

# Industrial Policies, Global Imbalances and Technological Hegemony

**Ambrogio Cesa-Bianchi**

Bank of England and CEPR

**Luca Fornaro**

CREI, UPF, BSE and CEPR

**Andrea Ferrero**

Oxford University and CEPR

**Martin Wolf**

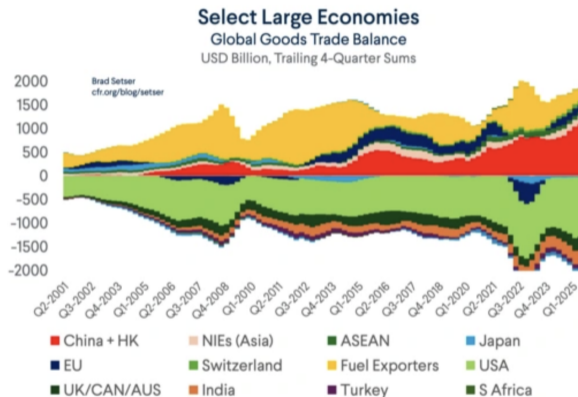
University of St Gallen and CEPR

**IFM Program Meeting, Spring 2026**

\*The views expressed in this paper are those of the author(s) and do not necessarily represent the views of the Bank of England.

# The issue

- ▶ Global imbalances are back on the agenda
  - \* Global current account balance widened by 0.6% of world GDP in 2024 [IMF ESR, 2025]
  - \* Mainly driven by the US and China

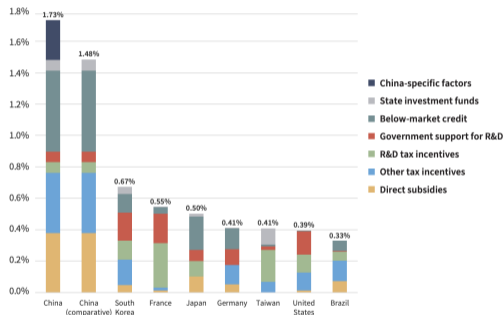


Source: Brad Setser's blog (2025)

# The issue

- ▶ Global imbalances are back on the agenda
  - \* Global current account balance widened by 0.6% of world GDP in 2024 [IMF ESR, 2025]
  - \* Mainly driven by the US and China
- ▶ Industrial policies (IPs) are a key feature of surplus countries, yet seldom seen as a cause

Figure 3.4: Industrial Policy Spending in Key Economies, 2019  
% of GDP



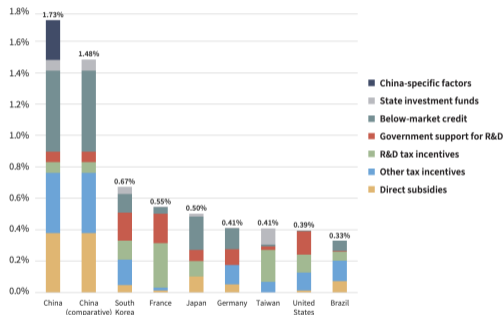
Note: Estimates only include instruments with sufficient data for quantification. China estimates are conservative.  
Source: Authors' calculations; please refer to the appendix for detailed information.

Source: DiPippo et al. (2022)

# The issue

- ▶ Global imbalances are back on the agenda
  - \* Global current account balance widened by 0.6% of world GDP in 2024 [IMF ESR, 2025]
  - \* Mainly driven by the US and China
- ▶ Industrial policies (IPs) are a key feature of surplus countries, yet seldom seen as a cause
- ▶ **Research questions**
  - \* Can IPs shape global imbalances?
  - \* What are the spillovers to deficit countries?
  - \* What policy responses are available?

Figure 3.4: Industrial Policy Spending in Key Economies, 2019  
% of GDP



Note: Estimates only include instruments with sufficient data for quantification. China estimates are conservative.  
Source: Authors' calculations; please refer to the appendix for detailed information.

Source: DiPippo et al. (2022)

# This paper

- ▶ **Model** Endogenous growth model of the global economy to study the effects of industrial policy
  - \* Two-regions (East  $e$  and West  $w$ )
  - \* Two-goods (traded  $T$  and non-traded  $N$ )
  - \* Globally integrated goods and financial markets

# This paper

- ▶ **Model** Endogenous growth model of the global economy to study the effects of industrial policy
  - \* Two-regions (East  $e$  and West  $w$ )
  - \* Two-goods (traded  $T$  and non-traded  $N$ )
  - \* Globally integrated goods and financial markets
  
- ▶ Key features
  - \* Tradable sector is the engine of growth and innovation
  - \* Global imbalances determined by demand/supply for liquid assets

# This paper

- ▶ **Model** Endogenous growth model of the global economy to study the effects of industrial policy
  - \* Two-regions (East  $e$  and West  $w$ )
  - \* Two-goods (traded  $T$  and non-traded  $N$ )
  - \* Globally integrated goods and financial markets
  
- ▶ Key features
  - \* Tradable sector is the engine of growth and innovation
  - \* Global imbalances determined by demand/supply for liquid assets
  
- ▶ **Empirics** Provide suggestive empirical evidence in support of the mechanism

# What we find

- ▶ IPs in the East → Production subsidy to high-tech traded sector
  - \* Boost output and productivity
  - \* Lead to trade surpluses (*'unbalanced policy mix'*)
  - \* Consumption-suppression policies isomorphic to IPs

# What we find

- ▶ IPs in the East → Production subsidy to high-tech traded sector
  - \* Boost output and productivity
  - \* Lead to trade surpluses (*'unbalanced policy mix'*)
  - \* Consumption-suppression policies isomorphic to IPs
- ▶ Global spillovers to the West
  - \* Fall in world interest rates and trade deficit in the West
  - \* Labor migrates from T to N sector, productivity declines

# What we find

- ▶ IPs in the East → Production subsidy to high-tech traded sector
  - \* Boost output and productivity
  - \* Lead to trade surpluses (*'unbalanced policy mix'*)
  - \* Consumption-suppression policies isomorphic to IPs
- ▶ Global spillovers to the West
  - \* Fall in world interest rates and trade deficit in the West
  - \* Labor migrates from T to N sector, productivity declines
- ▶ Welfare and policy options
  - \* Transfer of resources from East (+) vs sub-optimal size of tradable sector and innovation (-)
  - \* Innovation policies can insulate the West from negative spillovers

# Model Sketch

# Households

- ▶ Households get utility from two goods (traded T, non-traded N) and liquid bonds

$$\sum_{t=0}^{\infty} \beta^t \left( \omega \log C_{i,t}^T + (1 - \omega) \log C_{i,t}^N + \omega \phi \log B_{i,t} \right)$$

- ▶ Budget constraint

$$C_{i,t}^T + P_{i,t}^N C_{i,t}^N + \frac{B_{i,t+1}}{R_t(1 + \tau_{i,t})} = W_{i,t} \bar{L} + \Pi_{i,t} + B_{i,t} - T_{i,t}$$

# Households

- ▶ Households get utility from two goods (traded T, non-traded N) and liquid bonds

$$\sum_{t=0}^{\infty} \beta^t \left( \omega \log C_{i,t}^T + (1 - \omega) \log C_{i,t}^N + \omega \phi \log B_{i,t} \right)$$

- ▶ Budget constraint

$$C_{i,t}^T + P_{i,t}^N C_{i,t}^N + \frac{B_{i,t+1}}{R_t(1 + \tau_{i,t})} = W_{i,t} \bar{L} + \Pi_{i,t} + B_{i,t} - T_{i,t}$$

- ▶ Consumption suppression policies  $\tau_{i,t}$  raise effective return on bond holdings
  - \* Financial repression, capital controls, weak social safety nets, ...

# Households

- ▶ Households get utility from two goods (traded T, non-traded N) and liquid bonds

$$\sum_{t=0}^{\infty} \beta^t \left( \omega \log C_{i,t}^T + (1-\omega) \log C_{i,t}^N + \omega \phi \log B_{i,t} \right)$$

- ▶ Budget constraint

$$C_{i,t}^T + P_{i,t}^N C_{i,t}^N + \frac{B_{i,t+1}}{R_t(1 + \tau_{i,t})} = W_{i,t} \bar{L} + \Pi_{i,t} + B_{i,t} - T_{i,t}$$

- ▶ Optimality conditions

$$C_{i,t}^N = \frac{1-\omega}{\omega} \frac{C_{i,t}^T}{P_{i,t}^N} \quad \frac{C_{i,t+1}^T}{C_{i,t}^T} = \beta R_t (1 + \tau_{i,t}) \left( 1 + \phi \frac{C_{i,t+1}^T}{B_{i,t+1}} \right)$$

# Production, industrial policy, and innovation

- ▶ Tradable sector is the engine of growth
  - \* Manufacturing / high-tech services account for the bulk of R&D
  - \* Non-traded sector productivity is stagnant

# Production, industrial policy, and innovation

- ▶ Tradable sector is the engine of growth
  - \* Manufacturing / high-tech services account for the bulk of R&D
  - \* Non-traded sector productivity is stagnant

*Non-tradable (N) firm*

$$Y_{i,t}^N = L_{i,t}^N$$

*Tradable (T) firm*

$$Y_{i,t}^T = (ZL_{i,t}^T)^{1-\alpha} \int_0^1 (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^\alpha dj$$

# Production, industrial policy, and innovation

- ▶ Tradable sector is the engine of growth
  - \* Manufacturing / high-tech services account for the bulk of R&D
  - \* Non-traded sector productivity is stagnant

*Non-tradable (N) firm*

$$Y_{i,t}^N = L_{i,t}^N$$

*Tradable (T) firm*

$$Y_{i,t}^T = (ZL_{i,t}^T)^{1-\alpha} \int_0^1 (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^\alpha dj$$

- ▶ **Industrial policy:** subsidy  $s_t$  lowers effective input cost in T sector

$$(1 - s_t) \left( w_{i,t} L_{i,t}^T + \int_0^1 p_{i,t}^j x_{i,t}^j dj \right)$$

Convenient to define the IP index  $\xi_t \equiv (1 - s_t)^{-\frac{1}{1-\alpha}} \geq 1$

# Production, industrial policy, and innovation

- ▶ Tradable sector is the engine of growth
  - \* Manufacturing / high-tech services account for the bulk of R&D
  - \* Non-traded sector productivity is stagnant

*Non-tradable (N) firm*

$$Y_{i,t}^N = L_{i,t}^N$$

*Tradable (T) firm*

$$Y_{i,t}^T = (ZL_{i,t}^T)^{1-\alpha} \int_0^1 (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^\alpha dj$$

- ▶ **Innovation:** Intermediate good firms invest in R&D to improve quality (global frontier growing at  $g$ )

$$A_{i,t+1} = A_{i,t} + A_t^* L_{i,t}^R$$

# Production, industrial policy, and innovation

- ▶ Tradable sector is the engine of growth
  - \* Manufacturing / high-tech services account for the bulk of R&D
  - \* Non-traded sector productivity is stagnant

*Non-tradable (N) firm*

$$Y_{i,t}^N = L_{i,t}^N$$

*Tradable (T) firm*

$$Y_{i,t}^T = (ZL_{i,t}^T)^{1-\alpha} \int_0^1 (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^\alpha dj$$

- ▶ **Innovation:** Intermediate good firms invest in R&D to improve quality (global frontier growing at  $g$ )

$$A_{i,t+1} = A_{i,t} + A_t^* L_{i,t}^R$$

- ▶ **Growth equation (GG):** Productivity (relative to frontier in BGP) linked to size of tradable sector  $L_i^T$

$$a_i = \frac{\beta\eta}{g} (\alpha L_i^T + 1)$$

# Use of productive resources

- ▶ Labor is allocated across production of two consumption goods and research

$$\bar{L} = L_{i,t}^T + L_{i,t}^N + \int_0^1 L_{i,t}^j dj$$

- ▶ **Resource constraint equation (RR)** in BGP

$$L_i^T = \bar{L} - \underbrace{\frac{1-\omega}{\omega} \frac{1+\alpha c_i^T}{\xi_i a_i}}_{L_i^N} - \underbrace{a_i(g-1)}_{L_i^R}$$

# Use of productive resources

- ▶ Labor is allocated across production of two consumption goods and research

$$\bar{L} = L_{i,t}^T + L_{i,t}^N + \int_0^1 L_{i,t}^j dj$$

- ▶ **Resource constraint equation (RR)** in BGP

$$L_i^T = \bar{L} - \underbrace{\frac{1-\omega}{\omega} \frac{1+\alpha c_i^T}{\xi_i a_i}}_{L_i^N} - \underbrace{a_i(g-1)}_{L_i^R}$$

- \* Subsidies ( $\xi \uparrow$ ) raise profitability of T sector: labor shifts into tradables
- \* An increase in T consumption ( $c_i^T \uparrow$ ) raise demand for non-tradables: labor shifts into N

# Use of productive resources

- ▶ Labor is allocated across production of two consumption goods and research

$$\bar{L} = L_{i,t}^T + L_{i,t}^N + \int_0^1 L_{i,t}^j dj$$

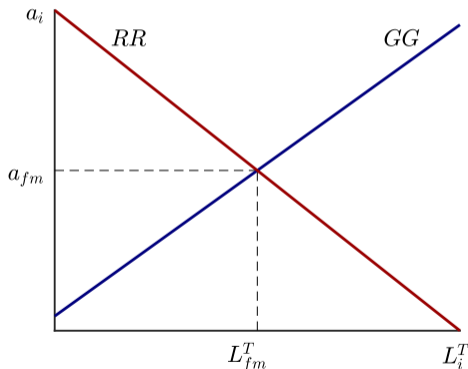
- ▶ **Resource constraint equation (RR)** in BGP

$$L_i^T = \bar{L} - \underbrace{\frac{1-\omega}{\omega} \frac{1+\alpha c_i^T}{\xi_i a_i}}_{L_i^N} - \underbrace{a_i(g-1)}_{\underline{L_i^R}}$$

- \* Higher productivity ( $a \uparrow$ ) requires more research effort: labor shifts into R&D

# Free-market equilibrium: Tradable sector

- ▶ Symmetric equilibrium, no industrial policy ( $\xi = 1$ ), no consumption suppression ( $\tau = 0$ )
- ▶ Balanced trade (Consumption = GDP)



(a) Production and innovation

# Asset market & Trade balance

- ▶ **Asset demand (Euler) equation:** Households' asset demand increasing in  $R$  in BGP

$$b_i = \frac{\phi c_i^T}{g/\beta R(1 + \tau_i) - 1}$$

- ▶ **Asset supply:** Governments set exogenous path for liquid assets  $d_i$

# Asset market & Trade balance

- ▶ **Asset demand (Euler) equation:** Households' asset demand increasing in  $R$  in BGP

$$b_i = \frac{\phi c_i^T}{g/\beta R(1 + \tau_i) - 1}$$

- ▶ **Asset supply:** Governments set exogenous path for liquid assets  $d_i$

- ▶ **Global asset market clearing:**

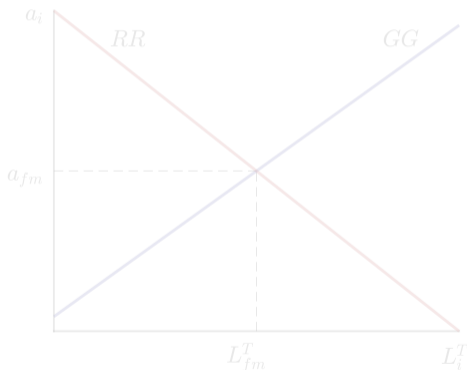
$$b_w + b_e = d_w + d_e$$

- ▶ **Goods market clearing:** Asset imbalance  $\rightarrow$  trade (im)balance

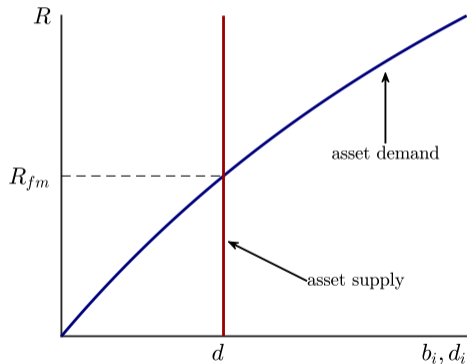
$$GDP_i^T - c_i^T = (b_i - d_i) \left( \frac{g}{R} - 1 \right)$$

# Free-market equilibrium: Asset market

- ▶ Symmetric equilibrium, no industrial policy ( $\xi = 1$ ), no consumption suppression ( $\tau = 0$ )
- ▶ Balanced trade (Consumption = GDP)



(a) Production and innovation

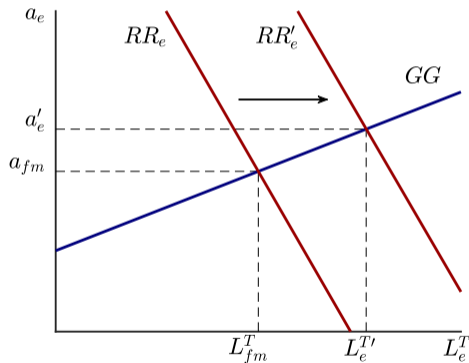


(b) Capital flows (Metzler diagram)

# IPs & Global Imbalances

# Industrial policies from the East

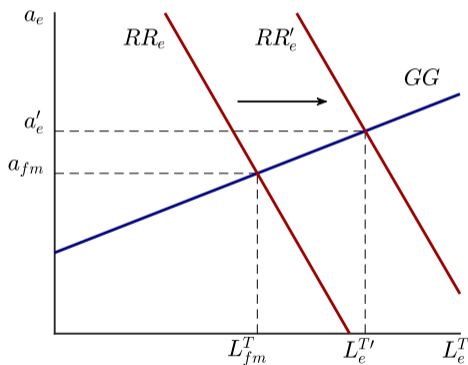
- ▶ Subsidies to T sector → Reallocation from NT to T → Higher innovation and productivity



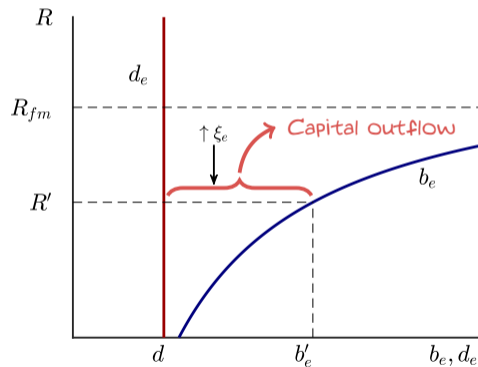
(a) Production and innovation.

# Industrial policies from the East

- ▶ Subsidies to T sector → Reallocation from NT to T → Higher innovation and productivity
- ▶ National income rises → Higher demand for assets → Capital outflows and trade surpluses



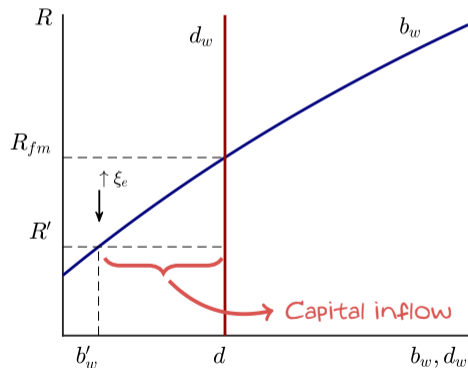
(a) Production and innovation.



(b) Capital flows (Metzler diagram)

# Financial resource curse in the West

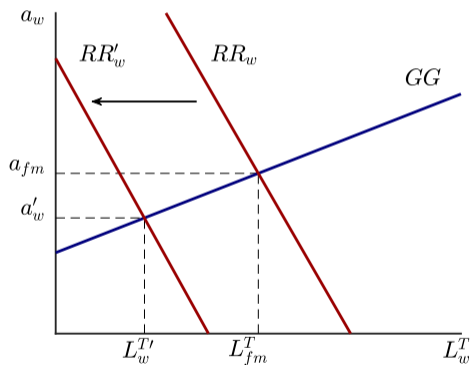
- ▶ Drop in world interest rate → Capital inflows & trade deficits



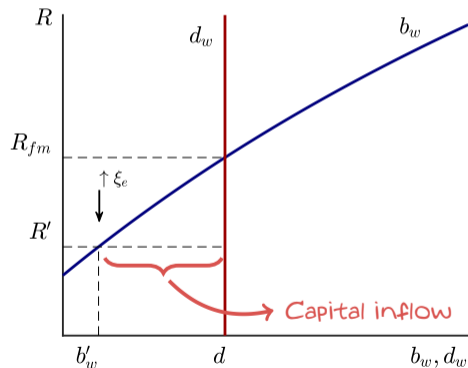
(b) Capital flows (Metzler diagram)

# Financial resource curse in the West

- ▶ Drop in world interest rate  $\rightarrow$  Capital inflows & trade deficits
- ▶ N sector expands  $\rightarrow$  T sector contracts  $\rightarrow$  Lower innovation and productivity



(a) Production and innovation.

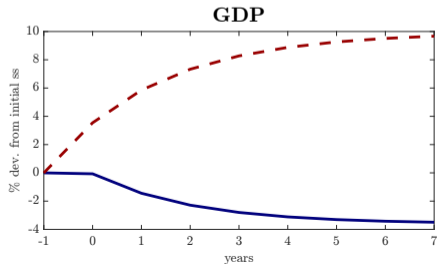
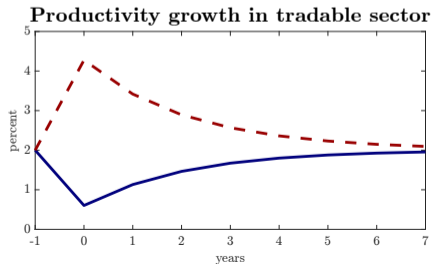
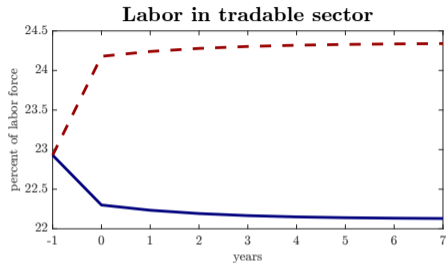
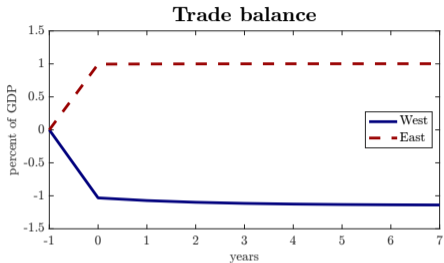


(b) Capital flows (Metzler diagram)

# Medium-run dynamics: Approach and calibration

- ▶ Numerical simulation of transition dynamics
  - \* Start from the free-market steady state
  - \* Period 0: East implements unbalanced IP (unexpected)
  - \* Perfect foresight thereafter
  
- ▶ Calibration targets (China benchmark)
  - \* IP spending: 1% of GDP ( $s_e = 0.038$ )
  - \* Trade surplus: 1% of GDP ( $\zeta = 0.965$ ,  $\tau_e = 4.28\%$ )
  - \* Public debt: 50% of GDP in both regions
  
- ▶ Parameter choices
  - \*  $\beta = 0.98$  (4% equity return),  $\phi = 0.0596$  (1% bond return),  $\eta = 0.963$  (social return = 2 × private return),  $\alpha = 1/9$  (10% profit share),  $\omega = 0.25$ ,  $g = 1.02$

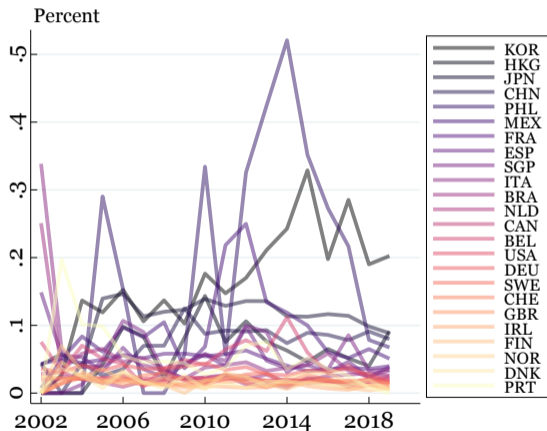
# Medium-run dynamics: Simulation results



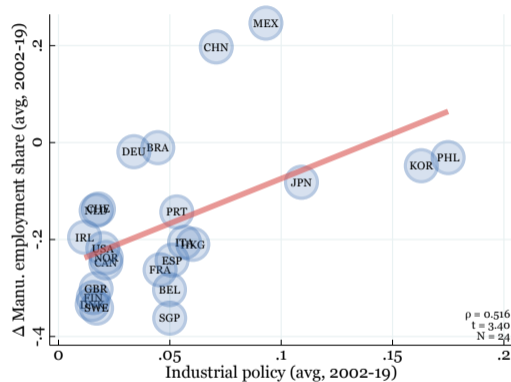
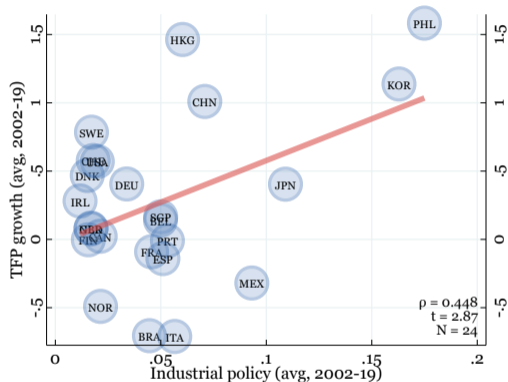
# Empirics

# Measuring industrial policy

- ▶ Country–time measure of firm IP exposure from earnings calls (NL Analytics)
- ▶ Key words: subsidies, grants, concessionary loans, credit, ... from all levels of government
- ▶ “Positive” sentiment avoids considering negative spillovers of foreign IP / misallocation
- ▶  $IP_{i,t}$  is # positive sentences with IP words, summed over firms in country  $i$ -year  $t$ , relative to # sentences



# Cross-sectional evidence: IPs, TFP and manufacturing activity



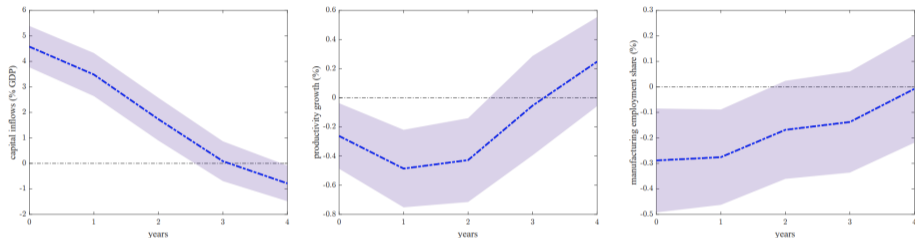
Notes: Each bubble represents a country. The x-axis shows the average industrial policy intensity over the 2002–2019 period, namely  $ip_i$ . The y-axis shows average TFP growth (left panel) and the average change in the manufacturing employment share (right panel), over the same period. Source: Penn World Tables 10.0, UNIDO INDSTAT2, NL Analytics.

# Cross-sectional evidence: IPs and current account

	(1)	(2)	(3)	(4)
	Dep. var: Avg CA/GDP (i-j)			
Industrial Policy	-6.570 (5.895)	-4.554 (5.899)	35.378*** (6.931)	37.664*** (7.027)
Oil + Gas Rents		0.472*** (0.167)		0.316** (0.134)
Population Growth			2.580*** (0.292)	2.469*** (0.297)
Old Age Dep. Ratio			-0.584*** (0.077)	-0.574*** (0.077)
Life Expectancy			1.244*** (0.148)	1.250*** (0.151)
Prime-age savers			0.422*** (0.148)	0.432*** (0.149)
Observations	276	276	276	276
R squared	0.003	0.027	0.409	0.419

NOTE. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . All variables are computed as bilateral differences between country  $i$  and country  $j$ . Industrial policy measures the average share of positive mentions in firms' earnings calls transcripts. Demographic controls include average population growth, the old age dependency ratio (population aged 65 and over relative to working-age population), prime age savers (the share of working age population aged 45 to 64) and life expectancy at birth. Oil and gas rents are measured as a share of GDP.

# Spillovers: Trade deficits, TFP and manufacturing



(a) Capital inflows

(b) Productivity growth

(c) Manufacturing employment

**Figure 2: Episodes of large capital inflows.** Notes: Regression outcome based on equation (F.1). Shaded areas represent 90% confidence bounds from standard errors computed as in [Driscoll and Kraay \(1998\)](#), with lag length  $\text{ceil}(1.5(3 + h))$ .

- ▶ Capital inflows correlate negatively with growth and manufacturing employment
- ▶ Source: Benigno et al. (2025)

# Policy Analysis

- ▶ Welfare effects from consumption are ex ante ambiguous
  - \* This is surprising, since a transfer of resources from abroad would seem welfare increasing
- ▶ Under laissez-faire the tradable sector is inefficiently small
  - \* Monopoly power depresses tradable output below the first-best level
  - \* Knowledge spillovers depress private innovation below the social optimum

- ▶ Welfare effects from consumption are ex ante ambiguous
  - \* This is surprising, since a transfer of resources from abroad would seem welfare increasing
- ▶ Under laissez-faire the tradable sector is inefficiently small
  - \* Monopoly power depresses tradable output below the first-best level
  - \* Knowledge spillovers depress private innovation below the social optimum
- ▶ Trade deficits exacerbate this inefficiency by shrinking the T sector further → Welfare loss

# Policy options

## 1. Attempt to reduce the trade deficit

- \* Tariffs are likely to reduce innovation further

Fornaro and Wolf (2026)

- \* Increasing domestic savings (more private savings, fiscal austerity) ⇒ Can lead to a global slump

Fornaro and Romei (2019)

# Policy options

## 1. Attempt to reduce the trade deficit

- \* Tariffs are likely to reduce innovation further

[Fornaro and Wolf \(2026\)](#)

- \* Increasing domestic savings (more private savings, fiscal austerity) ⇒ Can lead to a global slump

[Fornaro and Romei \(2019\)](#)

## 2. Use the trade deficit in a “productive way”

- \* Trade deficit: consumption above domestic production

- \* Use it in a welfare-enhancing way

- \* Our suggestion: innovation policies redirect capital inflows from consumption to investment

[Müller and Verner \(2024\)](#)

# Conclusions

# Conclusion

- ▶ **Framework** Connect industrial policies to global imbalances and technological hegemony
- ▶ **Mechanism** *Unbalanced* industrial policies
  - \* Supply expansion + demand suppression → Capital outflows and trade surpluses
  - \* Shift innovation and technological power across countries
- ▶ **Corollary** Consumption-suppression policies are themselves a form of industrial policy
- ▶ **Policy** Don't fight capital inflows – redirect them to productive uses via innovation subsidies

# Industrial Policies, Global Imbalances and Technological Hegemony

**Ambrogio Cesa-Bianchi**

Bank of England and CEPR

**Luca Fornaro**

CREI, UPF, BSE and CEPR

**Andrea Ferrero**

Oxford University and CEPR

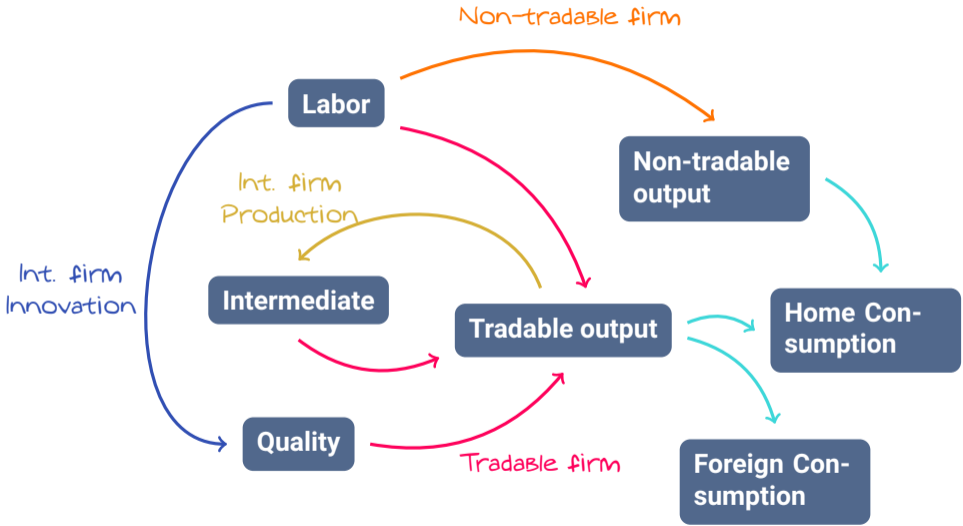
**Martin Wolf**

University of St Gallen and CEPR

**IFM Program Meeting, Spring 2026**

# A1: Derivations

# Model overview



# Firms in tradable sector

## Final goods producers [\[Back\]](#)

- ▶ Final good production function ( $Z \equiv (\alpha^{\frac{2\alpha}{1-\alpha}}(1-\alpha^2))^{-1}$  normalizing constant)

$$Y_{i,t}^T = (ZL_{i,t}^T)^{1-\alpha} \int_0^1 (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^\alpha dj,$$

- ▶ First order conditions

$$(1-\alpha)Z^{1-\alpha} (L_{i,t}^T)^{-\alpha} \int_0^1 (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^\alpha dj = (1-s_{i,t})W_{i,t}$$

$$\alpha (ZL_{i,t}^T)^{1-\alpha} (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^{\alpha-1} = (1-s_{i,t})P_{i,t}^j,$$

- ▶ Industrial policies  $s_{i,t}$  lower effective input cost faced by final-good producers
  - \* Subsidy to factor inputs  $s_{i,t}$ , but convenient to define  $\xi_{i,t} \equiv (1-s_{i,t})^{-\frac{1}{1-\alpha}} \geq 1$  as index of IPs

# Firms in tradable sector

## Final goods producers [\[Back\]](#)

- ▶ Final good production function ( $Z \equiv (\alpha^{\frac{2\alpha}{1-\alpha}} (1-\alpha^2))^{-1}$  normalizing constant)

$$Y_{i,t}^T = (ZL_{i,t}^T)^{1-\alpha} \int_0^1 (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^\alpha dj,$$

- ▶ First order conditions

$$(1-\alpha)Z^{1-\alpha} (L_{i,t}^T)^{-\alpha} \int_0^1 (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^\alpha dj = (1-s_{i,t})W_{i,t}$$

$$\alpha (ZL_{i,t}^T)^{1-\alpha} (A_{i,t}^j)^{1-\alpha} (x_{i,t}^j)^{\alpha-1} = (1-s_{i,t})P_{i,t}^j,$$

- ▶ Industrial policies  $s_{i,t}$  lower effective input cost faced by final-good producers
  - \* Subsidy to factor inputs  $s_{i,t}$ , but convenient to define  $\xi_{i,t} \equiv (1-s_{i,t})^{-\frac{1}{1-\alpha}} \geq 1$  as index of IPs

# Firms in tradable sector

Intermediate goods producers: Pricing and profits [\[Back\]](#)

- ▶ Each intermediate good  $j$  is produced by a monopolist
  - \* Unitary marginal cost
  - \* Downward-sloping demand from final good producers gives  $P_{j,t} = 1/\alpha$
  - \* Equilibrium profits

$$P_{i,t}^j x_{i,t}^j - x_{i,t}^j = \frac{\alpha}{1+\alpha} A_{i,t}^j \xi_{i,t} L_{i,t}^T,$$

- \* Increasing in quality  $A_{i,t}^j$ , size of tradable sector  $L_{i,t}^T$ , and IP index  $\xi_{i,t}$
- ▶ GDP in the tradable sector

$$Y_{i,t}^T - \int_0^1 x_{i,t}^j dj = \frac{\xi_{i,t}^\alpha - \alpha^2 \xi_{i,t}}{1 - \alpha^2} L_{i,t}^T A_{i,t} \quad \text{where} \quad A_{i,t} \equiv \int_0^1 A_{i,t}^j dj$$

Increasing in IP index  $\xi_{i,t}$  if subsidy is not too large

# Firms in tradable sector

Intermediate goods producers: Innovation [\[Back\]](#)

- ▶ Firm  $j$  can invest to improve the quality of its products

$$\sum_{t=0}^{\infty} \frac{(\eta\beta)^t C_{i,0}^T}{C_{i,t}^T} \Pi_{i,t}^j \quad \text{where} \quad \Pi_{i,t}^j \equiv \alpha \xi_{i,t} A_{i,t}^j L_{i,t}^T / (1 + \alpha) - W_{i,t} L_{i,t}^j$$

subject to law of motion for  $A_{j,t}$

$$A_{i,t+1}^j = A_{i,t}^j + A_t^* L_{i,t}^j$$

- ▶ Dying probability  $1 - \eta \Rightarrow$  Social return innovation  $>$  Private return  $\Rightarrow$  Role for IP
- ▶ Exogenous frontier knowledge  $A_t^*$ , growing at rate  $g \equiv A_{t+1}^*/A_t^*$

# Firms in tradable sector

Intermediate goods producers: Innovation [\[Back\]](#)

- ▶ First order condition

$$\frac{W_{i,t}}{A_t^*} = \frac{\beta \eta C_{i,t}^T}{C_{i,t+1}^T} \left( \frac{\alpha}{1+\alpha} \xi_{i,t+1} L_{i,t+1}^T + \frac{W_{i,t+1}}{A_{t+1}^*} \right)$$

- ▶ Using  $W_{i,t} = \frac{\xi_{i,t} A_{i,t}}{1+\alpha}$

$$a_{i,t} = \frac{\beta \eta C_{i,t}^T}{C_{i,t+1}^T} \frac{\xi_{i,t+1}}{\xi_{i,t}} \left( \alpha L_{i,t+1}^T + a_{i,t+1} \right),$$

where  $a_{i,t} \equiv A_{i,t}/A_t$  proximity to frontier

- \* More activity in tradable sector  $L_{i,t}^T$  pushes economy closer to frontier
- \* Market size effect

# Model summary & Equilibrium

[\[Back\]](#)

- ▶ Define  $x_{i,t} \equiv X_{i,t}/A_t^*$  and collect the equilibrium conditions in one place

## ▶ Equations

Capital flows (Euler)  $\frac{c_{i,t+1}^T}{c_{i,t}^T} = \frac{\beta R_t(1+\tau_{i,t})}{g} \left( 1 + \phi \frac{c_{i,t+1}^T}{b_{i,t+1}} \right)$

Resource constraint  $c_{i,t}^T + (b_{i,t+1} - d_{i,t+1}) \frac{g}{R_t} = \frac{\xi_{i,t}^\alpha - \alpha^2 \xi_{i,t}}{1 - \alpha^2} a_{i,t} L_{i,t}^T + b_{i,t} - d_{i,t}$

Growth  $a_{i,t} = \frac{\eta\beta}{g} \frac{c_{i,t}^T}{c_{i,t+1}^T} \frac{\xi_{i,t+1}}{\xi_{i,t}} \left( \alpha L_{i,t+1}^T + a_{i,t+1} \right)$

Market clearing (bonds)  $b_{w,t} + b_{e,t} = d_{w,t} + d_{e,t}$

Market clearing (labor)  $\bar{L} = L_{i,t}^T + L_{i,t}^N + L_{i,t}^R, \quad L_{i,t}^R = g a_{i,t+1} - a_{i,t}, \quad L_{i,t}^N = \frac{1-\omega}{\omega} \frac{1+\alpha}{\xi_{i,t}} \frac{c_{i,t}^T}{a_{i,t}}$

- ▶ **Equilibrium:**  $\{c_{i,t}^T, b_{i,t+1}, a_{i,t+1}, L_{i,t}^T\}_{i,t}$  and  $\{R_t\}_t$  given  $\{\tau_{i,t}, d_{i,t+1}, \xi_{i,t}\}_{i,t}$  and  $\{b_{i,0}, a_{i,0}\}_i$

# Model summary & Steady-state

[\[Back\]](#)

► **Unknowns:**  $\{c_i^T, b_i, a_i, L_i^T\}_{i=w,e}$  and  $R$

► **Equations**

Asset demand (Euler)  $b_i = \frac{\phi c_i^T}{g/(\beta R(1+\tau_i))-1}$

Tradable-goods market clearing  $c_i^T + (b_i - d_i)\left(\frac{g}{R} - 1\right) = \frac{\xi_i^\alpha - \alpha^2 \xi_i}{1 - \alpha^2} a_i L_i^T$

Growth (GG)  $a_i = \frac{\alpha L_i^T}{g/(\beta \eta) - 1}$

Resource constraint (RR)  $L_i^T = \bar{L} - \frac{1-\omega}{\omega} \frac{1+\alpha}{\xi_i} \frac{c_i^T}{a_i} - a_i(g-1)$

Global bond-market clearing  $b_w + b_e = d_w + d_e$

► **Equilibrium:** 9 unknowns pinned down by 9 conditions (2 × Euler, 2 × goods mkt, 2 × GG, 2 × RR, and bond-market clearing)

# Consumption suppression policies as IPs

- ▶ Set aside the subsidy and consider a consumption-suppression policy  $\tau_e \uparrow$ 
  - \* Examples: financial repression, tight fiscal policy, reserve accumulation
- ▶ Households save more and consume less ( $b_e$  curve shifts out)
- ▶ Lower domestic absorption hits both tradable and non-tradable sectors:
  - \* T goods: excess supply exported  $\rightarrow$  Trade surplus, capital outflows
  - \* N goods: lower demand  $\rightarrow$  Labor reallocates from N to T
- ▶ Larger T sector, implies more innovation and higher productivity ( $RR$  curve shifts out)
- ▶ **Key insight** Isomorphic outcome to IP subsidy, but causal chain differs
  - \* Asset demand  $\rightarrow$  Capital outflows  $\rightarrow$  Tradable sector expansion