Post-Keynesian Approaches to International and Development Economics

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Outline

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  - Kaldor's growth laws
  - The Dixon-Thirlwall (Setterfield-Cornwall) model and "Kaldor's paradox"
  - Boggio-Barbieri, Beckerman-type model based on levels of relative costs
  - Rodrik on structural change
- Balance-of-payments-constrained growth (BPCG) models
  - The original: Thirlwall's Law
  - Extensions of the BPCG model, especially structural change
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- Samples of new, alternative models
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  - Cimoli-Porcile and Gabriel et al., incorporating structural change into BPCG
  - Ribeiro et al., reconciling ELG and BPCG

Export-led growth, cumulative causation, and structural change

Export-led growth and cumulative causation: intellectual origins

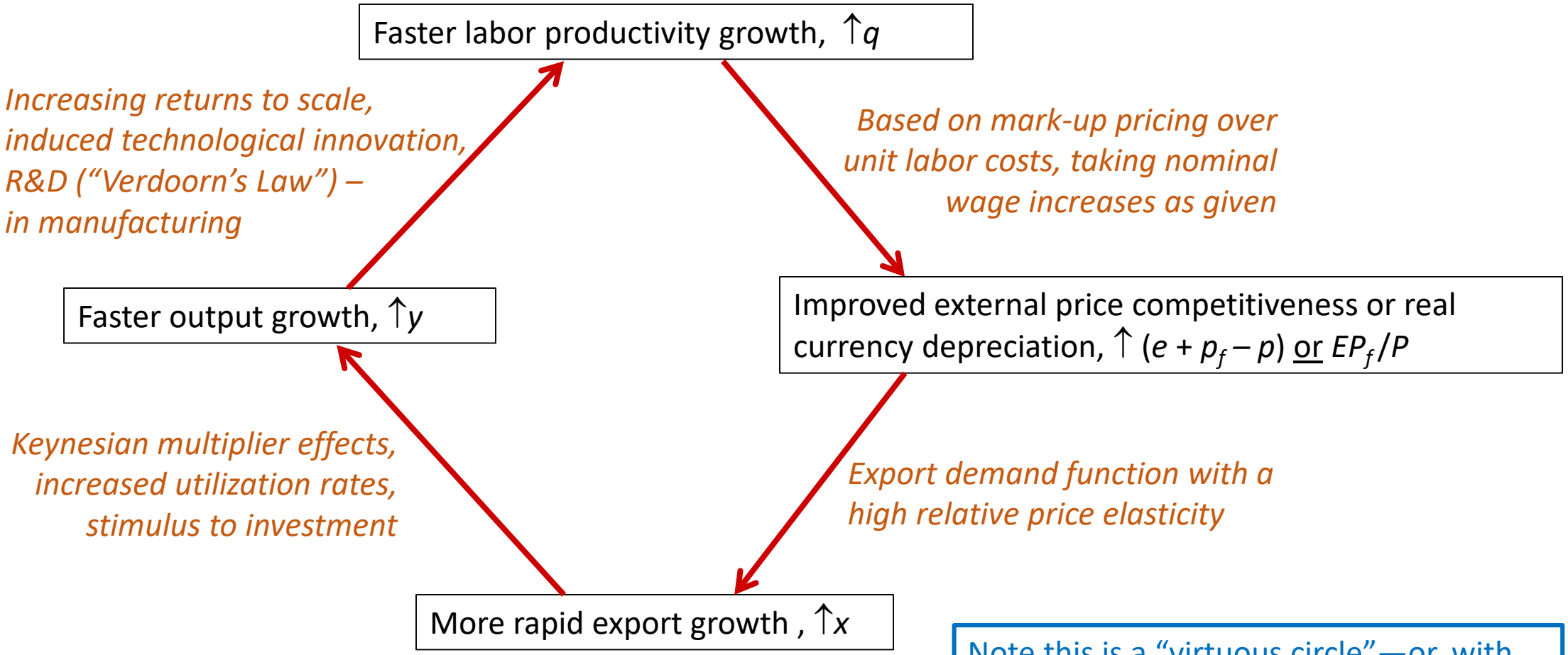
- Adam Smith (1776): the “international division of labour” increases the “wealth of nations”
  - A wider “extent of the market” achieved through exporting fosters greater specialization and raises productivity
- Gunnar Myrdal’s (1957) cumulative and circular causation
  - Positive, self-reinforcing feedbacks in growth (or stagnation), leading to ...
  - Virtuous (or vicious) circles
- Nicholas Kaldor’s growth models and anti-equilibrium views (1960s-80s)
  - Explaining why the UK lagged relative to West Germany and Japan (Kaldor 1966, 1971)
  - Static and dynamic increasing returns to scale, induced innovation in manufacturing (Kaldor 1972, 1981)
  - Export-led growth as formalized by Dixon and Thirlwall (1975)

Four of "Kaldor's growth laws"
(according to Thirlwall, *JPKE*, 1983, emphasis added)

1. "The faster the rate of growth of the **manufacturing sector**, the faster will be the rate of growth of Gross Domestic Product (GDP)...."
2. "The faster the rate of growth of ***manufacturing*** output, the faster will be the rate of growth of labor productivity *in* ***manufacturing*** owing to static and dynamic economies of scale, or increasing returns in the widest sense...."
   - Called **Verdoorn's Law** (after P.J. Verdoorn, 1949)
3. "The growth of manufacturing output is *not* constrained by labor supply but is fundamentally determined by demand from agriculture in the early stage of development **and exports in the later stages**...."
4. "**A fast rate of growth of exports and output will tend to set up a cumulative process, or virtuous circle of growth**, through the link between output growth and productivity growth."

Export-Led Growth with Cumulative Causation

(inspired by Dixon-Thirlwall 1975; Cornwall 1977; Setterfield and Cornwall 2002)



Note this is a "virtuous circle"—or, with the opposite changes, a "vicious circle."

A note about labor supply

- Labor supply is assumed to be endogenous and not a binding constraint on output growth (Cornwall 1977)
  - Labor-saving technological change releases labor that can be reemployed in other activities (Marx's "industrial reserve army")
  - Transfers of labor from agriculture to manufacturing and manufacturing to services
  - Also immigration, guest workers, and/or changes in gender and age relations can relax labor supply constraints
  - These may be endogenous responses to rising labor demand and upward pressure on wages

Math for the Kaldor-Dixon-Thirlwall (KDT) export-led growth (ELG) model*

Note: lower-case variables are in growth rate form.

1) Export demand: $x = \varepsilon_x(e + p_f - p) + \eta_x y_f$

Export growth depends positively on changes in relative foreign prices and foreign income growth

2) Mark-up pricing: $p = \tau + w - q = w - q$

Price inflation = mark-up change + wage inflation – labor productivity growth

(assuming no long-run change in the mark-up rate, $\tau = 0$)

3) Verdoorn's Law: $q = q_0 + \alpha y$

Labor productivity growth is an increasing function of output growth (dynamic increasing returns)

4) Output growth: $y = \lambda(\omega_x x + \omega_a a)$

Where λ is the Keynesian multiplier, a is the growth rate of exogenous *domestic demand, and the ω's are weights reflecting the export and domestic shares of aggregate demand*

*Called "Export-led cumulative causation (ELCC)" in Blecker (2013); modified version of Setterfield & Cornwall (2002), who borrowed from Dixon and Thirlwall (1975); the model in Setterfield (2013) is similar. NOTE: Subscript *f* here (* in Blecker 2013) indicates a foreign variable.

KDT/ELG model solution

- The model boils down to 2 equations in 2 endogenous variables, q and y:

(3) The Verdoorn equation:

"Productivity Regime" (PR) $q = q_0 + \alpha y$

(5) The other 3 equations solved for the **"Demand Regime" (DR)**:

$$y = \Omega + \lambda \omega_x \varepsilon_x q$$

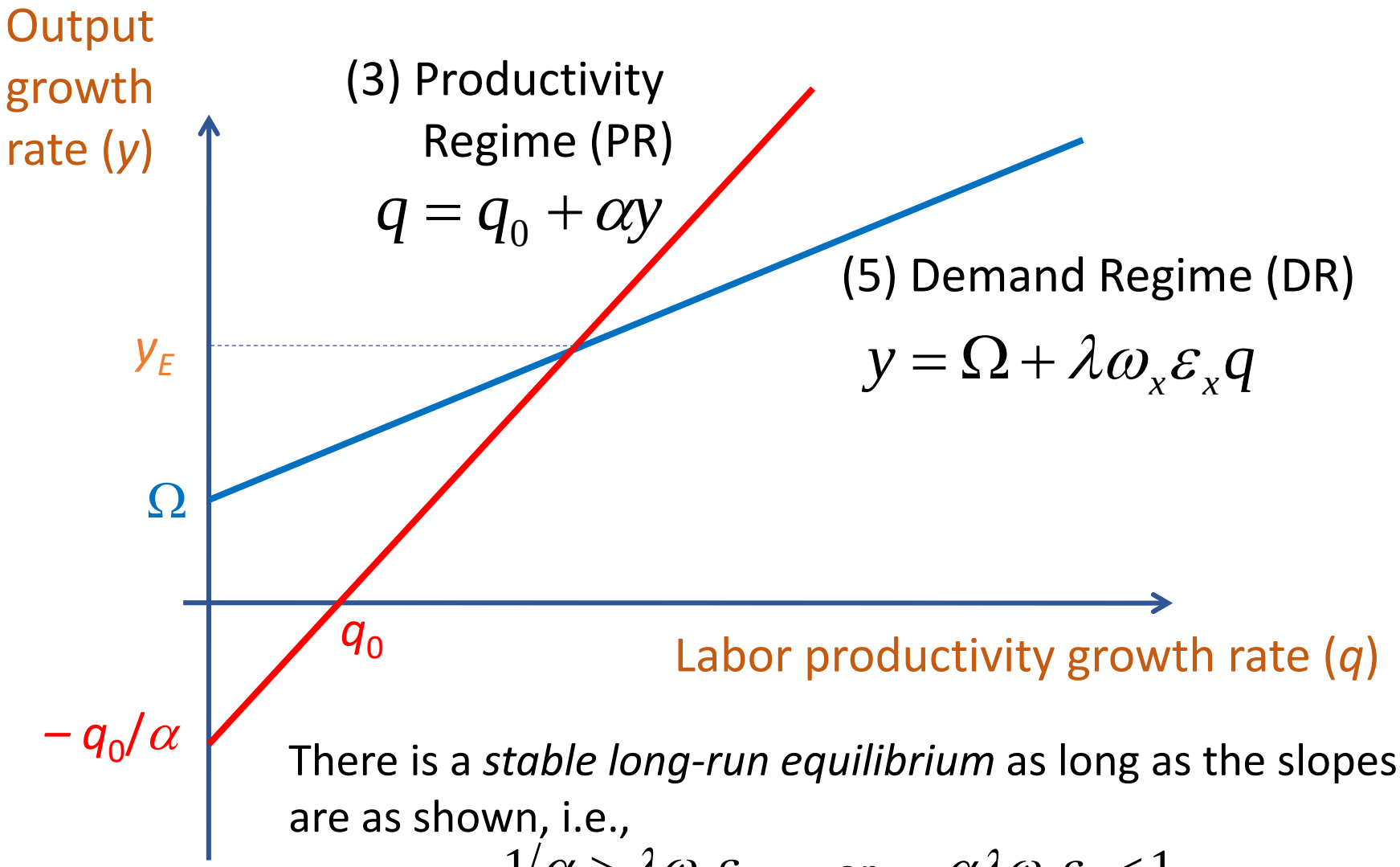
where $\Omega = \lambda \left[\omega_a a + \omega_x \left(\varepsilon_x (e + p_f - w) + \eta_x y_f \right) \right]$

- With equilibrium solution

(6) $$y_E = \frac{\Omega + \lambda \omega_x \varepsilon_x q_0}{1 - \alpha \lambda \omega_x \varepsilon_x}$$

Note: Setterfield & Cornwall (2002) and Setterfield (2013) get a slightly different solution for Ω based on different assumptions about the parameters

Figure 2: Graphical Solution of KDT/ELG Model



There is a *stable long-run equilibrium* as long as the slopes are as shown, i.e.,

$$1/\alpha > \lambda \omega_x \varepsilon_x \quad \text{or} \quad \alpha \lambda \omega_x \varepsilon_x < 1$$

in other words, ***not too much*** *cumulative causation!*

Theoretical and policy implications:

- The model emphasizes export demand as the main force driving the growth process
  - Other components of demand (e.g. investment) are not modeled explicitly, and are assumed to adjust endogenously
  - Supply conditions also matter in regard to productivity growth and changes in relative costs
  - In spite of Kaldor's (1972) anti-equilibrium views, there *can* be a stable equilibrium as long as the forces of cumulative causation are *not too strong*
- *Either* supply-side *or* demand-side policies, both domestic and foreign, can increase growth of output, exports, and productivity *in the long run*
  - R&D subsidies, improved education, etc. boost productivity growth ($\uparrow q_0$) and shift PR to right
  - Fiscal stimulus, infrastructure spending, etc. stimulate domestic expenditures ($\uparrow a \Rightarrow \uparrow \Omega$) and shift DR up, as does faster foreign growth ($\uparrow y_f$) – must be higher growth rates
- The model predicts conditional convergence
  - Countries that are initially farther below their long-run equilibria will grow faster in the transition to the equilibrium, controlling for other factors (Roberts 2007)

Sympathetic critiques

- *Too many positive self-reinforcing effects*, and not enough offsetting effects, to be realistic
  - Wage increases, currency appreciation, or spill-overs of technology to other countries can eventually limit or reverse the gains for a rapidly growing country
  - Too much emphasis on *continuous changes* in relative costs (not realistic or supported by data)
- A country may never reach the steady-state equilibrium before conditions change
  - See Setterfield (2002, 2013)
  - The equilibria depicted by the ELG model are “provisional” or “conditional” equilibria that are subject to path-dependent shifts
  - Any particular growth regime (DR + PR) can generate *endogenous* changes in the underlying conditions that in turn alter the long-run growth path
- This model is aggregative and does not reflect structural change
  - The Verdoorn relationship between output growth and productivity growth is supposed to apply ***only*** in manufacturing
  - Applying Verdoorn to total output growth could be misleading for policy purposes

The Kaldor paradox and responses

- Early empirical tests of Kaldor's ELG model were not favorable
  - The estimated elasticity of export growth with respect to the change in the relative price had the wrong sign ($-\varepsilon_x > 0$ instead of < 0) in cross-sectional data
  - This was labeled "**Kaldor's paradox**"; various explanations were offered
    - For example, reverse causality: faster export growth causes greater demand for labor, which raises wages and makes home country products more expensive (real appreciation)
- Kaldor (1981) was convinced by this evidence to abandon his own ELG model and to support Thirlwall's model BPCG instead
  - He concluded that price or cost competitiveness didn't matter; only "**non-price competitiveness**" (quality, service, etc.) mattered
  - But was the evidence really convincing? Did Kaldor abandon his own theory too quickly?
  - One later study found the opposite result: $-\varepsilon_x < 0$, after controlling for investment rates and R&D expenditures (León-Ledesma, *CJE*, 2002)

The alternative approach of Beckerman

- What Kaldor (1971) originally said (quoted in Boggio and Barbieri, 2017):

  "[T]he main autonomous factor governing both the level and the rate of growth of effective demand of an industrial country with a large share of exports in its total production and of imports in its consumption is the external demand for its exports: and the main factor governing the latter is international competitiveness, which in turn depends on the ***level*** of its industrial cost relatively to other industrial exporters." (emphasis added)

  ➢ Note he said "level" and <u>not</u> growth rate!

- In an earlier model of ELG by Beckerman (1962), the growth rate of exports was assumed to be a function of the ***level*** of a country's prices (or unit labor costs) relative to other nations':

$$x = a + b(1 - \alpha)$$

  where a is the growth rate of total world trade, b is a positive parameter, and α is a measure of relative competitiveness (real exchange rate or relative unit labor cost, **<u>in levels</u>**)

- Since this can be rewritten as $x - a = b(1 - \alpha)$, it's really an equation for *the rate of change in a country's **share** of world exports*

Boggio and Barbieri (*CJE*, 2016)

- They revive Beckerman's (1962) approach
  - They also draw on empirical work on exports by evolutionary/Schumpeterian economists, e.g., Verspagen (1993), Amendola et al. (1993), Amable and Verspagen (1995), Verspagen and Wakelin (1997), who focus on technology variables and have tested relative costs in levels
- They show that Beckerman's export share equation is mathematically equivalent to a "replicator equation" in evolutionary biology
  - The growth of a variety's share in the total population of a species is a function of its fitness
  - I will skip the replicator math for reasons of time
- They argue that the Beckerman/replicator formulation is more consistent with Kaldor's original quote from 1971 than the KDT model
- They provide new empirical evidence linking changes in export ***shares*** to the ***level*** of competitiveness, measured by relative unit labor costs ("fitness")
  - Levels of this variable are significant; growth rates are not (robust result)

Samples of Boggio and Barbieri's regression results

OLS cross-sectional estimates

Table 1. *OLS estimation of the replicator equation. Cross-section analysis*

Dependent variable: export share growth - *EXPGR*			
Independent Variables	(1)	(2)	(3)
ULCAV	-0.137***		-0.137**
	(0.042)		(0.057)
ULCGR		-0.001	1.60E-05
		(0.001)	(0.001)
const	0.094***	0.010	0.095**
	(0.028)	(0.007)	(0.036)
Number of obs.	33	33	33
R-squared	0.202	0.047	0.202
JB(χ^2)	2.114	3.449	2.119
Reset(χ^2)	1.196	0.043	1.191
White(χ^2)	6.037**	2.216	7.551

1.Data refer to 33 OECD countries.
2.Standard errors are in parenthesis. In the first equation, they are corrected for the presence of heteroskedasticity, given the results of the White test.
3.* Statistically significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

GLS panel estimation with random effects

Table 3. *Random effects GLS regression for panel data*

Dependent variable: export share growth - *EXPGR*			
Independent Variables	(1)	(2)	(3)
ULCAV	-0.088**		-0.084**
	(0.038)		(0.039)
ULCGR		0.0003	0.0002
		(0.0003)	(0.0003)
const	0.065***	0.014**	0.064***
	(0.023)	(0.006)	(0.024)
Number of obs.	440	440	440
R-squared			
– within	0.001	0.002	0.001
– between	0.175	0.013	0.191
– overall	0.036	0.002	0.038
Wald(χ^2)	5.320**	0.750	5.510*

1.Data refer to the 33 OECD countries over the period 1993–2007.
2.Standard errors are in parenthesis. In the first equation, they are corrected for the presence of heteroskedasticity.
3.* Statistically significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Notes:

- *ULCAV* is the average level of unit labor costs; *ULCGR* is their growth rate.
- Qualitatively similar results are obtained using OLS with pooled data, using lags of the *ULC* variables, and when controlling for R&D expenditures; when controlling for average GDP level, *ULCAV* is not significant but average wages are.

Conclusions on ELG

- Relative price (cost) effects were dismissed as unimportant based on "Kaldor's paradox" about the effects of *rates of change* in prices (wrong sign or insignificant)
  - This is an example of how a particular mathematical specification can limit or bias our thinking!
- Boggio and Barbieri show that this was premature; relative unit labor costs (*in levels*) ***do*** significantly affect the growth of countries' export shares
  - Consistent with much empirical research showing the importance of real exchange rates (levels of over- or under-valuation) in affecting growth (Rodrik 2008; Berg et al. 2012, Rapetti et al. 2012)
- Before we get to that, let's turn to the neglected aspect of structural change
  - This was key to Kaldor's views, but is omitted in the aggregative models of Dixon-Thirlwall and Boggio-Barbieri
  - I will briefly present a simple model from a leading "mainstream dissenter," Dani Rodrik

Rodrik's model of structural change

(in "Past, Present, and Future," 2014 book chapter)

- Average or aggregate productivity (y = real GDP per worker) is a weighted averaged of sectoral productivities

$$y = \alpha_M y_M + \alpha_S y_S + \alpha_T y_T$$
$$= \alpha_M y_M + \alpha_S y_S + (1 - \alpha_M - \alpha_S)$$

- where y_i = labor productivity, $\pi_i = y_i/y$ = relative productivity, and α_i = share of employment in each sector i
  - Sectors are M = Manufactures, S = Services (modern), T = Traditional (informal, agriculture, etc.)
  - By definition $\alpha_T = 1 - \alpha_M - \alpha_S$, and we assume $y_T = 1$ and $\hat{y}_T = 0$ for simplicity
    - Normalizing output so that it equals the product of one T-sector worker, which is constant
- Rodrik defines Θ as the "fundamentals" (institutions, macro policies, rule of law, education, human capital, R&D, etc.) emphasized in neoclassical and neo-institutionalist approaches
  - We could substitute other "fundamentals" based on post-Keynesian theory, such as infrastructure, exports, competitive real exchange rates, expansionary monetary and fiscal policies, etc.

Productivity growth by sector

- Manufacturing productivity growth has both unconditional and conditional components:

$$\hat{y}_M = \beta(\ln y_M^* - \ln y_M) + \gamma\left[\ln y^*(\Theta) - \ln y)\right]$$

  - where y_M^* is "the global productivity frontier in manufacturing" (advanced country level) and $y^*(\Theta)$ is the country's own steady-state level of productivity based on its institutions/fundamentals
  - Even if a developing country has weak fundamentals, it can still benefit from unconditional convergence in manufacturing (Rodrik, *QJE*, 2013)
    - With strong fundamentals, manufacturing productivity can increase even more rapidly
- Services productivity growth depends only on economy-wide fundamentals:

$$\hat{y}_S = \gamma\left[\ln y^*(\Theta) - \ln y)\right]$$

Unconditional convergence in manufacturing (from Rodrik, *QJE*, 2013)

Total economy

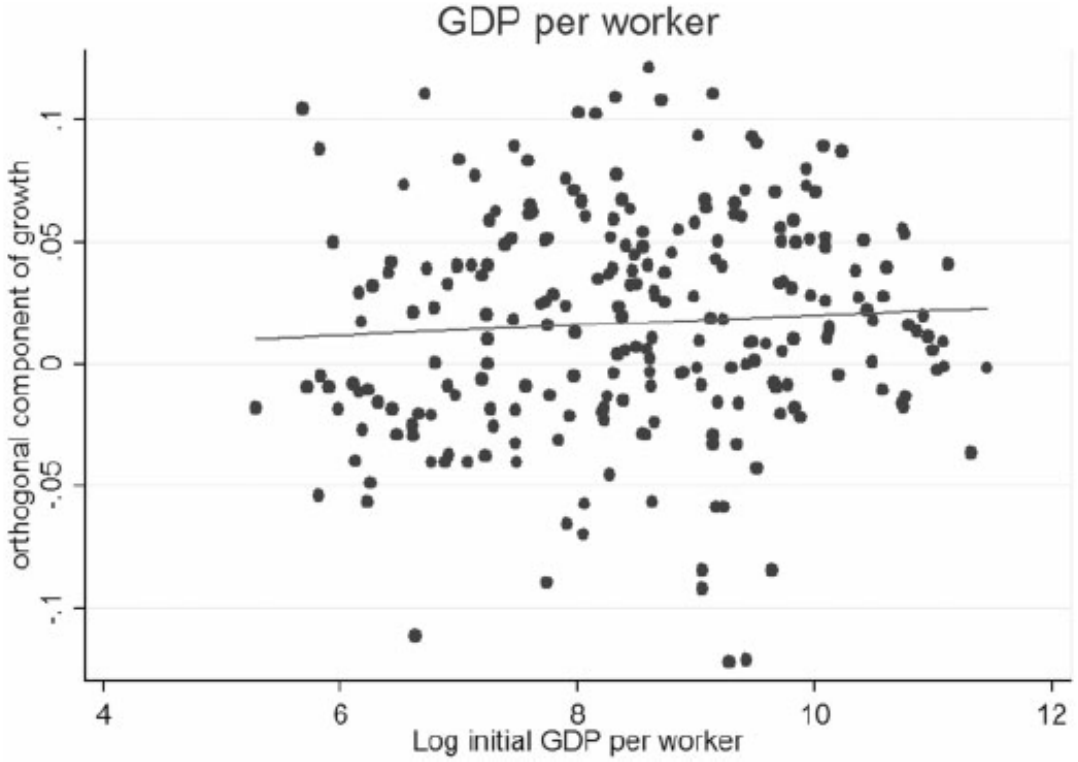


FIGURE I

Lack of Convergence in Economy-wide Labor Productivity

Variable on the vertical axis is growth of GDP per worker over four separate decades (1965–1975, 1975–1985, 1985–1995, 1995–2005), controlling for decadal fixed effects. Source of data: PWT 7.0. Sample is restricted to countries included in the manufacturing convergence regressions.

Manufacturing only

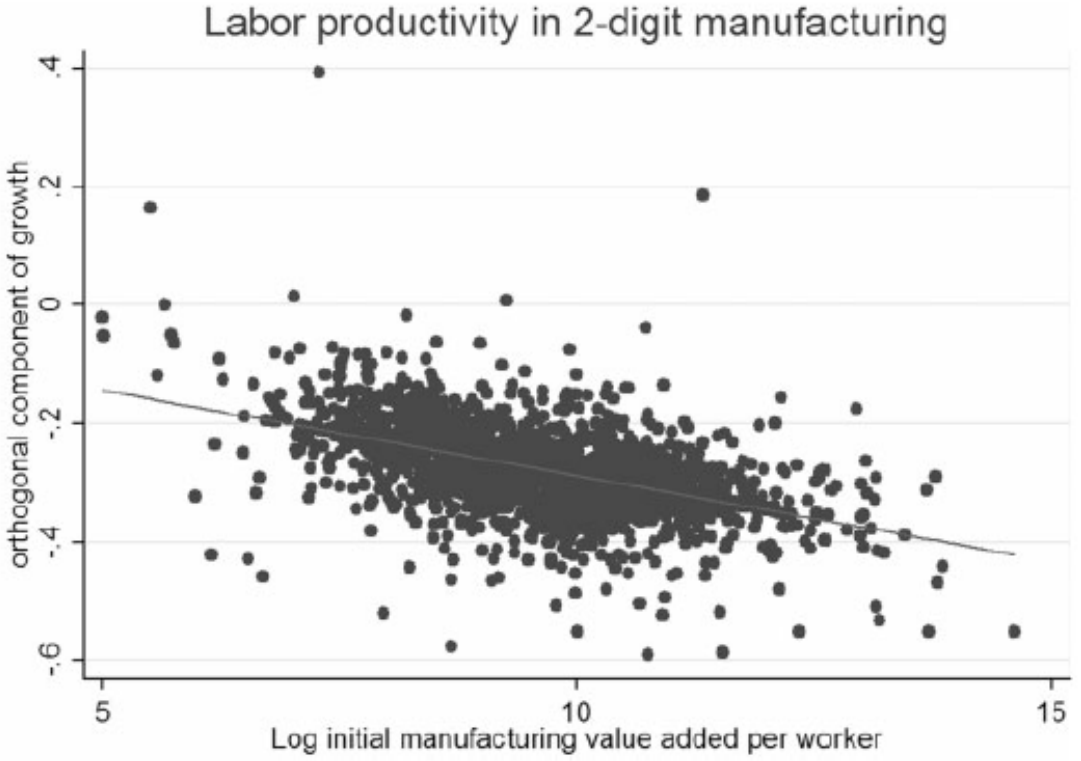


FIGURE II

Unconditional Unconditionce in 2-digit Manufacturing Sectors

Variable on the vertical axis is the growth of value added per worker in 2-digit manufacturing industries, controlling for period, industry, and period × industry fixed effects, where for each country the latest decade over which data are available is included. Source of data: INDSTAT2. For further details on data and methods, see text.

Decomposing average productivity growth (four channels)

$$\hat{y} = (\alpha_M \pi_M + \alpha_S \pi_S) \cdot \gamma \left[\ln y^*(\Theta) - \ln y \right] \qquad \text{(A)}$$

$$+ \alpha_M \pi_M \cdot \beta (\ln y_M^* - \ln y_M) \qquad \text{(B)}$$

$$+ (\pi_M - \pi_T) \mathrm{d}\alpha_M \qquad \text{(C)}$$

$$+ (\pi_S - \pi_T) \mathrm{d}\alpha_S \qquad \text{(D)}$$

(A) = conventional conditional convergence based on "fundamentals"

(B) = unconditional convergence in manufactures (emphasized by Rodrik)

(C) = "structural change bonus" from reallocation of labor from traditional activities to manufacturing (emphasized by Kaldor, Szirmai, etc.)

(D) = reallocation of labor to modern services

Rodrik's policy implications

- All developing and emerging countries can benefit from (B) and (C), i.e., structural change oriented toward industrialization
  - Even countries with weak institutions
  - Contrary to the Washington Consensus/neo-liberalism emphasis on improving institutions and other "fundamentals"
  - Also contrary to the orthodox view that it doesn't matter which goods a country produces
  - Nevertheless (A) is important for emerging countries to reach advanced country status (escape the "middle income trap")
- His analysis is broadly supportive of the Kaldorian/structuralist view of the importance of the manufacturing sector
  - Rodrik accepts the importance of the "structural change bonus" (Szirmai 2012)
  - His formulation of unconditional convergence within manufacturing is different from Verdoorn's Law, but supports the view that manufacturing offers special advantages

Critical comments on Rodrik

- He assumes a neoclassical framework in which the long-run “natural” rate of growth is supply-determined by productivity
  - He does not conceptualize a demand-constrained actual growth rate that can differ from a pre-determined natural rate in the long run
- But his framework allows us to think about how demand-side factors could affect the supply-side “natural rate” of growth
  - Demand-side factors could influence structural change
    - Exports, investment, etc. can impact the share of manufactures
  - Then the potential (“natural”) rate of growth is endogenous and has to be reconciled with the demand-driven growth rate (however determined)

Balance-of-payments constrained growth (BPCG)

Post-Keynesian critiques of KDT-ELG approach

- Too much reliance on *continuous* changes in relative costs or real exchange rate depreciation
  - It's not realistic that these would continue to change in the same direction in the long run
  - Early empirical evidence did not support changes in relative prices or RERs explaining export growth (Kaldor's paradox)
  - It appeared that exports were driven mainly by "non-price competitiveness"
- The ELG framework ignores imports and the balance of payments
  - The KDT/ELG model could imply persistently increasing trade (CA) imbalances (surpluses or deficits) in a long-run "equilibrium," requiring ever-growing net financial flows
    - Net outflows for a surplus or net financial inflows for a deficit
    - These cannot increase without limit in the long run
  - In the long run, a country must either keep its trade balanced (on average) or else maintain a sustainable level of financial inflows or outflows

The balance-of-payments-constrained growth (BPCG) model: basic version

- Originated by Thirlwall (1979), Thirlwall & Dixon (1979)
- Assumptions of the basic model include:
  - Trade must be balanced in the long run
    - This assumption was relaxed in extended models incorporating capital flows (Thirlwall & Hussain 1982, McCombie & Thirlwall 1997; Moreno-Brid 1998-99)
  - Goods are nationally differentiated, imperfect substitutes
  - Supplies are infinitely elastic (prices fixed in seller's currency)
  - Output (growth) is the adjusting variable in the long run
  - Relative prices (RERs) are either constant (on average, in the long run) or else have little impact (elasticity pessimism)

➢ The model is only intended for long-run analysis; the relationships are not expected to hold in short-run periods

The simplest BPCG model in growth rate form (no financial flows)

- Export demand: $x = \varepsilon_x(e + p_f - p) + \eta_x y_f$
- Import demand: $m = -\varepsilon_m(e + p_f - p) + \eta_m y$
- Balance of payments equilibrium (assuming zero net financial flows so CA = 0):

$$p + x = p_f + e + m$$

The value of exports must grow at the same rate as the value of imports

  - Note *e* is the rate of nominal depreciation of the home currency (percentage increase in home currency/foreign currency)
- Some standard Marshall-Lerner assumptions:
  - One home and one foreign good which are imperfect substitutes, prices are fixed in seller's currency (no partial pass-through), exogenously given price & income elasticities

Model solution

- The condition for maintaining balanced trade is found by substituting the export and import demand functions into the balanced trade condition to obtain:

$$\eta_m y - \eta_x y_f - (\varepsilon_x + \varepsilon_m - 1)(e + p_f - p) = 0$$

- But which variable is the endogenous one that adjusts to maintain BP equilibrium?
  - For a small country, foreign income growth y_f can be taken as exogenously given
- Thirlwall's "Keynesian" solution is to assume that relative prices are either constant or change at an exogenously given rate in the long run, so domestic income growth y must adjust
  - An alternative "neoclassical" solution would take y as an exogenous "natural rate of growth", in which case the rate of change in the real exchange rate ($e + p_f - p$) would have to adjust.
  - Krugman (1989) and others have claimed that the income elasticities η_x and η_m could adjust

Solving for "Thirlwall's Law"

- Under Thirlwall's Keynesian assumptions, we solve for the BP-constrained growth rate of output:

$$y_B = \frac{(\varepsilon_x + \varepsilon_m - 1)(e + p_f - p) + \eta_x y_f}{\eta_m}$$

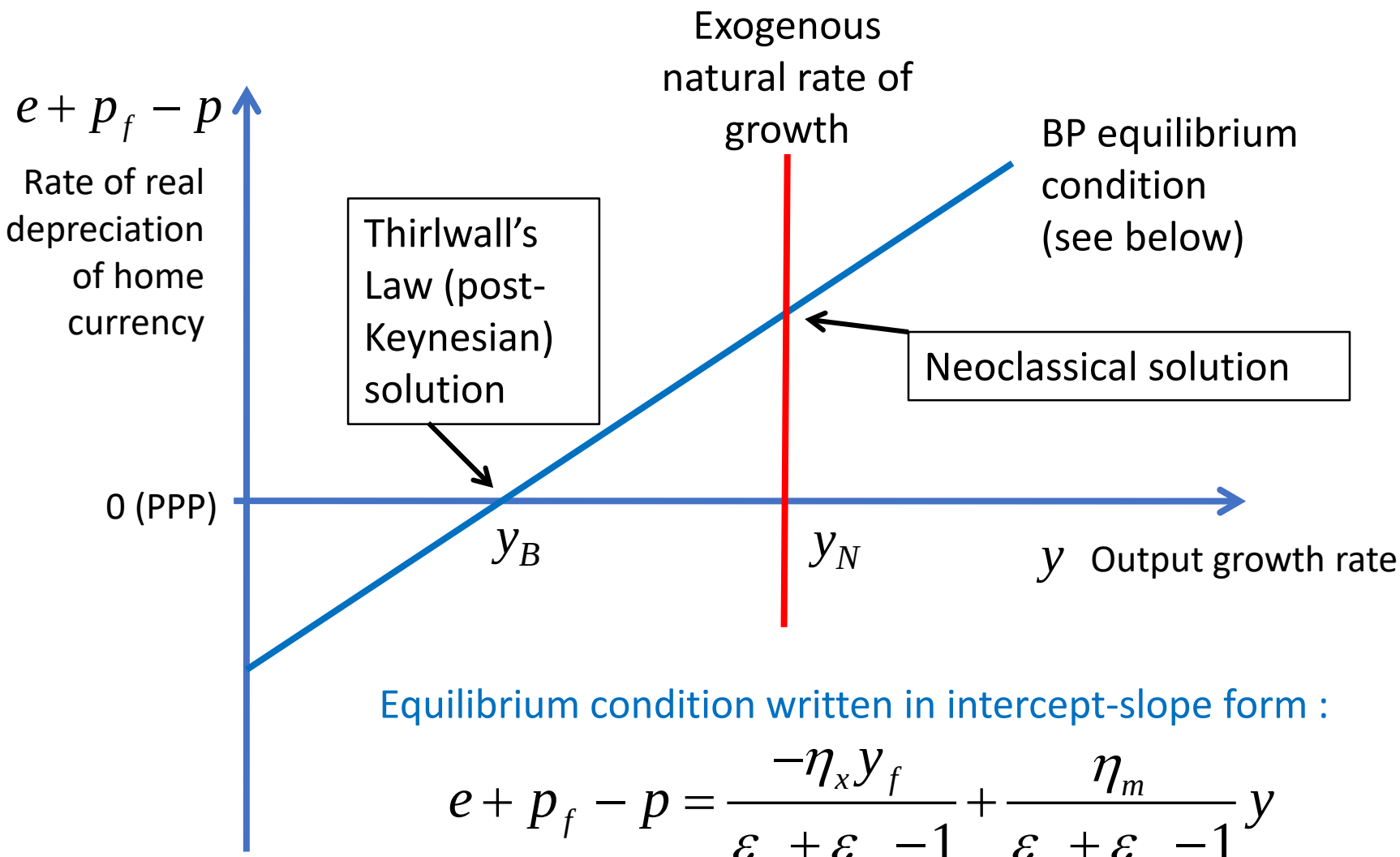
most general form (includes price effects)

- Thirlwall further assumes that relative price effects don't matter because of either
  - Elasticity pessimism: $\varepsilon_x + \varepsilon_m \approx 1$ or
  - Constant relative prices (RER): $e + p_f - p = 0$

Implying two versions of Thirlwall's Law (Perraton 2003):

- Then the solution simplifies to $y_B = \eta_x y_f / \eta_m$ "strong form"
  - Under constant RER, we can also simplify to $y_B = x/\eta_m$ "weak form"

Graphical representation of a BP-constrained country



Equilibrium condition written in intercept-slope form :

$$e + p_f - p = \frac{-\eta_x y_f}{\varepsilon_x + \varepsilon_m - 1} + \frac{\eta_m}{\varepsilon_x + \varepsilon_m - 1} y$$

assuming that the Marshall-Lerner condition holds, $\varepsilon_x + \varepsilon_m > 1$.

Digression: how to reconcile y_B and y_N

- It is not plausible to have a long-run, BP-constrained equilibrium that is different from the "natural rate of growth," $y_N = n + q$
  - If $y_B < y_N$, we would observe continuously increasing unemployment
  - If $y_B > y_N$, the labor force would eventually be exhausted
- Several proposed solutions:
  - Palley (2002): y_B will adjust toward y_N because the income elasticity of import demand η_m is positively related to capacity utilization
    - Excess capacity (low utilization) implies less demand for imports; more goods can be produced at home
  - Setterfield (2006): $y_N = n + q$ will adjust toward y_B because of Verdoorn effects on productivity growth q:
    - q will fall in a slow-growing economy ($y_B < y_N$), and rise in a rapidly growing economy ($y_B < y_N$)
  - Oreiro (2016): the RER (level) has to adjust to a LR equilibrium level to make $y_B \rightarrow y_N$
    - Both of these growth rates also get reconciled with the growth rate of capacity (capital accumulation)

Policy implications of BPCG/Thirlwall's Law (I)

- Exports are still vital to LR growth, as in KDT/ELG, but *for a different reason:*
  - To obtain the foreign exchange to finance necessary imports without a growing trade deficit – not to unleash a process of cumulative causation
- Non-price or qualitative competition (reflected in the income elasticities η_x and η_m) is more important than price or cost competition
  - This is controversial; at best, it is likely to vary by type of goods (manufactures vs. primary commodities, innovative vs. standardized manufactures)
- Although the model is (external) demand-driven, supply factors also play a role
  - Greater domestic productive capacity reduces η_m; also investment, R&D, and product quality in export industries can increase η_x
  - The composition of a country's industries matters (same as above)
  - Technology policy, R&D, etc. can help in this regard
  - All these factors operate ***only*** via their effects on income elasticities

Policy implications of BPCG/Thirlwall's Law (II)

- In contrast to KDT/ELG, expansionary *domestic* policies ***cannot*** increase *long-run* equilibrium growth
  - They can work in the short run, but eventually result in increasing trade deficits, which require adjustments (e.g. fiscal contraction) leading back to the BPCG solution
- "Mercantilist" trade policies (export-promotion *cum* import restrictions, or selective import liberalization) ***can*** make sense
  - ***If*** such policies effectively boost η_x relative to η_m
    - But not pure protectionism, if it simply closes markets and fails to promote exports
    - Enhanced access to foreign markets can raise y_f
  - Trade liberalization can **fail** to increase LR (BP-equilibrium) growth – in fact it may even lower y_B – if it increases η_m proportionately more than x or $\eta_x y_f$
    - See Santos-Paulino & Thirlwall (2004) and various others

Extensions of the BPCG model

(covered in sections 7.2 and 7.5 of the Blecker-Setterfield, chapter 7 draft)

- International capital flows (Thirlwall and Hussain 1982; McCombie and Thirlwall 1997; Moreno-Brid 1998-99; Blecker 2013)
  - Assuming *either* a given growth rate of net capital inflows *or* a sustainable ratio of CA deficit to GDP
- Models of large countries with income repercussion effects (McCombie 1993) or relative price (terms-of-trade) adjustment (Ros 2013)
- Partial pass-through of domestic and foreign prices into prices of exports and imports (Blecker 1998; Godley 1999; Godley and Lavoie 2007; Lavoie 2014)
- Re-incorporating cumulative causation via Verdoorn's Law (Thirlwall and Dixon 1979; Blecker 2013; Cimoli & Porcile 2014; Ribeiro et al. 2017; various others)
  - This can operate only in a time period short enough for relative prices changes to matter

Another important extension

- **BPCG with structural change**, or the "multi-sectoral Thirlwall's law" (MSTL) of Araujo and Lima (2007), Gouvea and Lima (2010).
  - Extended to imported intermediate goods by Blecker & Ibarra (2013), Ibarra & Blecker (2016)
- This formalizes the idea (already expressed by Thirlwall, McCombie, and others) that the aggregate income elasticities of export and import demand are really weighted averages of industry-level elasticities:

$$y_{B,t} = \frac{y_{f,t} \sum_{j=1}^{N} \alpha_{j,t} \eta_{x,j}}{\sum_{j=1}^{N} \beta_{j,t} \eta_{m,j}}$$

where j indexes the industry, t indexes time, $\alpha_{j,t}$ and $\beta_{j,t}$ are the shares of good j in total exports and imports (respectively) at time t, $\eta_{x,j}$ and $\eta_{m,j}$ are the income elasticities of export and import demand for each good j, there are N total industries or goods, and both the foreign growth rate $y_{f,t}$ and the domestic BP-equilibrium growth rate $y_{B,t}$ are time-varying.

Some features of the MSTL

- Structural change is modeled by changes in the industry shares of exports and imports, $\alpha_{j,t}$ and $\beta_{j,t}$
  - This links to the Kaldorian/Schumpeterian emphasis on structural change
    - Manufactures vs. agriculture or services; also advanced vs. standardized manufactures
  - Shifting the composition of exports or imports to goods with higher (lower) income elasticities raises (lowers) the average elasticities
- As a result, the BP-equilibrium growth rate $y_{B,t}$ ***varies over time***
  - Hence, an important part of a growth strategy is to emphasize both exports and domestic production of goods with high income elasticities, so as to raise average η_x and lower average η_m
  - This simple formulation ignores relative prices, but in some later extensions of the model relative cost competitiveness (real exchange rate) affects industrial composition, i.e. the weights $\alpha_{j,t}$ and $\beta_{j,t}$, and thereby raises or lowers the BP-equilibrium growth rate

Empirical tests of BPCG ("Thirwall's Law")

- Much of the popularity of the model stems from its apparently strong empirical support
  - It's relatively easy to estimate income elasticities and use data on export growth
- Many studies have found that estimated BP-equilibrium growth rates (y_B) are close to actual long-run average growth rates for most countries
  - Using a wide variety of econometric techniques
- But critics argue that these are weak tests, because they are really testing a near-tautology or near-identity
  - McCombie (1981), who later recanted; Ros (2013); Clavijo and Ros (2015); Razmi (2016); Blecker (2016)
  - See McCombie (2011) for a defense

The near-identity (or near-tautology) critique

- Estimated income elasticities should approximate the ratios of the growth rates of exports or imports to the appropriate income growth rate, foreign or domestic:

$$\eta_x \approx x/y_f \qquad \text{and} \qquad \eta_m \approx m/y$$

- Substituting these into the solutions for the strong or weak form of Thirwall's Law:

$$\frac{y_B}{y} \approx \frac{x}{m}$$

- Thus, statistical tests of whether $y = y_B$ are merely testing whether exports and imports grow at about the same rate ($x = m$)
  - In the long run, the vast majority of countries have roughly equal growth rates of exports and imports, regardless of whether Thirlwall's model applies or not.
  - Even in the US, in spite of a 3.4% of GDP decline in the trade balance for goods & services from 1968 to 2015 – see data in Blecker (2016)

Alternative econometric approaches

- The preceding critique only implies that standard tests of whether $y = y_B$ have weak power to reject the null hypothesis that they are equal
  - But it does **not** necessarily invalidate Thirlwall's Law
  - Rather it implies that *more powerful tests are needed*
  - The "Law" is really the proposition that *income growth rates (not relative prices or RERs) are what adjust to maintain BP equilibrium in the LR* (Pérez-Caldentey, 2015)
- Therefore, instead of testing for equality of actual and BP-equilibrium growth rates, it is better to test directly for *which variable adjusts* to a BP *dis*equilibrium: income growth or relative prices?
  - See Alonso & Garcimartín (*JPKE*, 1998-99), who used a simultaneous equations framework
  - Also newer work using cointegration methods (Moreno-Brid; Razmi; Lima & Carvalho; others)
  - These studies generally find that output growth rates adjust, not relative prices
  - But these time-series studies probably reflect medium-run rather than long-run adjustments

Theoretical critiques of the BPCG model

- Foreign income vs. domestic capital accumulation as the main driver of growth
  - The BPCG model implies that foreign income growth y_f is a strong predictor of countries' long-run growth, but critics contend this is driven more by domestic capital accumulation – which in turn constrains export growth
- Levels vs. rates of change in relative prices (RERs)
  - Similar to the debate about Kaldor's paradox in ELG models, BP-constrained growth could be affected by *levels* of relative prices or cost competitiveness, even if it's not impacted by their rates of change
- Country size
  - The model assumes a hybrid "Keynesian small country," which is too small to affect foreign income but has infinitely elastic supply of exports (instead of demand, as in a pure small country)
  - Hence various alternative models of "large" or "small" economies have been proposed
- Endogeneity of income elasticities
  - Income elasticities are seen as fundamental, exogenous parameters in the original BPCG model
  - Krugman (1989) modeled income elasticities as functions of exogenously given natural rates of growth
  - Newer BPCG models incorporating the MSTL have assumed that income elasticities reflect the composition of exports and imports *and* may adjust in response to *levels* of relative prices or RERs

Some recent alternative models

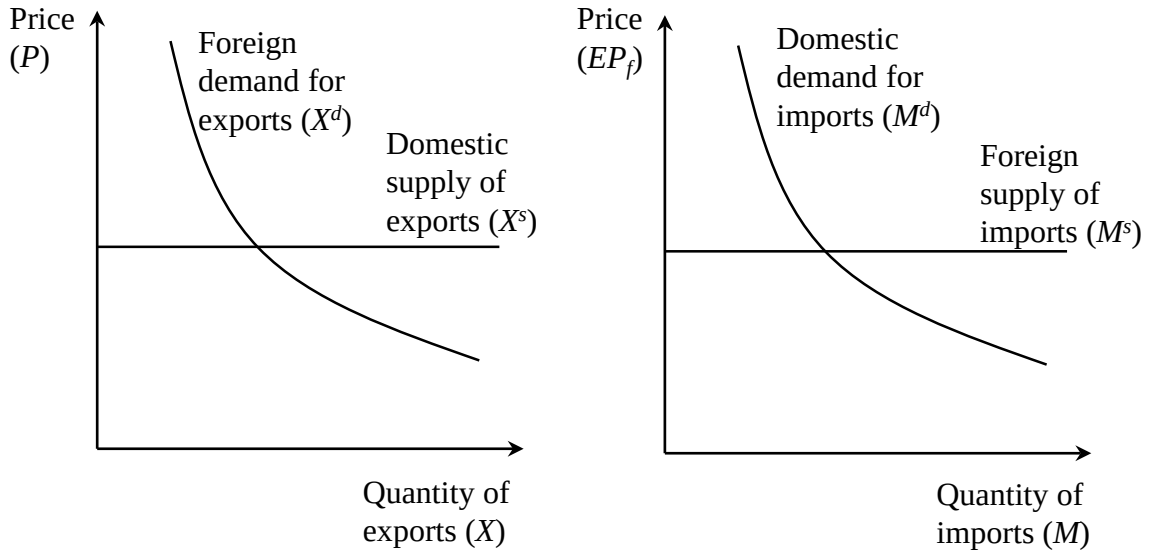
Just a few tips of a very large iceberg of new literature!

Razmi (*CJE*, 2016) – Small country BPCG model

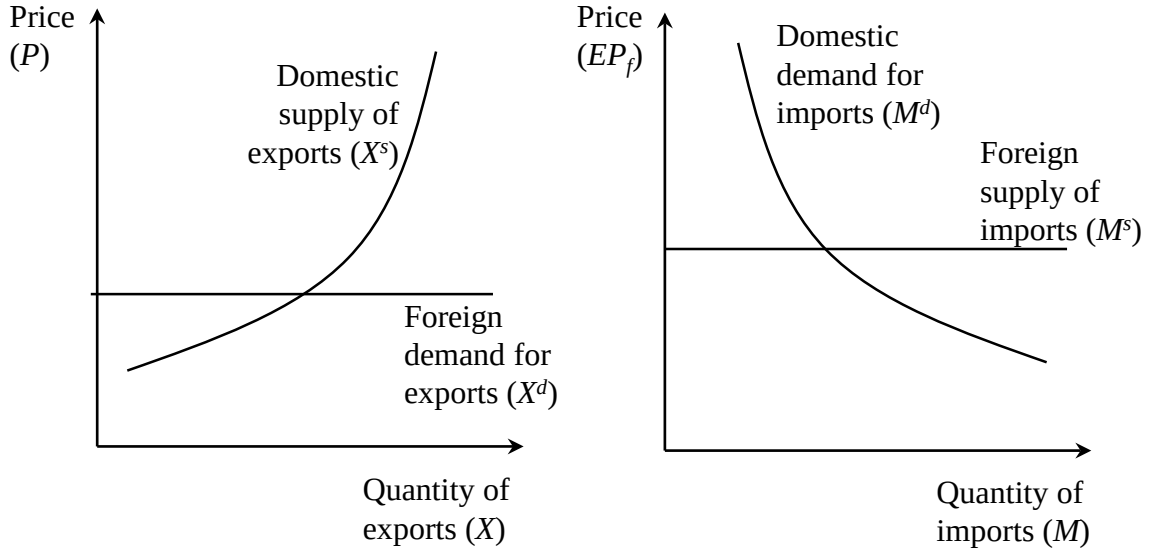
- He assumes a "small open economy" (pure price-taker)
  - This again assumes an infinitely elastic supply of imports (similar to BPCG)
  - But it assumes instead perfectly elastic **demand** for exports at a given price (TOT)
  - Hence exports are supply-constrained
- A small country *is* BP-constrained
  - But the chief constraining factor is capacity (capital accumulation) in export industries, not foreign income
  - Foreign demand matters only via its effects on world prices (taken as given)
- Export capacity depends on investment, which depends on the profit rate and hence on the real exchange rate (RER) in an open economy
  - Therefore the **level** of the RER matters to LR growth
  - Consistent with recent empirical evidence
  - In this respect, Razmi's argument about BPCG parallels Boggio-Barbieri's about ELG

Alternative assumptions about market structure

Small Keynesian open economy: infinitely elastic *supplies* of exports *and* imports; prices are fixed in seller's currency. Assumed in Marshall-Lerner condition, **Thirlwall BPCG model**



Small open economy model (pure price-taker): *demand* for exports and *supply* of imports (foreign curves) are infinitely elastic. Assumed in **Razmi's alternative model** of BP-constrained growth for a small country.



Simplified version of Razmi's small-country model, in modified notation

- Export **supply** function $x = \gamma_x p + \sigma_x g$
- Import demand function $m = -\varepsilon_m (e + p_f - p) + \eta_m y$
- BP equilibrium condition $p + x = e + p_f + m$
- Capital accumulation function $g = \Phi\left(\frac{EP_f}{P}\right)$
- General model solution $y = \frac{\gamma_x p + \sigma_x g + \varepsilon_m (e + p_f - p)}{\eta_m}$
- Price assumptions (small country, price-taker): $p_f = 0$; $p = e$
- Small-country (SC) solution $y_{SC} = \frac{\gamma_x e + \sigma_x g}{\eta_m} = \frac{\gamma_x e + \sigma_x \Phi(EP_f / P)}{\eta_m}$

Lower-case letters are growth rates of variables, with $g = I/K = \hat{K}$

BP-equilibrium for a small country depends on the level of the RER, not its rate of change

Conclusions and policy implications from Razmi

- Small, open economies are not constrained by global demand *per se*
  - Except insofar as it affects world prices of exported commodities
- These countries do face BP constraints and need to promote exports
- But the key to their export success is capital accumulation (broadly defined) that expands export capacity
  - This could include infrastructure, “human capital,” etc.
- To attract firms to locate in any given country, it must have a competitive real exchange rate
  - In levels (not a continuous real depreciation!)
  - Price competition does matter, not via demand functions, but via its impact on industry location
- Thirlwall’s Law does not apply to small countries!

Caveats and critiques for Razmi's model

- The pure small country model is quite extreme, and may not be realistic
  - It requires that domestic exports and foreign goods are perfect substitutes
    - This could be realistic for primary commodities, but may be less realistic for manufactures
  - Even if prices are set globally, costs are set in domestic currency (especially labor costs), and these can affect the location of production within global supply chains
- Fallacy of composition (Blecker & Razmi, 2008, 2010)
  - Even if one small country by itself faces an infinitely elastic demand curve for its exports, a large *group* of such countries exporting similar products does not and may behave more like a large country (i.e. faces downward-sloping X^d)
- Export supplies are much more elastic in the long run than in the short run
  - Capital accumulation in export sectors can be an endogenous response to export opportunities
    - Defenders of Thirlwall's Law argue that the causality is reversed: $\hat{X} \rightarrow \hat{K}$

A BPCG model incorporating structural change: Cimoli and Porcile (*CJE*, 2014)

- A model of South-North trade and convergence
  - South = developing/emerging economies, North = developed/advanced economies
  - Reflecting the Latin American structuralist tradition along with Kaldorian and Schumpeterian theory
- The "technological gap" G is the ratio of the level of "technological capability" T in North/South: $G = T_n/T_s$
  - T could reflect productivity (labor or total factor), but could also include other measures of technological ***capabilities*** such as innovative capacity, R&D, etc.
- The relative growth rate of the South is: $y = y_s / y_n$
  - Be careful: G is relative North-South (a gap) while y is relative South-North (catch-up or convergence)

Relative productivity, wages, and trade

- Define W_j as the nominal wage rate and $\pi_j{}^i = Y_i/L_i$ as labor productivity in country *j*, sector (good) *i*.
  - Let *e* be the nominal exchange rate of the South (pesos/dollar, rupees/pound, reaies per euro, etc.); a <u>higher</u> *e* is a Southern <u>depreciation</u>
  - Wages are assumed equal *within* each country (competitive labor market)
- According to a Ricardian trade model with multiple goods, the South will produce and export all goods for which Southern unit labor costs are lower:

$$\left(W_s/\pi_s^i\right) \leq \left(W_n e/\pi_n^i\right)$$

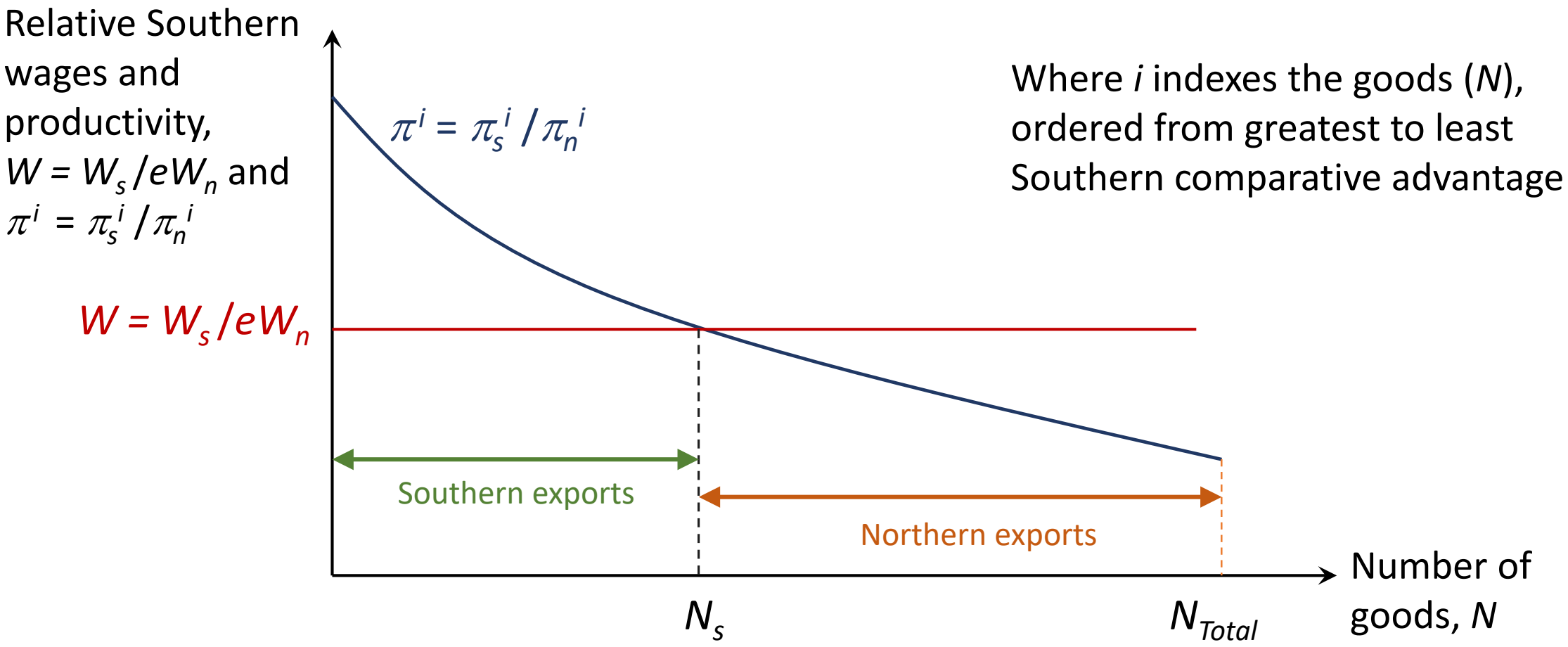
More about trade and Southern specialization

- Equivalently, the South produces/exports the goods for which its relative productivity exceeds its relative wage:

$$\frac{\pi_s^i}{\pi_n^i} \equiv \pi^i \geq W \equiv \frac{W_s}{W_n e}$$

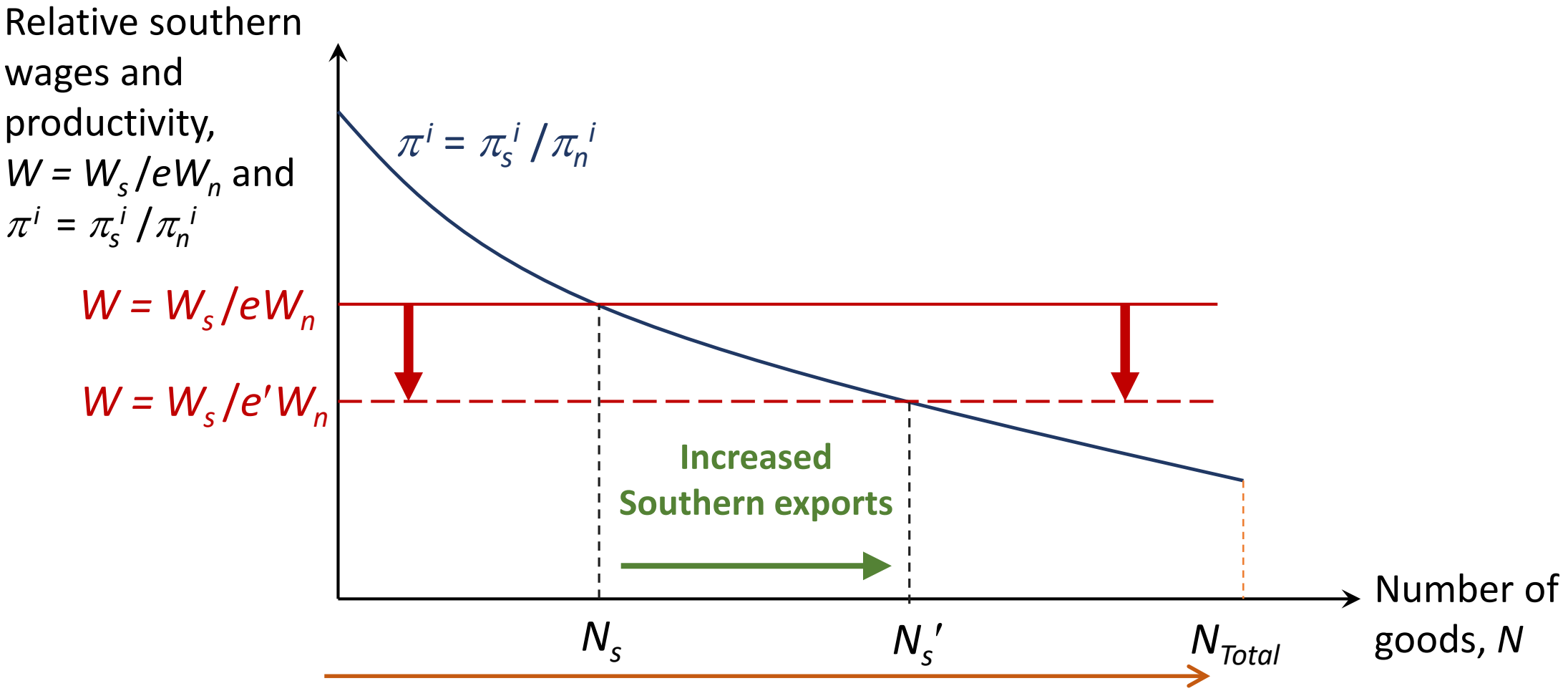
  - where π^i and W are relative (S-N) productivity in good i and wages, respectively
- This shows the importance of the South's real exchange rate (RER) in terms of wages, $W_n e/W_s$: a higher RER (real depreciation) means that *the South gets to produce a wider range of goods*
- Let the goods produced by the South be $N = 1, 2, 3, ..., N_s$
  - These start with goods of the least technological intensity (more resource- or labor-intensive), and become progressively more technological intensive (also requiring more capital and skill/education) as N rises.

The Dornbusch-Fischer-Samuelson (1977) Ricardian trade model, applied to North-South trade by Cimoli-Porcile (2014)*



*Based on an earlier adaptation by Dosi and Soete (1990). In the original DFS (1977) model, there was an infinite continuum of goods on the interval $z \in (0,1)$, so $N_{total} = 1$. Cimoli and Porcile (2014) use a discrete number of goods, and a linear approximation to the π_s^i / π_n^i curve; they also assume that goods with higher *N* have greater "technological intensity".

A real depreciation of the Southern currency (lower relative wage) increases the range of goods produced by the South



Key assumption: The income elasticities of the goods η are increasing as we move toward the goods typically produced in the North

Incorporating Thirlwall's Law

- The LR equilibrium growth rate of the South is determined by Thirlwall's Law:

$$y_s = \frac{\eta_X y_n}{\eta_M}$$

  - where η_X and η_M are the South's **income** elasticities of demand for exports and imports, respectively [in my notation]
    - The same as the North's income elasticities of demand for imports and exports
- This is equivalent to the following solution for the *relative* Southern growth rate:

$$y = \frac{y_s}{y_n} = \frac{\eta_X}{\eta_M} = \eta$$

Note: this is ε in the original article.

- Increases in which in turn reduce the technological gap:

$$\dot{G} = u - vG - gy$$

  - where *u*, *v*, and *g* are positive constants (*v* reflects convergence, *g* represents Verdoorn's Law)

Linking export diversification to relative growth

- As the number of southern exports $N_s = N^*$ increases, the South moves into goods of higher quality or greater technological intensity, for which income elasticities are higher
- Thus the relative income elasticity of southern exports rises and relative Southern growth increases accordingly:

$$y = \eta(N_s), \quad \eta' > 0.$$

Actually this isn't obvious, it's based on an implicit assumption*

- The more goods the South produces, the faster it grows relative to the North
  - Thus, "what you export matters" (Hausmann et al. 2005) to catch-up or convergence!
  - You can think of N_s as a simple indicator of "export diversification" for the South
  - Initially, the South needs a competitive real exchange rate (higher $W_n e/W_s$) to widen its range of exports, grow relatively more rapidly, and close the technological gap (converge)
  - Eventually, once Lewis-type "surplus labor" is eliminated, the relative wage ($W_n e/W_s$) also increases

*The numerator and denominator of $\eta = \eta_X/\eta_M$ both rise, so Cimoli & Porcile are assuming that the numerator rises proportionally more than the denominator.

Another version of structural change in a BPCG-type model: Gabriel, Jayme, and Oreiro (*SCED*, 2016)

- They build on the earlier BPCG models with the capacity utilization rate (u) and natural rate of growth ($y_N = q + n$) by Palley, Setterfield, and Oreiro
- Key innovations:
  - The Verdoorn effect is linked to the share of manufactures in output (h_s), and
  - The evolution of the share of manufactures depends on the real exchange rate and the technological gap

$$x = \eta_x y_f$$

$$m = \eta_m u_s y$$

$$q = q_0 + \alpha h_s y$$

$$\hat{h}_s = \sigma(\theta - \theta^i) - \beta(G - 1)$$

where relative price effects on export and import demand growth are suppressed, and

- u_s is the Southern utilization rate
- $\theta = EP_n/P_s$ is the real exchange rate (relative price of Northern goods)
- θ^i is the "industrial equilibrium" real exchange rate (the level that exerts neither upward nor downward pressure on h_s)
- G is the technological gap ($0 \leq G \leq 1$, where $G = 1$ would be full catch-up, and the closer to 0, the more the South lags behind) [convergence factor]

Comparison and evaluation of Cimoli-Porcile and Gabriel-Jayme-Oreiro

- Both assume that structural change is influenced by the ***level*** of RER, but in different ways:
- **Cimoli and Porcile** link structural change to **average income elasticities**, and hence to the (relative) BP-equilibrium growth rate
  - This reflects the MSTL view that the average income elasticities of exports and imports depend on industrial composition
- **Gabriel et al.** instead link structural change (share of manufactures) to **average productivity growth**, and hence to the natural rate of growth (which becomes endogenous)
  - This is more similar to Rodrik and also connects more directly to Verdoorn's Law
- None of them uses an *explicitly* multisectoral model (manufactures, services, agriculture/ traditional) as Rodrik does (and earlier generations of heterodox development models, e.g. Lance Taylor and other "structuralists")

Broader conclusions and research questions

- In both the ELG and BPCG literatures, the impact of cost competition or relative prices (real exchange rate = RER) is making a comeback
  - In various ways, Boggio-Barbieri, Razmi, Cimoli-Porcile, Gabriel et al. all recognize effects of the RER (relative price) ***level*** on exports and long-run growth
  - Consistent with mounting empirical evidence
  - But contrary to Kaldor's paradox and the original Thirlwall's Law, in which relative prices (measured in *rates of change*) have no long-run impact
- Much empirical work needs to be done to sort out which causal channels are most important in practice – does the RER level operate through
  - Impact on profits and investment in export industries? (see Ibarra & Ros paper on Mexico)
  - Impact on structural shifts (manufacturing share)?
  - Impact on income elasticities of exports and imports?
  - Impact on demand for exports and imports?

Reconciling ELG/CC with BPCG

- New paper by Ribeiro, McCombie and Lima (*J. Econ. Studies*, 2017)
  - Builds on Thirlwall and Dixon (1979), Blecker (1998, 2013), Pugno (1998), others
  - They distinguish 3 time periods: short, medium, and long run
- Key assumptions:
  - Verdoorn's Law holds (aggregate level)
  - Imported intermediate inputs are included in unit costs
    - Assumed to be a constant proportion of output
  - Markups are flexible in response to changes in RER à la Blecker (1989)
  - Income distribution (labor share) and workers' bargaining strength are incorporated in the model
  - Wage-setting behavior varies by time horizon:
    - Nominal wage growth is exogenously given in the short run
      - So faster productivity growth improves competitiveness
    - There is partial pass-through of productivity growth into the real wage in the medium run
    - In the long run, the real wage grows at the same rate as labor productivity

Main results from Riberio et al. (2017)

- Relative price changes matter in the short and medium runs
  - In the long run, the relative price is constant (by assumption)
  - The short and medium runs differ because of the assumptions about wages
- **Short run:** BP-equilibrium growth is affected by (exogenous) changes in relative unit labor costs
  - Hence nominal wages, labor productivity, and the exchange rate all matter (in rate-of-growth form)
- **Medium run:** BP-equilibrium growth is affected by Verdoorn's Law effects
  - Endogenous productivity growth affects cost competitiveness because the wage only partially adjusts
- **Long run:** Thirlwall's Law holds ($y_B = \eta_x y_f / \eta_m$)
  - Since the real wage grows at the same rate as productivity, the labor share and RER converge to constant levels, and relative price effects (in rates of change) drop out

➢ A currency depreciation has complex and ambiguous effects that vary by time period, because of the endogeneity of wages, prices, productivity, and the labor share

Tentative evaluation of Ribeiro et al. (2017)

- It's a major theoretical contribution
- But the long-run results appear to be imposed by assumption
  - If long-run adjustments are weak, a country could get stuck in a "medium-run" state for a long time
- They take a "traditional" KDT/BPCG approach by focusing on rates of change in relative prices (RER), not on levels
  - Rates of change matter in the short and medium run, but not in the long run
- They ignore level effects
  - It is possible that the long-run equilibrium growth rate can converge to the Thirlwall's Law (BPCG) rate at ***different levels*** of output, productivity, and per capita income
  - In this sense, the factors that appear to matter "only" in the short or medium run could have persistent long-term effects (this needs to be investigated!)

Final thoughts

- There are many exciting recent developments in the ELG and BPCG frameworks
  - Issues of rates of change vs. level effects for relative prices (RER), strength of Verdoorn effects, income vs. relative price adjustment, small vs. large countries, etc.
    - Is ELG just a "medium-run" concept, or does cumulative causation have a long-run impact?
  - Many opportunities for new empirical tests and further theoretical modeling
- Some new work is bringing structural change back into these models
  - This aspect still needs more attention and more explicit modeling
- Understanding the implied long-run adjustments is especially important
  - Much work has focused on relative price adjustment (Oreiro 2016; Gabriel et al 2016; Ribeiro et al. 2017; many others)
  - But what is going on with domestic savings and expenditures (consumption, investment, fiscal policy) to enforce the BP constraint in the long run?
- Thirlwall always said that some countries had to be unconstrained in order for the rest to be BP-constrained
  - Which ones are unconstrained? Japan in 1960s-70s. USA and China today? Germany?

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