Interest Rates and World Trade: An 'Austrian' Perspective

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Introduction

- World economy witnessed a period of significant trade integration and the rise of global value chains (GVCs) in the late 1980s, 1990s and 2000s
- Same period saw a very substantial decline in real interest rates and in the cost of capital faced by firms
- Were these two phenomena unrelated?
- Perhaps the decline in the cost of capital partly fueled the growth in world trade and in GVCs?
- Hypothesis not only relevant for understanding past events. Interest rates may be on the rise in coming years!

Trade Integration and Interest Rates

- I develop a framework to study the interplay between world trade and real interest rates
- I build on the 'Austrian' model in Antràs (2023), which is in turn inspired by the work of Böhm-Bawerk (1889), Wicksell (1934), and Findlay (1978), among many others
- Model incorporates an explicit notion of production length and of delivery time
- Letting the production process *mature* increases labor productivity, but it comes at the cost of higher working capital needs for firms
- Selling to foreign markets provides an additional source of income for firms, but exports are associated with an additional time lag between production and consumption.
- Changes in interest rates affect production lengths, labor productivity, and the financial costs of exporting

Böhm-Bawerk Meets Krugman

Closed-Economy Model: Environment

- Time evolves continuously
- Infinitesimal agents are born at a rate ρ per unit of time and die at the same rate; population mass is constant and equal to L
- All agents are endowed with one unit of labor services which they supply inelastically to the market
- Consumers value a single final good (the numéraire) which is costlessly put together combining a continuum of differentiated inputs

$$U = Q_Y = \left(\int_0^n (c_\omega)^{(\sigma-1)/\sigma} \, d\omega \right)^{\sigma/(\sigma-1)}$$

Krugman-Side of the Model

- Input varieties are produced by a continuum of firms, each producing a single variety ω
- Industry is monopolistically competitive and there is free entry
- Before any production takes place, firms need to incur a fixed overhead cost of f_e workers
- After incurring f_e, firms can produce inputs with a linear technology in labor
- We can succinctly express technology as

$$y_\omega = \varphi_\omega \left(L_\omega - f_e \right),$$

- φ_ω is inversely related to the marginal cost of production
- L_ω is the total amount of labor hired by the firm producing variety ω

Böhm-Bawerk Side of the Model

- Production *takes time*: the more time is spent on production, the more output is obtained
  - I formalize this in an 'Austrian' manner following the approach in Findlay (1978)
- Firms initially hire an amount $L_\omega - f_e$ at the same time they incur the fixed cost f_e, and they could instantaneously produce an amount $\varphi_\omega(0)(L_\omega - f_e)$ of output
- But by 'waiting' and letting the production process 'mature', labor efficiency increases as a function of time, though at a diminishing rate
  - $\varphi'_\omega(t) > 0$ and $\varphi''_\omega(t)/\varphi'_\omega(t) < \varphi'_\omega(t)/\varphi_\omega(t)$
- Lengthening production and delaying sales comes at cost of higher working capital needs
- Producers maximize their profits:

$$\max_{t_\omega, L_\omega} \pi = p_\omega \varphi_\omega(t_\omega)(L_\omega - f_e) e^{-rt_\omega} - wL_\omega,$$

Optimal Production Length

- The optimal production length t_ω^* is common for all firms and satisfies:

$$\frac{\sigma-1}{\sigma}\frac{\varphi_\omega'\left(t^*\right)}{\varphi_\omega\left(t^*\right)}=r.$$

- The length and labor productivity of all production processes are decreasing in interest rate r and in the markup $(\sigma-1)/\sigma$
- t_ω^* is independent of the scale of production!
- Log-linear case: when $\varphi_\omega(t)=\varphi t^\zeta$, with $\zeta<1$, we have

$$t^*=(\sigma-1)\zeta/\sigma r$$

Industry and General Equilibrium

- Zero-profit condition and labor-market clearing imply

$$y_\omega = Lc_\omega = (\sigma - 1) f_e \varphi(t^*) \qquad ; \qquad n = L/\sigma f_e$$

- Price index is $np^{1-\sigma} = 1$, and thus

$$w = \left(\frac{L}{\sigma f}\right)^{1/(\sigma-1)} \frac{\sigma - 1}{\sigma} \varphi(t^*) e^{-(\sigma-1)\zeta/\sigma}.$$

- Wage rate w is decreasing in the interest rate r because $\varphi(t^*)$ is decreasing in r
- Supply of capital modeled as in Caballero, Farhi and Gourinchas (2008)
  - Agents save and consume right before dying (ρ is impatience; m is size of monitoring costs)
  - Equilibrium interest rate is

$$r = (\rho + m)\left(1 - e^{-(\sigma-1)\zeta/\sigma}\right)$$

Free Trade

Free Trade

- Consider world economy with two countries, Home and Foreign, symmetric in all respects
- World equilibrium is identical to that under autarky with size $2 \times L$
- Labor productivity, firm-level output and the interest rate will be *unaffected* by trade
- Available input varieties doubles and real wage increases by factor of $2^{1/(\sigma-1)}$
- World exports (sum of Home and Foreign exports) can be expressed as

$$T = 2 \times \frac{1}{2} \times \rho K = \frac{\rho}{\rho + m - r} \times wL,$$

- A lower interest rate r (due to lower m) increases trade via two channels:
  1. By increasing production length and labor productivity and thus the wage rate w
  2. By increasing the propensity to consume out of labor income or $\rho/(\rho + m - r)$

Costly Trade

Costly Trade

- Assume now that, relative to domestic transactions, shipping goods across borders involves an additional interval of time d between production and delivery
- Analogous to iceberg trade cost in Krugman (1980), but shaped by interest rate r
- Costly trade increases capital demand and leads to higher interest rate r
- Wage rate still decreases in r but now for second reason (lower trade costs)
- World trade is now

$$T = 2 \times \frac{e^{-rd(\sigma-1)}}{1 + e^{-rd(\sigma-1)}} \times \frac{\rho}{\rho + m - r} \times wL.$$

- A lower interest rate r (due to lower m) increases trade via three channels:
  1. By increasing production length and labor productivity and thus the wage rate w
  2. By increasing the propensity to consume out of labor income or $\rho/(\rho + m - r)$
  3. By reducing the additional working capital needs associated with variable costs of exporting

Böhm-Bawerk Meets Melitz

Böhm-Bawerk Meets Melitz

- Introduce heterogeneity in φ and fixed costs of exporting, as in Melitz (2003)
  - Two thresholds φ_h and φ_x for survival and for exporting

$$(\varphi_x/\varphi_h)^{\sigma-1} = e^{rd(\sigma-1)} \times f_x e^{rd}/f_h$$

- World trade is now

$$T = 2 \times \frac{e^{-rd(\sigma-1)} \times V(\varphi_x)/V(\varphi_h)}{1 + e^{-rd(\sigma-1)} \times V(\varphi_x)/V(\varphi_h)} \times \frac{\rho}{\rho + m - r} \times wL$$

$$\text{with} \qquad V(\varphi_j) = \int_{\varphi_j}^{\infty} \varphi^{\sigma-1} dG(\varphi) \qquad \text{for } j = h, x$$

- A lower interest rate r (due to lower m) increases trade via four channels:
  1. By increasing production length and labor productivity and thus the wage rate w
  2. By increasing the propensity to consume out of labor income or $\rho/(\rho + m - r)$
  3. By reducing the additional working capital needs associated with variable costs of exporting
  4. By reducing the additional working capital needs associated with fixed costs of exporting

Conclusions

- I have studied the implications of changes in interest rates for world trade
- I have done so by developing a highly stylized 'Austrian' model of international trade, in which low interest rates:
  - facilitate the sustainability of more 'roundabout' production processes that result in higher labor productivity, higher income and higher world trade
  - reduce the working capital needs for international transactions, which involve a disproportionately high time lag between production and consumption
- My results suggest that if interest rates were to rise over the next few years, they could contribute to a deceleration in the growth of world trade
- In Antràs (2023), I show (among many other things!) that a multi-stage 'Austrian' model can explain the rise of GVCs in periods of low interest rates