Exchange Controls As A Fiscal Instrument

S. Schmitt-Grohé and M. Uribe

Columbia University and NBER

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Motivation

• About 20 percent of all countries have in place dual, multiple, or parallel exchange rates (Ilzetzki, Reinhart, and Rogoff, QJE 2019).

• Much of the existing theoretical literature on exchange controls focuses on their likeness to commercial policy or their macroeconomic effects at inception or removal.

• This paper focuses on exchange controls as a fiscal instrument in an environment in which they compete with inflation to finance chronic fiscal deficits.

• This paper solves an optimal taxation problem of a government with access to money creation and exchange controls.

Are Exchange Controls Used as Fiscal Instruments in Practice?

• Dornbusch (1986): motivation for observed FX controls is ability to generate fiscal revenue.

• Kamin (1994): countries with dollar debt receive implicit tax revenues from FX controls.

• IMF (2022): Countries maintain Multiple Currency Practices (MCPs) to avoid balance of payment problems and to raise revenue.

• IMF (2022): MCPs not removed for 'lack of progress on domestic revenue mobilization and other fiscal reforms.'

• IMF (2019): MCPs are adopted because of expansionary fiscal policies, unsustainable macroeconomic policies, and revenue mobilization.

• IMF (2019, 2023): Countries prefer MCPs over direct taxation because of: administrative ease; large revenue potential; don't require legislation.

Preview of Main Results

- Exchange controls lead to misallocation of factors:
  - economy becomes more closed (exports and imports decline);
  - shortage of imported factor inputs (dollar shortage);
  - economy becomes less competitive (ToT deteriorate);
  - excessive reliance on domestic factor inputs (labor);

- Exchange controls can generate sizeable fiscal revenue.

- The trade-off between financing the fiscal deficit with exchange controls or inflation is resolved in favor of:

  - inflation, when there is a single official exchange rate applied to both exports and imports.

  - exchange controls on exports, when there are separate official exchange rates for exports and imports.

Related Literature

• Reinhart and Rogoff (2004) and Ilzetski Reinhart, and Rogoff (2019) document MCPs, 1946-2016, 194 countries.

• Argy and Porter (1972) and Flood and Marion (1982), models of dual FX with and without rational expectations.

• Adams and Greenwood (1985) and Mosquera and Sturzenegger (2021), lump-sum taxes versus dual FX. Espino, Gauna, and Neumeyer (2023), bop crisis with dual FX.

• Optimality of Friedman rule: Lucas and Stokey (1983); Chari, Christiano, and Kehoe (1991); Correia, Nicolini, and Teles, (2008); Schmitt-Grohé and Uribe (2004a,b).

• Ottonello, Perez, and Witheridge (2024), real FX management alters speed of convergence to technological frontier; Itskhoki and Mukhin (2023), different sanctions can support same real allocation, but imply different real exchange rates;

The Economic Environment

• The government must finance an exogenous stream of primary fiscal deficits and pay interest on a stock of public debt through a combination of money creation and exchange controls.

• The country owes an external debt and pays interest on it but is otherwise isolated from international financial markets.

• Importers and exporters can engage in illegal trade (smuggling) to circumvent exchange controls at a cost.

Single Official Exchange Rate, $\mathcal{E}_t^o$

Profit maximization problem of exporters

$$\max_{\{x_t^o, x_t^s, q_t^x\}} \quad \mathcal{E}_t^o P_t^{x*} x_t^o + \mathcal{E}_t P_t^{x*} x_t^s - P_t^m q_t^x - P_t C(x_t^s; \kappa_x)$$

$$\text{subject to} \quad x_t^o + x_t^s \leq X(q_t^x)$$

Optimality condition

$$\frac{P_t^{x*}}{P_t^{m*}} X'(q_t^x) = 1 \times \left(\frac{\mathcal{E}_t}{\mathcal{E}_t^o}\right) \times \left(\frac{P_t^m}{\mathcal{E}_t P_t^{m*}}\right)$$

Notation:
$\mathcal{E}_t^o$ = official exchange rate (pesos per dollar); $\mathcal{E}_t$ = market exchange rate; $\boldsymbol{\mathcal{E}_t^o < \mathcal{E}_t}$;
P_t^{x*} = world price of exports; P_t^{m*} = world price of imports;
P_t^m = domestic currency price of import good;
x_t^o = official exports; x_t^s = smuggled exports;
q_t^x = imported materials; $X(\cdot)$ = concave production function;
P_t = domestic currency price of final good;
$C(x_t^s; \kappa_q)$ = smuggling cost function, positive, convex, $C(0, \cdot) = 0$.

- If $x_t^s > 0$, the firm is **underinvoicing exports**
- Government **collects** $(\mathcal{E}_t - \mathcal{E}_t^o) P_t^{x*} x_t^o$
- Legal and illegal exports equally profitable at the margin:

$\mathcal{E}_t^o P_t^{x*} = \mathcal{E}_t P_t^{x*} - P_t C'(x_t^s, \kappa_x)$

Examples of reports on government detection and sanctioning of underinvoicing of exports

• February 12, 2023, Clarín reported the government's uncovering of an export underinvoicing scheme involving 20 slaughterhouses. The strategy consisted in channeling meat exports through traders located in a third country (Cyprus, Uruguay, and the United States). These middlemen provided no value added, but would simply buy meat from the slaughterhouses at a below-market price and then reexport it to other countries (including China, Chile, and Brazil) with a markup of about 30 percent.

• In the same article, Clarín reports another underinvoicing strategy consisting in exporting regular beef (class C) as canner beef (class D or E). The price difference is again deposited outside Argentina, avoiding conversion to domestic currency at the official exchange rate by the central bank. The article indicates that the reported monthly exports of canner beef rose 70 percent, suggesting that this form of underinvoicing of exports is widespread.

• According to the Argentine tax authority fines related to underinvoicing of exports in the meat industry increased by 667 percent between the first and second halves of 2022.

Profit maximization problem of importers

$$\max_{\{q_t^o, q_t^s\}} \quad P_t^m(q_t^o + q_t^s) - \mathcal{E}_t^o P_t^{m*} q_t^o - \mathcal{E}_t P_t^{m*} q_t^s - P_t C(q_t^s; \kappa_q)$$

$$\text{subject to} \quad q_t^o \leq \bar{q}_t^o$$

Optimality conditions

$$P_t^m = \mathcal{E}_t P_t^{m*} + P_t C'(q_t^s, \kappa_q); \quad \text{and} \quad P_t^m = \mathcal{E}_t^o P_t^{m*} + \mu_t^q$$

Notation:
q_t^o = official imports; q_t^s = smuggled imports;
$C(q_t^s; \kappa_q)$ = smuggling cost function;
$\bar{q}_t^o$ = upper limit of imports at official exchange rate (Dornbusch, 1986).

- Government **spends** $(\mathcal{E}_t - \mathcal{E}_t^o) q_t^o$; fiscal deficit
- If $q_t^o = \bar{q}_t^o$, **dollar shortage**;
- If $q_t^o = \bar{q}_t^o$, exchange controls turn from import subsidy to **import quota**;
- If $q_t^s > 0$, $P_t^m > \mathcal{E}_t P_t^{m*}$;

Profit maximization problem of producers of final goods

$$\max_{\{h_t, q_t^n\}} \quad P_t F(h_t, q_t^n) - P_t^m q_t^n - W_t h_t$$

Optimality condition

$$P_t F_2(h_t, q_t^n) = P_t^m = \mathcal{E}_t P_t^{m*} + P_t C'(q_t^s, \kappa_q)$$

Notation:

P_t = domestic (peso) price of final (nontraded) goods;

h_t = hours worked;

q_t^n = imported intermediate inputs;

W_t = nominal wage rate;

Households

$$\max \sum_{t=0}^{\infty} \beta^t U(c_t, h_t)$$

subject to $v_t = c_t/m_t$,

$$[1 + s(v_t)]c_t + \frac{a_t}{1+i_t} + \frac{i_t}{1+i_t} m_t = w_t h_t + \tau + \phi_t + \frac{a_{t-1}}{1+\pi_t}$$

The supply of labor

$$-\frac{U_2(c_t, h_t)}{U_1(c_t, h_t)} = \frac{w_t}{1 + s(v_t) + v_t s'(v_t)}$$

Notation:
c_t = consumption; v_t = money velocity; $s(v_t)$ = transactions costs;
m_t = real money holdings; i_t = nominal interest rate;
π_t = inflation rate; $w_t = W_t/P_t$ = real wage rate;
a_t = real value of nominal asset holdings (money + bonds);
τ = government transfer (or primary fiscal deficit); ϕ_t = profits of firms.

The Government's Import Restriction Policy

$$\bar{q}_t^o = (1 - \rho_t) p_t^x x_t^o,$$

where $\rho_t \in (0, 1)$ is a policy instrument

p_t^x = external terms of trade, $p_t^x \equiv P_t^{x*}/P_t^{m*}$;

The Government's Budget Constraint

Let $\gamma_t = \frac{\mathcal{E}_t}{\mathcal{E}_t^o} - 1 =$ **exchange rate gap**

$$\frac{a_t}{1+i_t} + \frac{i_t}{1+i_t} m_t + s_t = \tau + \frac{a_{t-1}}{1+\pi_t} + e_t \frac{i^* B^*}{1+i^*}$$

Direct revenue from exchange-rate controls

$$s_t = \frac{e_t \gamma_t}{1+\gamma_t} (p^x x_t^o - q_t^o)$$

Notation:

$a_t =$ real value of nominal asset holdings (money + bonds);

$i_t =$ nominal interest rate; $\pi_t =$ inflation rate;

$m_t =$ real money holdings;

$e_t = \frac{\mathcal{E}_t}{P_t} =$ external real exchange rate

$B^* =$ government's external debt

$i^* =$ foreign interest rate

$\tau =$ primary fiscal deficit

B^*, i^*, and τ are exogenous.

Calibration

(Data Sources: MAFHOLA, IMF, BCRA, INDEC, Cavallo-Bertolotto)

- Argentina 2007:Q1 to 2021:Q4
- Exchange-rate gap: $\gamma = 0.23$
- Primary fiscal deficit: $\tau = 2\%$ of GDP (net of Kehoe, Nicolini, Sargent, 2021 adjustment)
- Inflation: $\pi = 31\%$ per year
- Domestic government debt: $b/(1+i) = 38\%$ of GDP
- Money holdings: $m = 8.4\%$ of GDP (seignorage is 2.5% of GDP)

Money Demand

A novel functional form for the transactions cost function that guarantees 3 properties of the demand for money:
(1) A Laffer curve
(2) Finite real balances at a zero nominal interest rate
(3) A unit income elasticity.

The transaction cost function

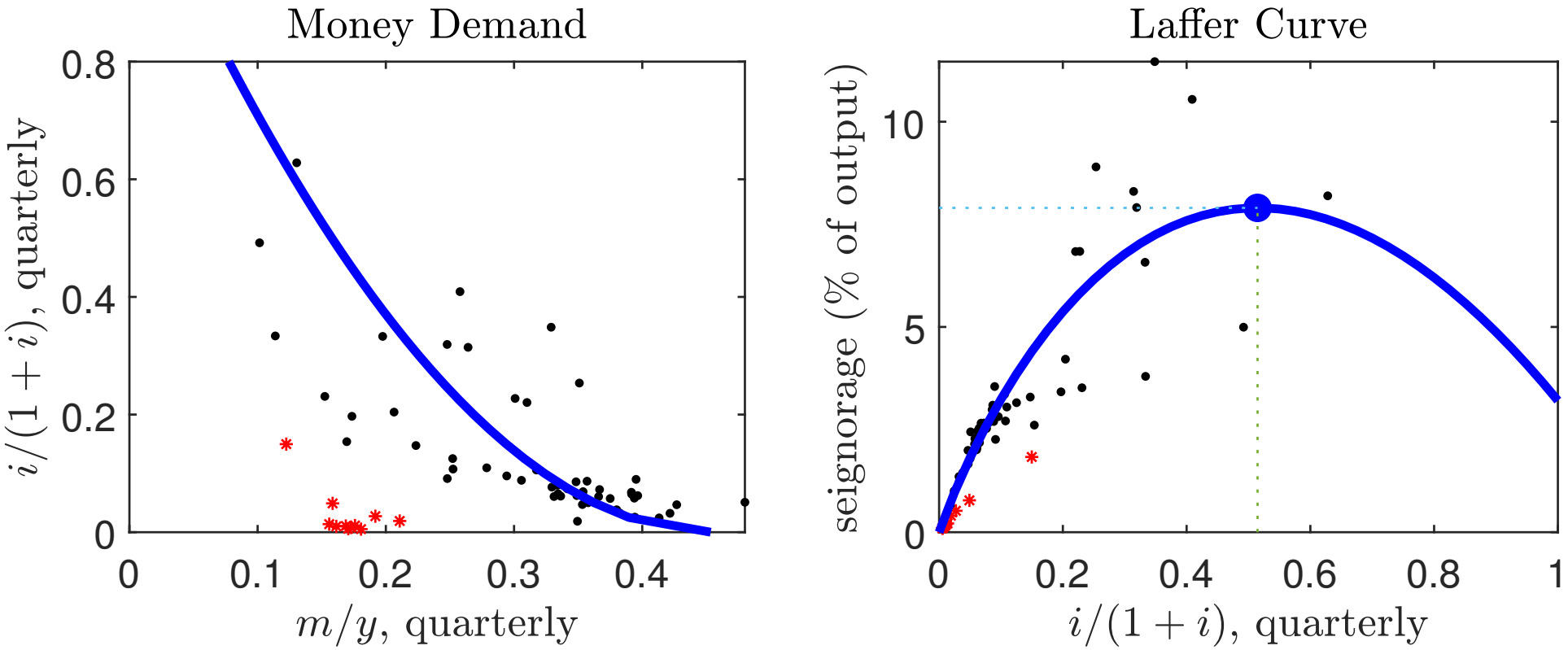
$$s(v) = \frac{\left(A - \frac{D}{v}\right)^{1+B}}{1+B}$$

implies the demand for money

$$m = c\left[\frac{A}{D} - \frac{1}{D}\left(\frac{i}{D(1+i)}\right)^{\frac{1}{B}}\right]$$

Observations: The peak of the Laffer curve occurs at $\frac{i}{1+i} = D\left(\frac{AB}{1+B}\right)^{B}$; and the demand for money at $i = 0$ is $\frac{cA}{D}$.

Estimated Money Demand Function and Laffer Curve: Argentina 1960 to 2021



Notation: m = real money balances, y = real quarterly GDP, and i = quarterly nominal interest rate. Dots and stars represent, respectively, data outside and during the convertibility period (1991 to 2001). Solid lines represent the estimated money demand function (left) and the Laffer curve (right). Seignorage is defined as $i/(1+i)m/y$. Estimated on base money velocity and inflation using NLLS. The money demand function is the one given on the previous slide.

Smuggling Cost Function

$$C(x,\kappa) = \frac{\kappa}{2}x^2$$

Calibration of κ

No direct evidence (though newspaper episodes of smuggling abound).

Indirect evidence:

$p^x x^o = 17\%$ of GDP (recorded export-to-output ratio).

$p^x x^o - q^o = 1.5\%$ of GDP (recorded trade-balance-to-output ratio).

$i^* B^*/(1+i^*) = 2.7\%$ of GDP (interest on external debt)

imply that $\kappa = 0.71$, and that

$C(x^s)/y = 0.0017$ and $C(q^s)/y = 0.000187$.

Fiscal Effects of Exchange Controls

The Fiscal Space

$$\text{fiscal space} = \frac{\gamma}{1+\gamma} e(p^x x^o - q^o) - e\frac{i^* B^*}{1+i^*} - \tau$$

Exchange controls generate fiscal space through two channels:

– **Tax:** The exchange rate gap γ acts as a tax on official net exports, $p^x x^o - q^o$. This channel has been emphasized at least since Bhagwati (1978).

– **Debt deflation:** By appreciating the real exchange rate, $e \downarrow$, exchange controls lower the real value of interest payments on external debt $i^* B^*/(1+i^*)$. (Novel channel.)

Fiscal Space Created by Exchange Controls

$$\text{fiscal space} = \frac{\gamma}{1+\gamma} e(p^x x^o - q^o) - e\frac{i^* B^*}{1+i^*} - \tau$$

Fiscal Space Created by Exchange Controls (in percent of GDP)

	ρ		
γ	0	0.5	1
0	0	1.4	2.3
1	0.3	3.1	3.9
2	0.4	3.2	4.5

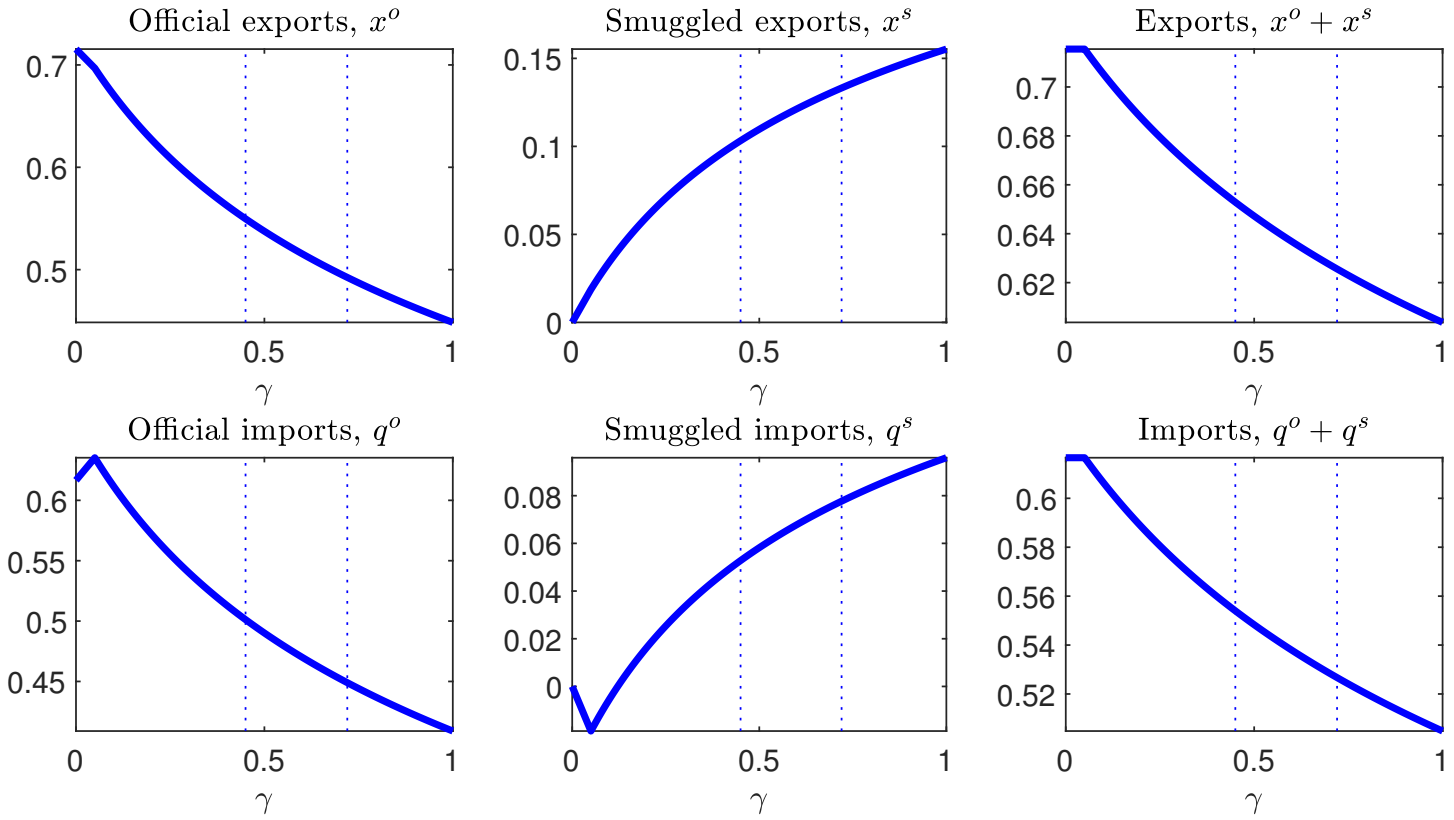
Notes. The fiscal space created by exchange controls is measured relative to the case $\gamma = \rho = 0$. The interest rate is kept constant at its baseline value, making this a partial equilibrium analysis. Recall definitions of ρ_t and γ_t: $q_t^o \leq (1-\rho_t) p_t^x x_t^o$, $1+\gamma_t = \mathcal{E}_t/\mathcal{E}_t^o$.

Takeaway: Exchange controls can generate sizeable fiscal revenue.

Macroeconomic Effects of

Exchange Controls in General Equilibrium

Exports and Imports as Functions of the Exchange Rate Gap



Notes. The policy variable ρ, measuring the strength of import controls, is kept constant at its baseline value of 0.088.

Takeaways: Exchange controls lead to misallocation of factors: they make the economy more closed (exports and imports decline); lead to a shortage of imported inputs (total imports decline);

Optimal Monetary and Exchange Control Policy

Single Official Exchange Rate

Ramsey Policy from the Timeless Perspective

Pick a policy triplet γ, ρ, i to maximize

$$U(c(\gamma,\rho,i),h(\gamma,\rho,i))$$

subject to

$$\frac{a}{1+i}+\frac{i}{1+i}m(\gamma,\rho,i)+s(\gamma,\rho,i)=\tau+\frac{a}{1+\pi}+e(\gamma,\rho,i)\frac{i^*B^*}{1+i^*}$$

$$1+\pi=\beta(1+i)$$

and

$$i\geq 0,$$

given a.

Optimal Policy with a Single Official Exchange Rate

Variable	No Exchange Controls	Optimal Exchange Controls	Minimum Inflation
exchange-rate gap γ	0	0.03	0.87
import restrictions ρ	–	0.15	0.52
interest rate (%/yr)	45.2	41.1	0
inflation (%/yr)	39.6	35.6	-3.8
seignorage (% GDP)	2.9	2.7	0
revenue FX controls (% GDP)	0	0.2	3.0
welfare cost (% consumption)	0.02	0	4.57

Notes. FX controls stands for exchange controls. The welfare cost of a given policy is computed as the percentage increase in consumption each period required to make households as well off under the given policy as under the optimal one.

Takeaways: The optimal exchange-rate gap is virtually nil. The government finances its chronic fiscal deficit almost exclusively with seignorage income (inflation).

Optimal Policy Under Multiple Official Exchange Rates

• thus far: single official exchange rate applied to exports and imports, $\mathcal{E}_t^o$.

• now: separate official exchange rates for exports and imports, $\mathcal{E}_t^{ox}$ and $\mathcal{E}_t^{oq}$ (nests baseline when $\mathcal{E}_t^{ox} = \mathcal{E}_t^{oq}$).

Direct government revenues from exchange controls on exports and imports, s_t

$$s_t = e_t \left[\frac{\gamma_t^x}{1+\gamma_t^x} p_t^x x_t^o - \frac{\gamma_t^q}{1+\gamma_t^q} q_t^o \right],$$

where $\gamma_t^x \equiv \mathcal{E}_t/\mathcal{E}_t^{ox} - 1$ and $\gamma_t^q \equiv \mathcal{E}_t/\mathcal{E}_t^{oq} - 1$

- Government now has four policy instruments, γ_t^x, γ_t^q, ρ_t, and i_t.

Optimal Policy With Multiple Official Exchange Rates

Variable	Single official exchange rate	Multiple official exchange rates
export exchange-rate gap γ^x	0.03	0.12
import exchange-rate gap γ^q	0.03	0
import restrictions ρ	0.15	$-\infty$
interest rate (%/yr)	41.1	10.9
inflation (%/yr)	35.6	6.6
seignorage (% GDP)	2.7	1.0
revenue FX controls (% GDP)	0.2	2.0
welfare cost (% consumption)	0	-0.22

Notes. The variables γ_t^x and γ_t^q denote the exchange-rate gaps on exports and imports. The entry $\rho = -\infty$ means that importers have unrestricted access to foreign exchange at the official rate $\mathcal{E}_t^{oq}$.

Takeaway:

• It is optimal to legalize the import exchange market ($\gamma^q = 0$). A 12 percent exchange rate gap on exports ($\gamma^x = 0.12$) and a 6.6 percent inflation rate suffice to finance the fiscal deficit.

(Example: impuesto país in Argentina)

Conclusions

• Exchange controls lead to widespread misallocation
– make the economy more closed (exports and imports decline);
– make the economy less competitive;
– cause 'dollar shortages';

• Exchange controls can generate sizeable fiscal revenue.

• The trade-off between financing the fiscal deficit with inflation or with exchange controls is resolved in favor of:
– inflation, under a single official exchange rate, $\mathcal{E}^{ox} = \mathcal{E}^{qo}$.
– exchange controls, under multiple official rates, $\mathcal{E}^{ox} \neq \mathcal{E}^{qo}$.

EXTRAS

47/192 countries had dual, multiple, or parallel exchanges rates at some point during the period 2007-2016:

Algeria, Angola, Argentina, Azerbaijan, Bahamas, Belarus, Bhutan, Botswana, Burundi, Congo, Democratic Republic of, Egypt, Eritrea, Ethiopia, Gambia, Georgia, Ghana, Guinea, Iran, Iraq, Kyrgyzstan, Liberia, Libya, Madagascar, Malawi, Maldives, Mauritania, Mongolia, Mozambique, Myanmar, Nigeria, Rwanda, Sao Tome and Principe, Seychelles, Sierra Leone, Somalia, Sudan, Suriname, Syria, Turkmenistan, Uganda, Ukraine, Uzbekistan, Venezuela, Zambia, Zimbabwe

(Source: Ilzetzki, Reinhart, Rogoff, QJE, 2019)

Definition: If the answer is yes to any of the three following questions in IMFs AEAER the IRR index takes on the value of one. It is zero otherwise. The three questions are: (i) is there a de jure dual market? (ii) is there a de jure system of multiple exchange rates? (iii) is there a parallel market (official, tolerated or outright illegal) and if there is, is the parallel market premium above 10 percent over the majority of a moving 12-month period?