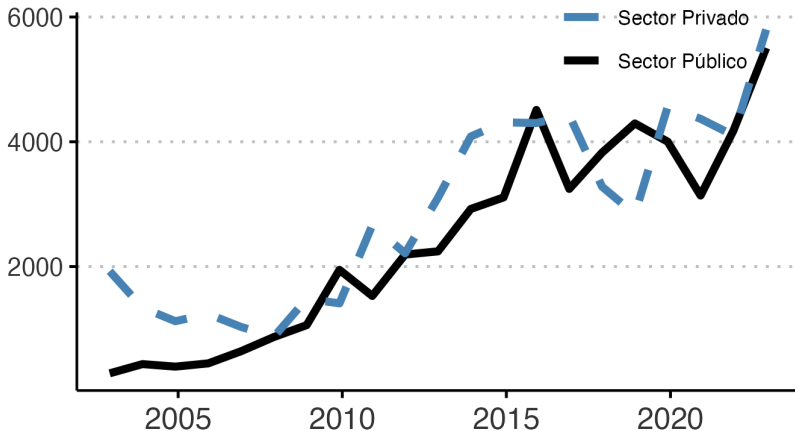
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# Public and private sectors are "hungry" for dollars

## Uso de Divisas por Sector

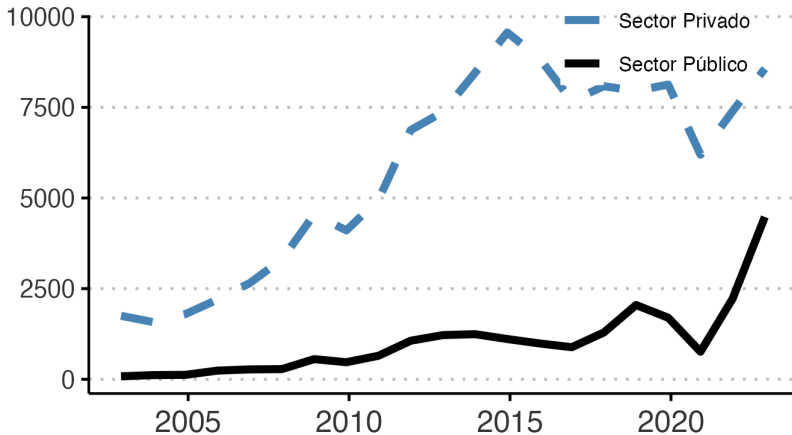
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# Favorable TOT led to private sector import boom

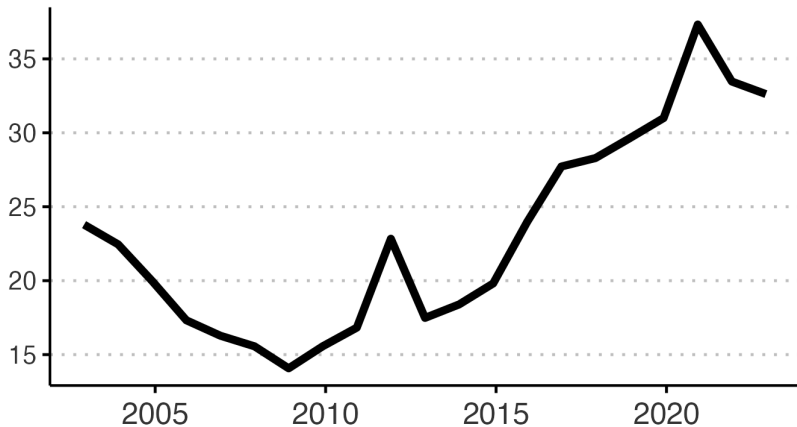
## Importaciones por Sector

Millones de Dólares



## Crédito del Sector Financiero / GDP

Porcentaje del PIB

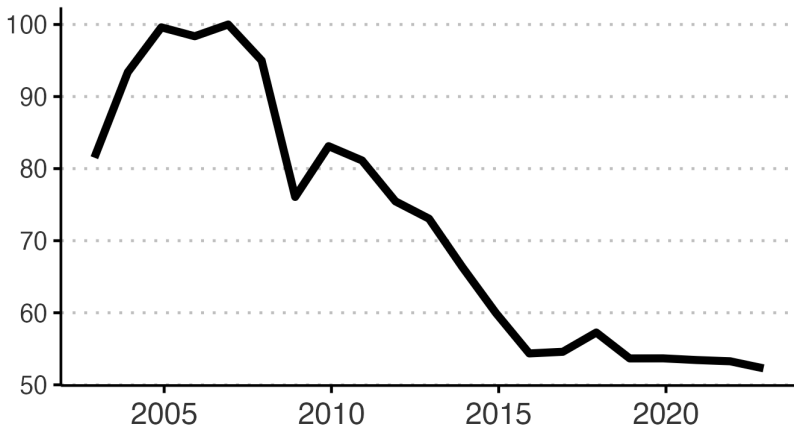




## Resulting in substantial RER appreciation

### Índice de Tipo de Cambio Real Multilateral

2006=100



Stylized Facts

Nominal Rigidities and Exchange Rate Policy

Two-period model of small-open economy facing fluctuations in tradable endowment

- Based on Schmidt-Grohe, Uribe and Woodford (2023) and Schmidt-Grohe and Uribe (2020)
- Optimizing households and firms
- Government only sets exchange rate regime
- Downward Nominal Wage Rigidity
- Emphasize private sector behavior

$$\max u(C_1, C_2) = \ln C_1 + \beta \ln C_2$$

*s.t.*

$$P_1^T C_1^T + P_1^N C_1^N + \mathcal{E}_1 B_1 = \mathcal{E}_1(1 + r_0) B_0 + P_1^T Q_1^T + W_1 h_1 + \Pi_1$$

$$P_2^T C_2^T + P_2^N C_2^N = \mathcal{E}_2(1 + r_1) B_1 + P_2^T Q_2^T + W_2 h_2 + \Pi_2$$

- $Q_t^T$  is the endowment of the tradable good
- $\mathcal{E}_t$  is the nominal exchange rate,  $r_t = r^*$  is the real interest rate
- Consumption is a composite good:  $C_t = (C_t^T)^\gamma (C_t^N)^{1-\gamma}$
- Household supply  $\bar{h}$  hours of work inelastically.
- No-Ponzi condition  $B_2 = 0$

**Intertemporal budget constraint**

$$C_1^T + p_1 C_1^N + \frac{C_2^T + p_2 C_2^N}{1 + r^*} = \bar{Y}$$

**Households' optimality conditions**  $C_1^T, C_2^T, C_1^N, C_2^N$

$$\frac{C_2^T}{C_1^T} = \beta(1 + r^*) \quad (1)$$

$$\frac{C_1^N}{C_1^T} = \frac{1 - \gamma}{\gamma} \frac{1}{p_1} \quad (2)$$

$$\frac{C_2^N}{C_2^T} = \frac{1 - \gamma}{\gamma} \frac{1}{p_2} \quad (3)$$

**Economy Wide Resource Constraint**

$$C_1^T + \frac{C_2^T}{1 + r^*} = (1 + r_0)B_0 + Q_1^T + \frac{Q_2^T}{1 + r^*} \quad (4)$$

# Equilibrium Demand for Tradables

Combine with (1) and (4)

$$C_1^T = \frac{1}{1 + \beta} \left[ (1 + r_0) B_0 + Q_1^T + \frac{Q_2}{1 + r^*} \right]$$

Which we can summarize as:

$$C_1^T = C^T(\underbrace{r_*}_{-}, \underbrace{Q_1^T}_{+}, \underbrace{Q_2^T}_{+}, \underbrace{(1 + r_0) B_0}_{+})$$

## Goods Market Clearing

$$C_t^N = F(h_t) \tag{5}$$

**Demand Schedule:** Using equation (2) and (5)

# Production

- Endowment  $Q_t^T$  of T goods
- Firms sell NT goods at price  $P_t^T$
- Non-tradeable goods produced using labor ( $h_t$ ):  $Q_t^N = F(h_t)$
- Where  $F(.)$  satisfies  $F'(.) > 0$  and  $F''(.) < 0''$ . Interpretation?
- Law of one price applies to T goods:  $P_t^T = \mathcal{E} P_t^{T*}$
- Assume  $P_t^{T*} = 1 \rightarrow \Delta \mathcal{E}_t = \Delta P_t^{NT}$

## Firms' objective and optimality

Firms maximize per-period profits:

$$\Pi_t = P_t^N F(h_t) - W_t h_t$$

First order conditions:

$$P_t^N F'(h_t) = W_t$$

Which can be written as:

$$p_t \equiv \frac{P_t^N}{P_t^T} = \frac{W_t / P_t^T}{F'(h_t)} = \frac{W_t / \mathcal{E}_t}{F'(h_t)}$$

FOC determines the **supply schedule** of nontradable goods



## Downward Nominal Wage Rigidity

$$W_t \geq W_{t-1}$$

Nominal wage can increase but it cannot fall. Interpretation?

## Labor Market Clearing

How does the DNWR affect the labor market?

- If  $h_t < \bar{h} \rightarrow$  involuntary unemployment and  $W_t = W_{t-1}$
- If  $h_t = \bar{h} \rightarrow$  full employment, and  $W_t > W_{t-1}$

In summary:

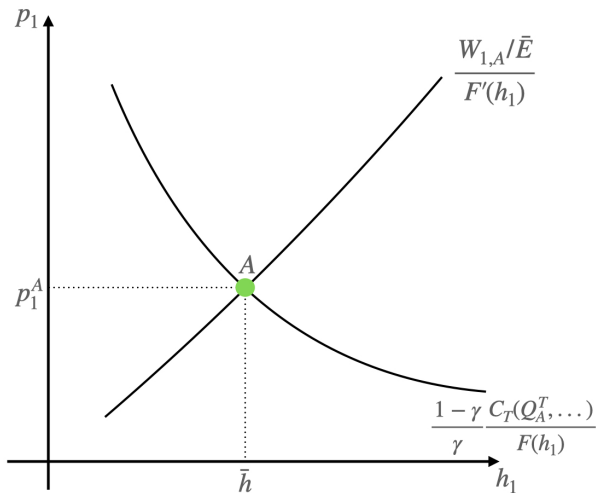
$$(W_t - W_{t-1})(\bar{h} - h_t) = 0$$

A slack labor market (unemployment) means that the downward

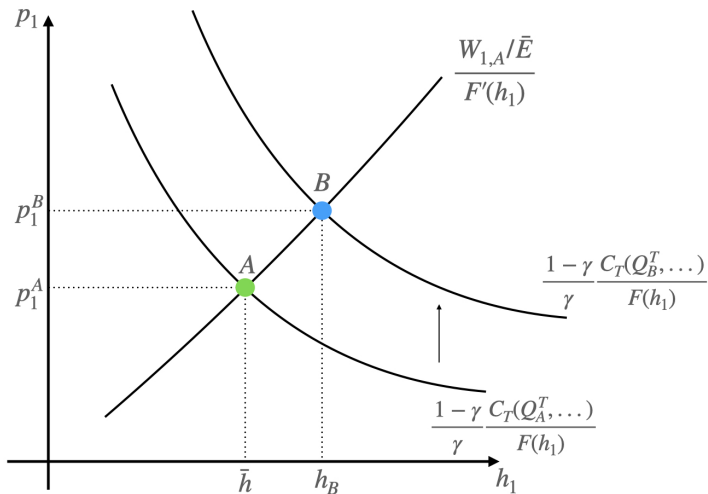
## Exchange rate arrangements

- Fixed Exchange Rate: central banks guarantees convertibility of the domestic currency with a foreign currency at a fixed exchange rate.  $\mathcal{E}_t = \bar{E}$
- Floating Exchange Rate: the nominal exchange rate can change over time. Central bank focuses to achieve full employment and price stability in  $P_t^N$

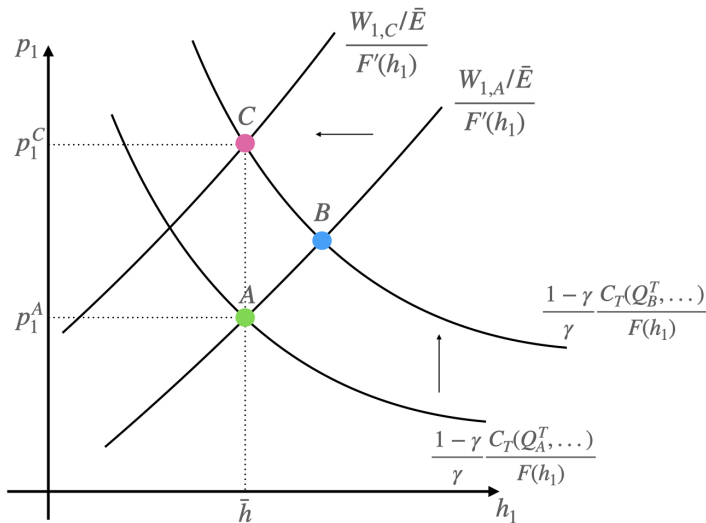
Pre-Boom:  $Q_1^T = Q_2^T = Q_A^T$



# Commodity Boom: $Q_B^T > Q_A^T$

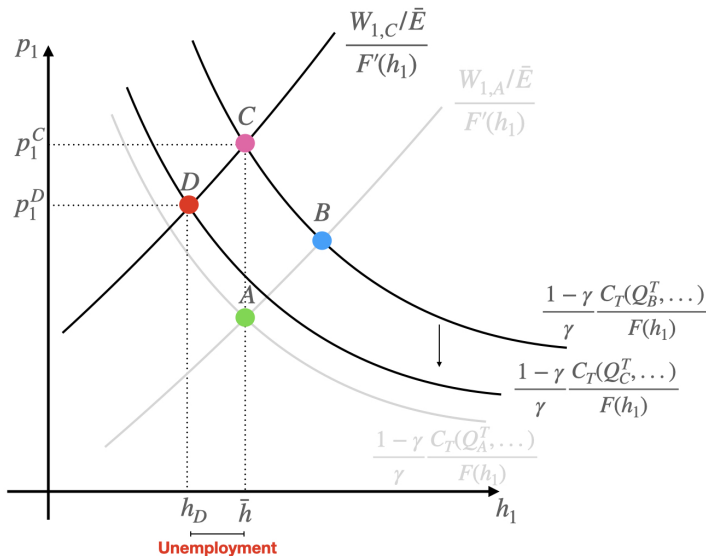


# Commodity Boom: $Q_B^T > Q_A^T$



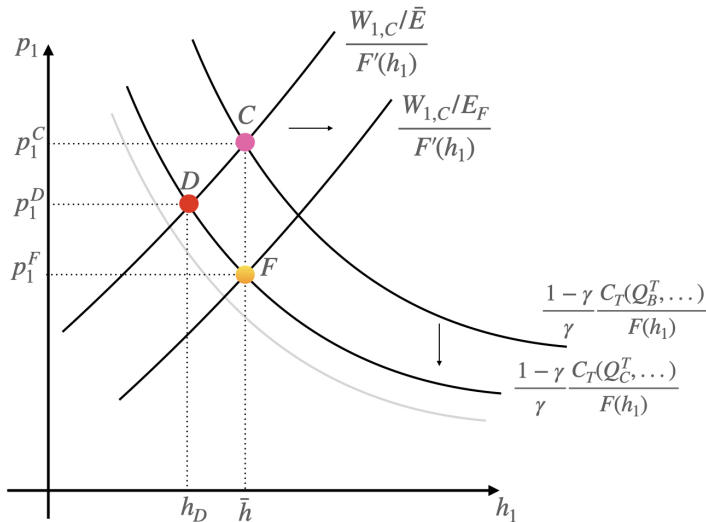
With a fixed exchange rate, nominal wage must go up. **Why?**

# Commodity Bust: $Q_C^T < Q_B^T$



Nominal wage rigidity + fixed exchange rate = unemployment

# Restoring full employment: $E_F > \bar{E}$



Exchange rate flexibility can restore full employment

# Summary

- Under fixed exchange rates:
  - Shocks can have asymmetric effects
  - Downward wage rigidity mediates the effect of negative shocks
- Under flexible exchange rates:
  - Can achieve full employment and price stability
  - Stabilize the economy through reallocation of demand