Post-Keynesian Approaches to International and Development Economics

Robert A. Blecker
Professor, Department of Economics
and Affiliate Faculty, SIS and CLALS
American University, Washington, DC, USA
blecker@american.edu

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Outline: Two Major Modeling Approaches

1. **Export-led growth and cumulative causation (ELCC)** – medium run
   - Kaldor's "growth laws" (stylized facts)
   - The Dixon-Thirlwall model (Setterfield-Cornwall version)
   - Implications: convergence vs. divergence, conflictive trade relations
   - Empirical tests and theoretical critiques
2. **Balance-of-payments-constrained growth (BPCG)** – long run
   - The basic model, "Thirlwall's Law", and its implications
   - Reconciling the BP constraint with the "natural rate of growth" (potential output)
   - Extensions: capital flows, large countries, structural change (multi-sectoral model)
   - New developments: Relative price (RERs) effects, small country version, re-incorporating cumulative causation, endogenous income elasticities

A note on notation

Growth rates of **quantity** variables are in lower case:

- Thus x is the growth rate of exports (X), y is the growth rate of income or output (Y), etc.

Rates of change in **nominal** variables (prices, wages, exchange rates) are indicated by "hats" or circumflexes:

- Thus $\hat{P}$ is the inflation rate (rate of change in the price level P),
  - $\hat{E}$ is the rate of nominal currency depreciation (rate of change in the exchange rate E, defined as home currency/foreign currency), etc.

1. Export-led cumulative causation (ELCC)

Readings: Blecker–Setterfield, Chapter 8, Sections 8.1–8.3, 8.6–8.7

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 innovation, thereby raising productivity
- Gunnar Myrdal’s (1957) cumulative and circular causation
  - Positive, self-reinforcing feedbacks in growth (or stagnation), leading to ...
  - Virtuous (or vicious) circles, and uneven development between countries
- Nicholas Kaldor’s growth models and disequilibrium views (1960s–1980s)
  - Explaining why the UK lagged relative to West Germany and Japan (Kaldor 1966, 1971)
  - Static and dynamic increasing returns to scale, induced innovation (Kaldor 1972, 1981)

Four of "Kaldor's growth laws"
(as summarized by Thirlwall, 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."

The importance of manufacturing: unconditional convergence (Rodrik, *QJE*, 2013)

Total economy

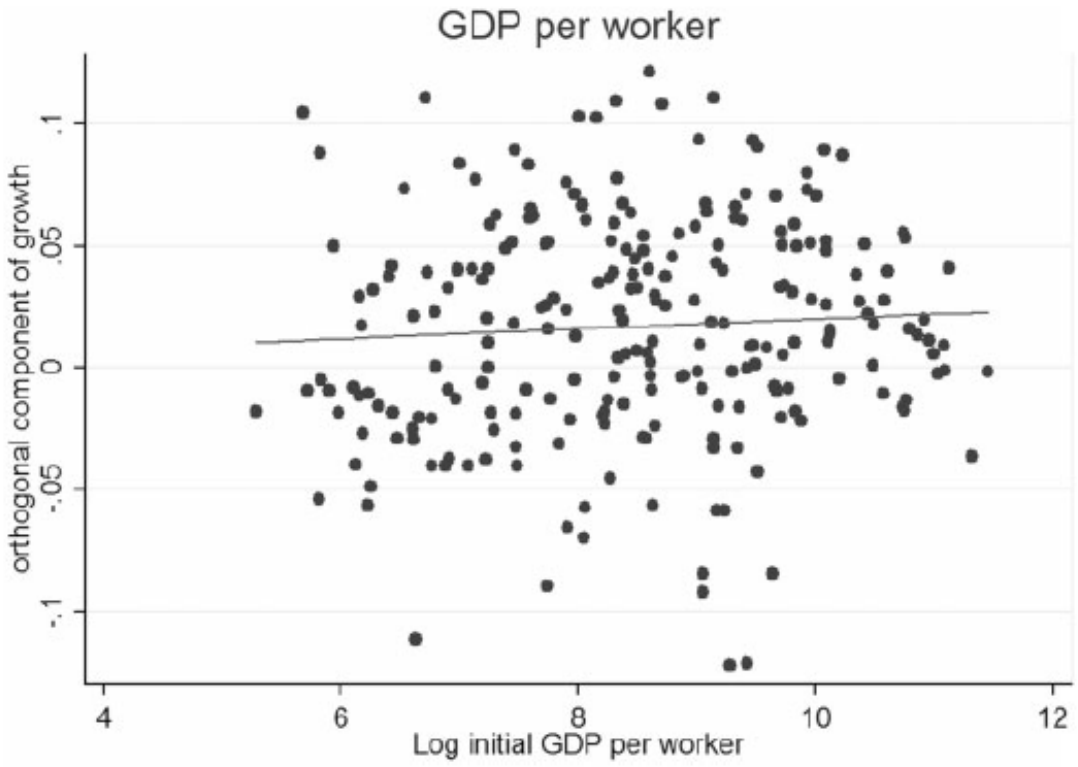


FIGURE I

Lack of Convergence in Economy-wide Labor Productivity

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

Manufacturing only

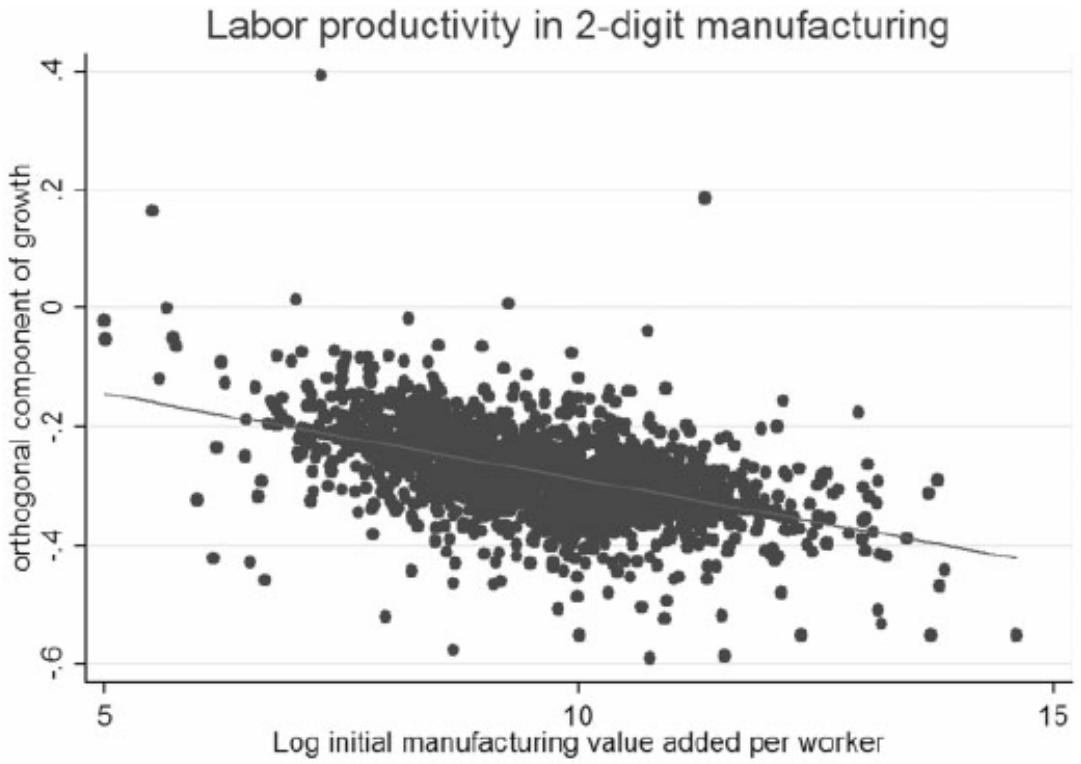


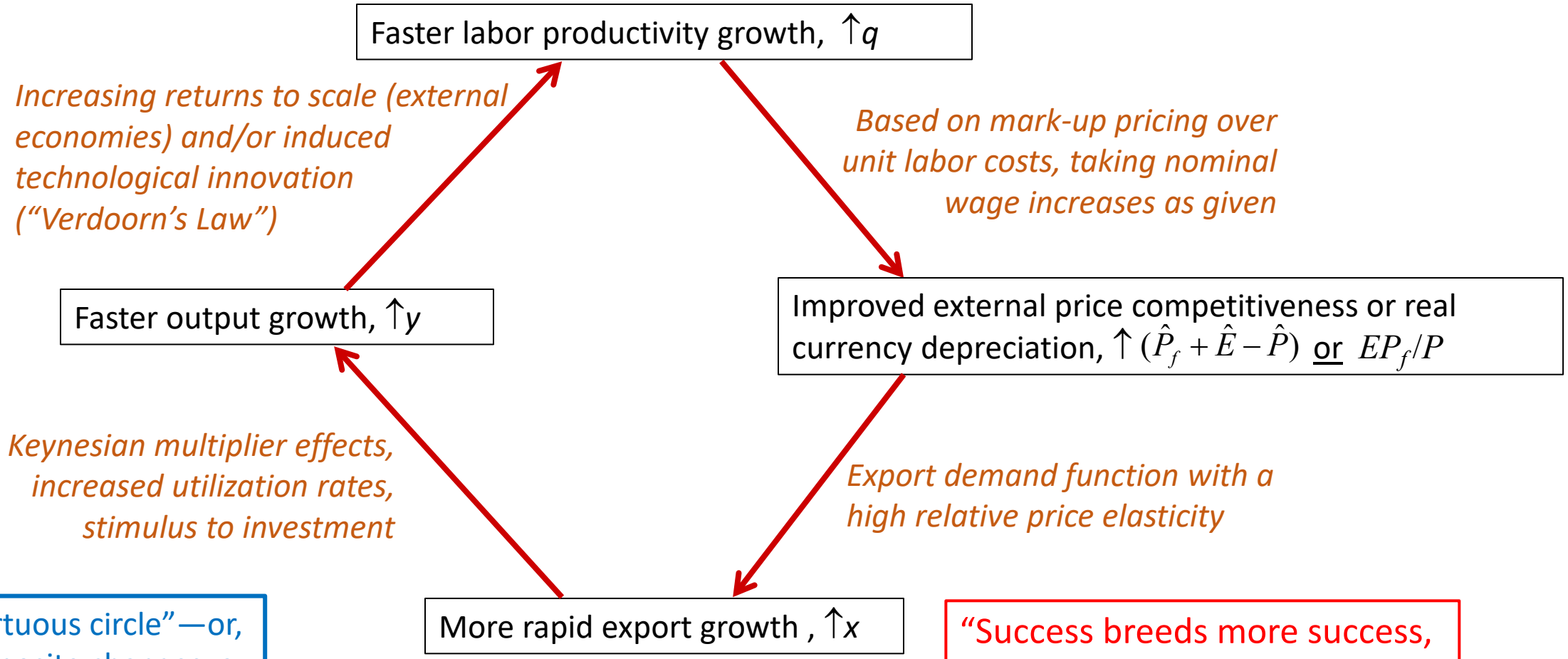
FIGURE II

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.

Export-Led Growth with Cumulative Causation

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



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

"Success breeds more success, failure breeds more failure"

Math for the export-led cumulative causation (ELCC) model*

Note: lower-case Roman letters are quantities in growth rate form.

1) Export demand: $x = \varepsilon_X(\hat{P}_f - \hat{P}) + \eta_X y_f$

Assuming $\hat{E} = 0$ or E is constant

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

2) Mark-up pricing: $\hat{P} = \hat{W} - q$

Price inflation = wage inflation – labor productivity growth (assuming the markup rate does not change in the long run)

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

Supposed to reflect external economies of scale and/or endogenous technical progress

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

4) Output growth: $y = k_X(\omega_X x + \omega_A g_A)$

Note: The original version omits the $\omega_A g_A$ term, so $\omega_X = 1$.

Where k_X is the Keynesian multiplier, g_A is the growth rate of exogenous *domestic demand, and the ω's are weights reflecting the export and domestic shares of autonomous demand*

NOTES: A subscript *f* indicates a foreign variable. P_f is measured in foreign currency and equation (8.9') is used for output growth.

*Based on Chapter 8 in Blecker & Setterfield (2019), Blecker (2013), Setterfield (2013), and Setterfield and Cornwall (2002), with minor modifications.

A few important qualifications

- The above is an **aggregative** model, but the positive feedbacks are mostly limited to manufactures and modern services
  - Disaggregating the model and incorporating structural change are needed extensions
- It's a model of **regional** growth
  - It can be applied to individual countries, groups of countries, *or* regions *within* countries
- Labor supply is **not** a binding constraint on output growth (Cornwall 1977), due to endogenous responses of:
  - Induced labor-saving technological change
  - Transfers of labor from agriculture to manufacturing and then services
  - Migration (international or internal), guest workers
  - Changes in gender norms or retirement ages

Solving the models: parallel equations for the "foreign" country (rest-of-world)

Assuming a similarly-specified model for the "foreign" country:

- Markup pricing (with a constant markup):

$$\hat{P}_f = \hat{W}_f - q_f$$

- Verdoorn's Law:

$$q_f = q_0 + \rho_f y_f$$

- Some simplifying assumptions (factors assumed to be equal across countries):

$$\hat{W} = \hat{W}_f, \quad q_0 = q_{f,0}$$

➢Note: this is one way to "close" the model, with some symmetry

- The countries still differ in the Verdoorn coefficients ρ and elasticities ε, η

ELCC model solution

- For the "home" country, the model boils down to 2 equations in 2 endogenous variables, q and y:

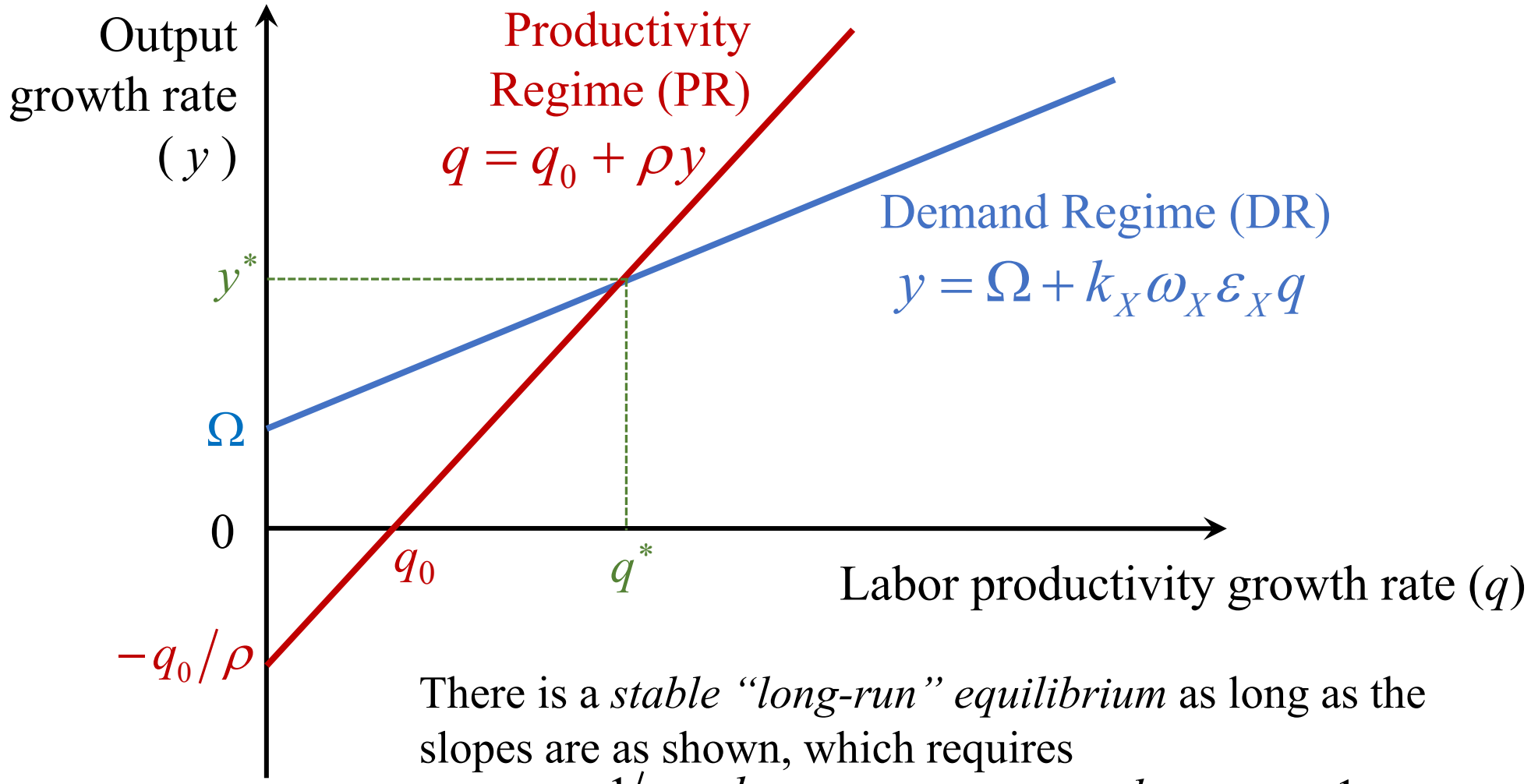
The Verdoorn equation or
"Productivity Regime" (PR): $q = q_0 + \rho y$

The other 3 equations solved for the
"Demand Regime" (DR): $y = \Omega + k_X \omega_X \varepsilon_X q$

with intercept $\Omega = k_X \left(\omega_A g_A + \omega_X [(\eta_X - \rho_f \varepsilon_X) y_f - \varepsilon_X q_0] \right)$

Equilibrium solution: $y^* = \dfrac{\Omega + k_X \omega_x \varepsilon_x q_0}{1 - \rho k_X \omega_x \varepsilon_x}$

Graphical Solution of ELCC Model



There is a *stable "long-run" equilibrium* as long as the slopes are as shown, which requires

$$1/\rho > k_X \omega_X \varepsilon_X \quad \text{or} \quad \rho k_X \omega_X \varepsilon_X < 1$$

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

Theoretical and policy implications I:

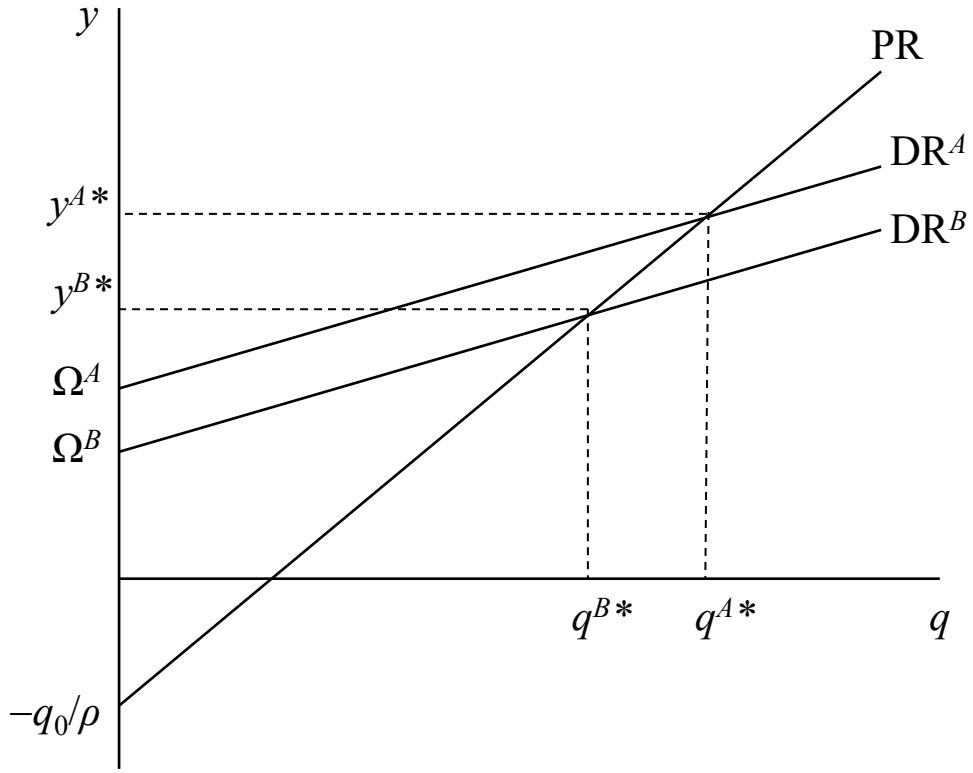
- Export demand is seen as the main force in the growth process
  - Implicitly, investment is driven by an accelerator mechanism to keep up with output growth
    - This is a type of "supermultiplier" model, where exports are the autonomous demand
  - *But supply conditions **do** matter through the PR relationship*
- *Either* supply-side *or* demand-side policies, both domestic and foreign, can affect 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 (or they could raise ρ and make PR flatter)
  - Faster foreign growth ($\uparrow y_f$) or growth of domestic autonomous expenditures ($\uparrow g_A$, e.g. government infrastructure spending) $\Rightarrow \uparrow\Omega$ and shift DR up
    - *The effect of $\uparrow g_A$ is not found in the original model where* $\omega_X = 1$

Theoretical and policy implications II:

- In spite of Kaldor's (1972) anti-equilibrium views, there *can* be a stable ELCC equilibrium as long as the forces of cumulative causation are *not too strong*
  - But it's a demand-driven equilibrium growth rate, not entirely supply-driven as in Solow or (most) other neoclassical growth models
    - A growth *rate* that would increase or decrease without limit is not plausible
- The model is consistent with 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 identified in the model (Roberts 2007)
  - But it can also predict absolute divergence, depending on initial conditions

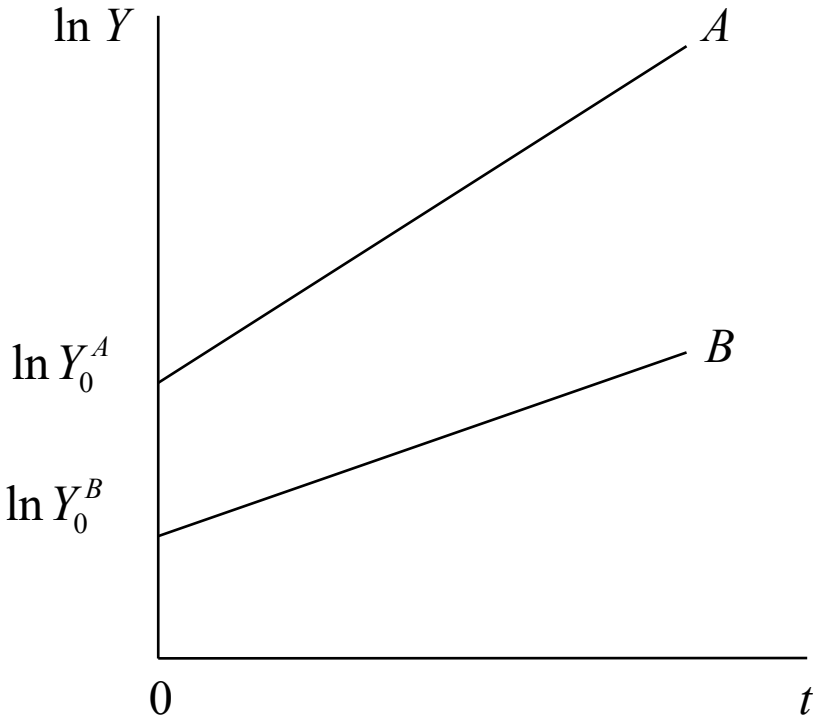
Causes of unequal growth

- Suppose two countries, *A* and *B*, have the same PR but differ in their DR
  - Suppose *A* has a higher income elasticity of export demand: $\eta_X^A > \eta_X^B$
    - This is only an example; other parameters could also differ.
  - Holding all else equal, *A*'s DR curve has a higher intercept ($\Omega^A > \Omega^B$) and *A* has a higher equilibrium growth rate: $y^{A*} > y^{B*}$



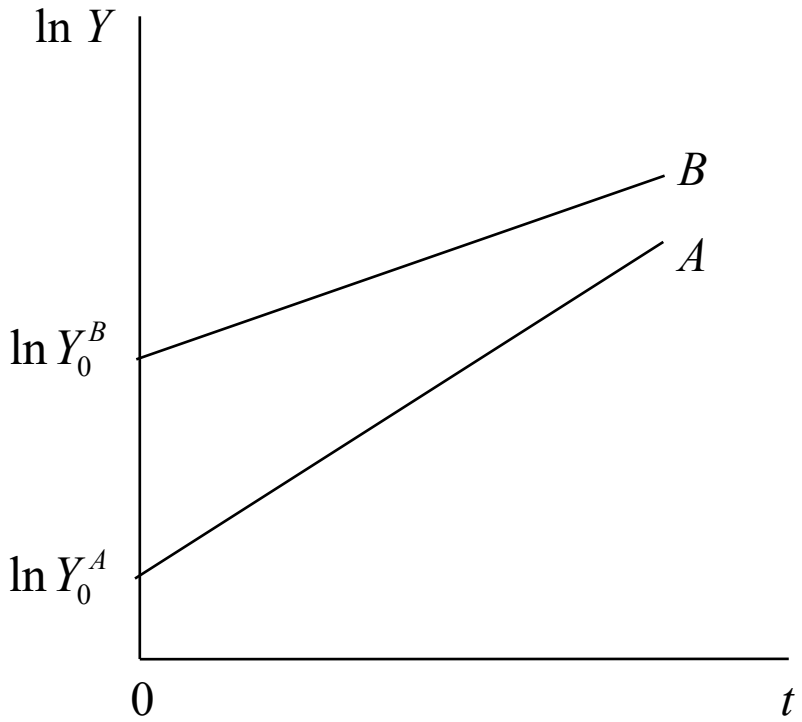
International divergence (or convergence)

If country *A* starts out ahead, it will increase the proportional gap vis-à-vis *B* (**divergence**)



East Asia (A) relative to Latin America (B)

Whereas if *A* starts out behind, it will close the gap with *B* (**convergence** or **catch-up**)



East Asia (A) relative to USA and Western Europe (B)

Theoretical and policy implications III:

- International trade can have a conflictive character at the macro level
  - Not just the mutual benefit seen in neoclassical models of comparative advantage, based on micro-level "gains from trade" in efficiency
  - Greater *foreign* technological dynamism (stronger foreign Verdoorn effects) *lowers* the *home* country's growth rate by slowing its export growth
- Thus *one country's faster growth of productivity comes at the expense of another country's slower growth*
  - Formally, this a negative effect on the intercept Ω in the DR equation (red circled term):

$$\Omega = k_X \left(\omega_A g_A + \omega_X [(\eta_X - \rho_f \varepsilon_X) y_f - \varepsilon_X q_0] \right)$$

    - where q_0 here is actually the foreign $q_{f,0}$ and I've corrected a typo in the text (+ sign on ω_X)
- But there is also room for international cooperation via expansionary Keynesian demand policies that raise y_f, assuming $\eta_X > \rho_f \varepsilon_X$ (green circled terms)

Sympathetic critiques

- *Too many positive self-reinforcing effects*; not enough offsetting effects
  - Wage increases, currency appreciation, or spill-overs of technology to other countries can eventually limit or reverse the gains for a rapidly growing country (Blecker, 2013)
- A country may never reach the model's equilibrium before conditions change
  - The equilibria depicted by the ELCC model are "provisional" or "conditional" equilibria that are subject to path-dependent shifts (Setterfield 2002)
    - A particular growth regime (DR + PR) can generate *endogenous* changes in the underlying conditions that in turn alter the long-run growth path (e.g., exhaustion of a technological paradigm)
- The standard ELCC model is too aggregative
  - The Verdoorn relationship between output growth and productivity growth is supposed to apply ***only*** in **manufacturing** (and perhaps "modern services" too)
  - The model needs to be extended to multiple sectors with structural change
  - *Applying Verdoorn's law to total output growth could be misleading for policy purposes*

The role of relative prices or real exchange rates: The Kaldor paradox and responses

- Early empirical tests of Kaldor's ELCC model were not favorable
  - Estimated elasticities of exports 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 ELCC model
  - 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?
  - León-Ledesma (*CJE*, 2002) found the opposite result: $-\varepsilon_X < 0$, after controlling for investment rates and R&D expenditures (but Kaldor had died in 1986)

Later evidence on relative cost effects

- León-Ledesma (2002) found that $-\varepsilon_X < 0$ in an extended ELCC model (panel data)
  - He controlled for investment rates and R&D expenditures and used IV methods (2SLS/3SLS)
    - This is using the *rate of change* in the relative price of exports
    - Kaldor had died in 1986, so he didn't live to change his mind again!
- Kaldor had *originally* framed his argument in terms of the **level** of relative costs:

  "...the main factor governing the [external demand for an industrial country's exports] is international competitiveness, which in turn depends on the ***level*** of its industrial cost relatively to other industrial exporters."
    - Kaldor (1971), quoted in Boggio and Barbieri (2017), emphasis added
- Boggio and Barbieri (2017) provide empirical evidence linking changes in export ***shares*** to the ***level*** of relative unit labor costs
  - **Levels** of this variable are significant; growth rates are not (robust result)
  - They use a different theoretical framework: Beckerman's (1962) model of export-led growth

Empirical Evidence: León-Ledesma (2002)

Appendix 3. Definition of the variables

All the variables were obtained from OECD statistics except where indicated. The variables used in the empirical model are the following:

y	average rate of growth of real GDP;
x	average rate of growth of real exports of goods and services;
p	rate of growth of the export price deflator;
pf	rate of growth of the import price deflator;
z	weighted rate of growth of the real GDP of the pre-1994 OECD countries;
I/O	ratio of real investment to real GDP at the beginning of the period considered;
K	ratio of the business sector expenditure on research and development over private investment (interpolated values for the years not available);
w	rate of growth of the total nominal labour costs;
r	rate of growth of real labour productivity;
GAP	one minus the ratio of the level of labour productivity to that of the USA in PPPs;
q	average rate of growth of the cumulative sum of the level of real output (Q_t). Thus, q = Log Q_t—Log Q_{t-1} and Q_t is calculated as:

$$Q_t = \sum_{t=0}^{t} Y(t)$$

using 1960 as the starting date t_0, to allow for the existence of a previous level of learning.

edu	average number of years of schooling of the population over 25 years, obtained from Barro and Lee (1993, 1996), for the years 1965, 1975, 1980 and 1990.

Note: Aside from some differences in variables and notation, this is an extended Kaldorian ELCC model in which R&D spending (K) is a 5th endogenous variable.

Table 1. *3SLS sstimation of the model for the OECD countries (1965–94)*

Equation (1)	$y = -0{\cdot}817 + 0{\cdot}650x$
	$(-1{\cdot}677)^{**}\ (7{\cdot}914)^{*}$
	$R^2 = 0{\cdot}4 \quad \text{SSR} = 0{\cdot}008 \quad n = 63 \quad DW = 2{\cdot}42$
Equation (2)	$x = -0{\cdot}023 - 0{\cdot}227(p - pf) + 1{\cdot}501z + 0{\cdot}001(I/O) + 0{\cdot}845K$
	$(-1{\cdot}079)\ (-2{\cdot}864)^{*}\ (6{\cdot}467)^{*}\ (2{\cdot}451)^{*}\ (2{\cdot}309)^{*}$
	$R^2 = 0{\cdot}49 \quad \text{SSR} = 0{\cdot}02 \quad n = 63 \quad DW = 1{\cdot}96 \quad \text{Wald rst } (\chi^2) = 0{\cdot}186$
Equation (3)	$p = 0{\cdot}011 + 0{\cdot}932w - 0{\cdot}374r$
	$(4{\cdot}012)^{*}\ (36{\cdot}84)^{*}\ (-4{\cdot}293)^{*}$
	$R^2 = 0{\cdot}95 \quad \text{SSR} = 0{\cdot}004 \quad n = 63 \quad DW = 2{\cdot}27$
Equation (4)	$r = -0{\cdot}015 + 0{\cdot}642y + 0{\cdot}0002(I/O) + 0{\cdot}617K + 0{\cdot}021GAP$
	$(-1{\cdot}213)\ (6{\cdot}019)^{*}\ (0{\cdot}649)\ (0{\cdot}404)\ (2{\cdot}113)^{*}$
	$R^2 = 0{\cdot}51 \quad \text{SSR} = 0{\cdot}006 \quad n = 63 \quad DW = 1{\cdot}76$
Equation (5)	$K = 0{\cdot}019 + 0{\cdot}499y + 0{\cdot}044q + 0{\cdot}0033edu - 0{\cdot}022GAP$
	$(1{\cdot}235)\ (0{\cdot}583)\ (1{\cdot}619)^{***}\ (3{\cdot}077)^{*}\ (-1{\cdot}670)^{**}$
	$R^2 = 0{\cdot}42 \quad \text{SSR} = 0{\cdot}012 \quad n = 63 \quad DW = 0{\cdot}768$

Notes: Method of estimation 3SLS. Convergence achieved after ten iterations.
Wald rst is the Wald test of the common parameter restriction on p and pf.
Countries, pp.Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, UK, USA.
Periods, pp.1965–73, 1974–79, 1980–88, 1989–94.
*Significant at the 95% confidence level.
**Significant at the 90% confidence level.
***Significant at the 85% confidence level.
t-statistics in brackets, SSR is the sum of squares of the residuals.

The "Kaldor paradox" is **not** found when additional control variables are included and instrumental variables are used to control for simultaneity bias.

Boggio and Barbieri's (2017) 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.

Summary on relative cost effects

- Relative price effects were seen as unimportant based on "Kaldor's paradox"
  - Based on early evidence about *rates of change* in prices (wrong sign or insignificant) in econometric studies from the 1960s–1970s.
- Critics have argued that the ELCC model relies too much on *continuous* changes in relative costs or RER depreciation
  - These are not realistic in the long run
    - But maybe it's a model of medium-run growth anyway (Setterfield's "conditional" or "provisional" equilibria)
- More recent empirical work showed that Kaldor was too quick in rejecting cost competitiveness as a possible determinant of export growth
  - Later studies (last 20 years) have found that cost competitiveness or the RER **does** affect export growth significantly in models of export-led growth, either in rates of change (León-Ledesma, 2002) or in levels (Boggio and Barbieri, 2017) – and others

Another problem with the ELCC approach

- The ELCC framework ignores imports and the balance of payments (BP) *when applied to national economies*
  - The growth rate implied by the ELCC model could imply persistently increasing trade (CA) imbalances (surpluses or deficits), requiring ever-increasing net financial flows
    - This would not be sustainable
  - 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
- This led to a shift to models that incorporate a "balance-of-payments constraint"
  - Because these models were developed in the late 1970s, they still assumed that relative price effects were unimportant (Kaldor's paradox) and focused on non-price competitiveness

2. Balance-of-payments constrained growth (BPCG)

Readings: Blecker–Setterfield, Chapter 9, Sections 9.1–9.2, 9.3.2; Chapter 10, Sections 10.1–10.2, 10.3.3, 10.4, 10.5.1, 10.6.

Blecker, *JOES* (2022), Sections 1– 4.

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

- Originated by Thirlwall (1979), Thirlwall & Dixon (1979)
- Key assumptions (of the basic model):
  - Trade must be balanced in the long run
  - 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 equilibrium solutions are not expected to hold in short-run periods

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

- Export demand: $x = \varepsilon_X(\hat{E} + \hat{P}_f - \hat{P}) + \eta_X y_f$
- Import demand: $m = -\varepsilon_M(\hat{E} + \hat{P}_f - \hat{P}) + \eta_M y$

Note: the nominal exchange rate *E* is explicitly included now.

- Balance of payments equilibrium (assuming zero net financial flows so CA = 0):

$$\hat{P} + x = \hat{E} + \hat{P}_f + m$$

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

  - Note $\hat{E}$ 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

The BP constraint

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

$$(\varepsilon_X + \varepsilon_M - 1)(\hat{E} + \hat{P}_f - \hat{P}) - \eta_M y + \eta_X y_f = 0$$

- But which is the endogenous variable that adjusts to maintain BP equilibrium?
  - For a small or medium-size country, foreign income growth y_f can be taken as exogenously given
- Thirlwall's **"Keynesian" solution** assumes that relative prices are either constant or have no effects in the long run, so domestic income growth y does the adjusting
- An alternative "neoclassical" solution would take $y = y_N$ as an exogenous "natural rate of growth", in which case the change in the real exchange rate $(\hat{E} + \hat{P}_f - \hat{P})$ would have to adjust.

The Keynesian solution

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

$$y_B = \frac{(\varepsilon_X + \varepsilon_M - 1)(\hat{E} + \hat{P}_f - \hat{P}) + \eta_X y_f}{\eta_M}$$

most general solution (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): $\hat{E} + \hat{P}_f - \hat{P} = 0$
- Then the solution simplifies to one of the following:

Two versions of Thirlwall's law
(Perraton, 2003)

- **Strong form**: assuming ***either*** elasticity pessimism ***or*** constant RER

$$y_B = \frac{\eta_X}{\eta_M} y_f$$

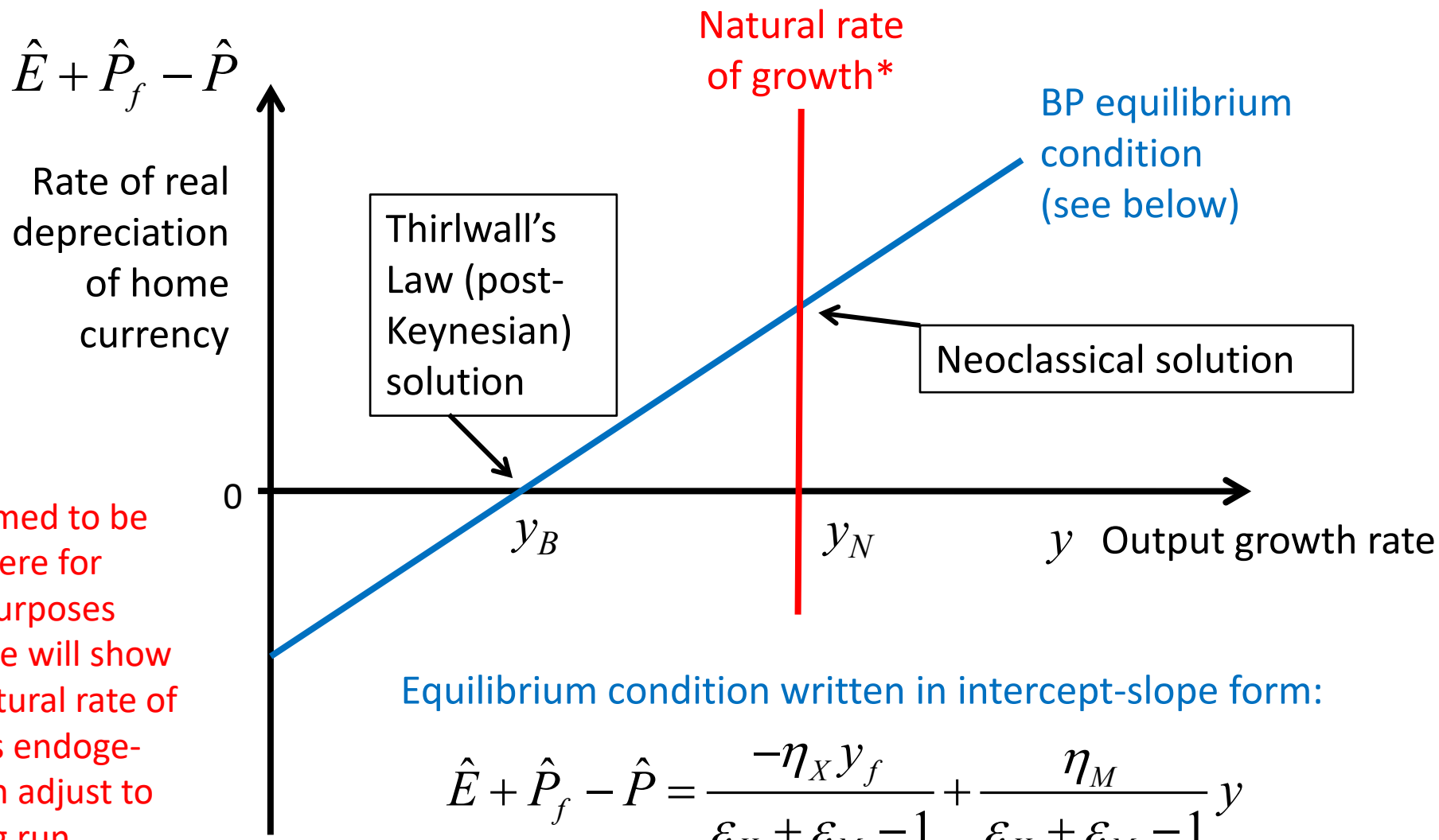
- **Weak form**: ***only*** on the assumption of constant RER $(\hat{E} + \hat{P}_f - \hat{P} = 0)$

$$y_B = \frac{x}{\eta_M}$$

  - Because in this case only,

$$x = \eta_X y_f$$

A BP-constrained economy: PK vs. NC solutions



*Note: Assumed to be exogenous here for illustrative purposes only. Later we will show how the "natural rate of growth" y_N is endogenous and can adjust to y_B in the long run.

Equilibrium condition written in intercept-slope form:

$$\hat{E} + \hat{P}_f - \hat{P} = \frac{-\eta_X y_f}{\varepsilon_X + \varepsilon_M - 1} + \frac{\eta_M}{\varepsilon_X + \varepsilon_M - 1} y$$

Upward sloping assuming that the Marshall-Lerner condition holds: $\varepsilon_X + \varepsilon_M > 1$.

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

- **Exports** are still vital to LR growth, as in ELCC, but *for a different reason:*
  - To obtain the foreign exchange to finance necessary imports without a growing trade deficit and rising foreign debt
- **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 (as we have seen, some empirical evidence suggests otherwise)
- Although the model is (external) demand-driven, **supply factors also play a role**
  - Greater (or more diversified) domestic productive capacity reduces η_M; investment and innovation in export industries can increase η_X
  - But these factors operate ***only*** through their impact on income elasticities

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

- In contrast to the extended ELCC model, expansionary *domestic* policies ***cannot*** increase *long-run* equilibrium growth under a BP constraint
  - 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 Moreno-Brid (1998-99), Santos-Paulino & Thirlwall (2004), Pacheco-López (2005), others

Reconciling BP-equilibrium growth with the "natural" rate of growth

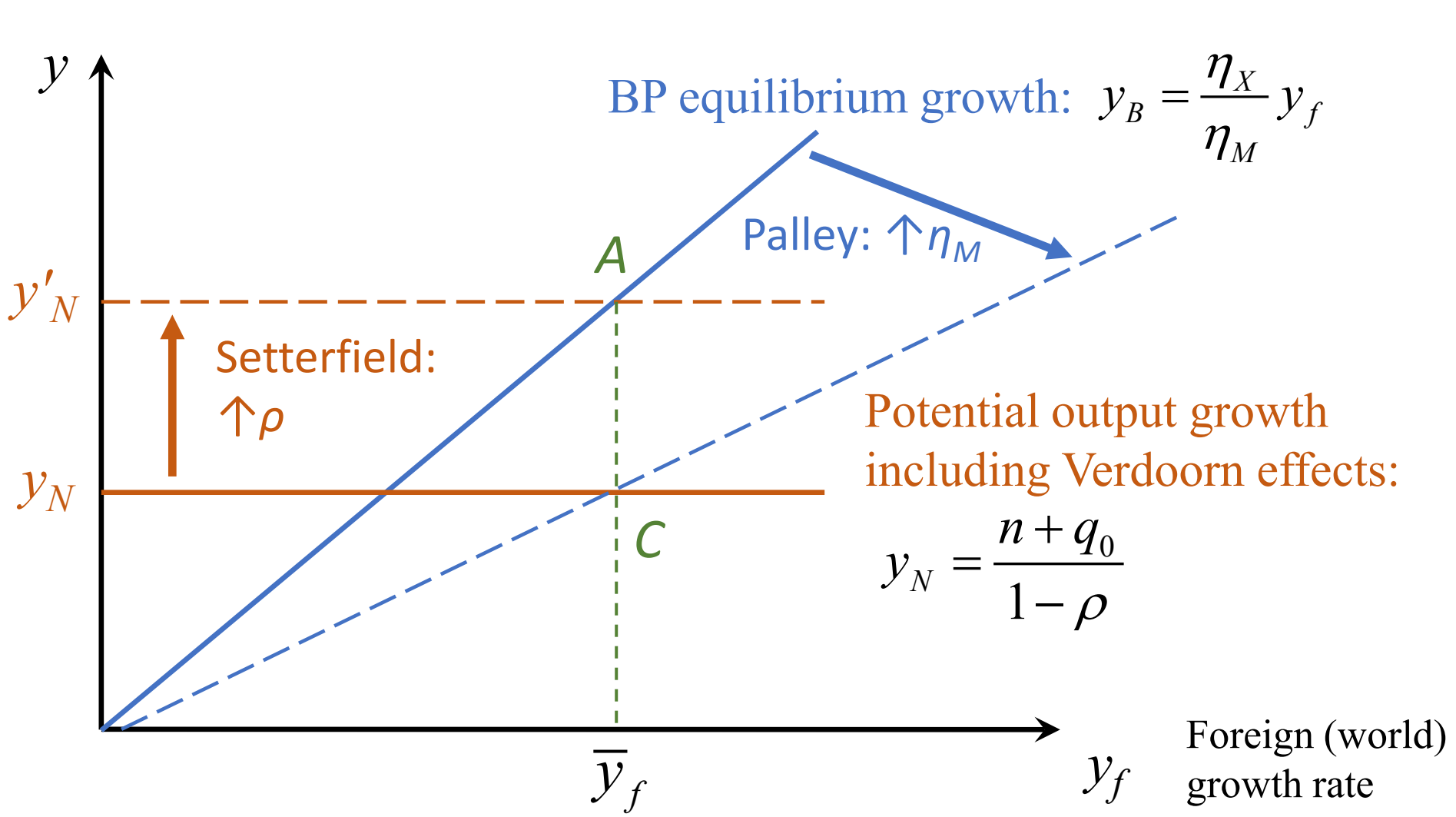
- It is not plausible for the long-run, BP-equilibrium growth rate to differ from the "natural rate of growth," $y_N = n + q$
  - n = growth rate of labor supply; q = growth rate of labor productivity
  - If $y_B < y_N$, we would observe continuously increasing unemployment
  - If $y_B > y_N$, the labor force would eventually be exhausted

- Therefore, some adjustment mechanisms must be postulated
  - Some mechanisms make y_N adjust to y_B, some do the opposite
  - If $y_B \rightarrow y_N$ there is not really a BP constraint (the BP-equilibrium rate adjusts)
  - If $y_N \rightarrow y_B$ then the BP constraint is binding and the natural rate adjusts

Proposed ways to reconcile BP-equilibrium growth with the "natural" rate of growth

- **Palley (2002):** y_B will adjust toward y_N because the income elasticity of import demand η_M is positively related to capacity utilization
  - When $y_B < y_N$, low utilization of capacity implies less demand for imports as more goods can be produced at home, so η_M falls and y_B rises; conversely, when $y_B > y_N$, η_M rises and y_B falls
- **Oreiro (2016):** the RER (level) adjusts to a LR equilibrium level to make $y_B \rightarrow y_N$
  - A higher RER (real depreciation) leads to more diversified domestic production and lowers η_M
- **Setterfield (2006):** $y_N = n + q$ will adjust toward y_B because of Verdoorn effects on productivity growth, $q = q_0 + \rho y$; ρ is an increasing function of capacity utilization
  - ρ and q will fall in a slow-growing economy ($y_B < y_N$), and rise in a rapidly growing one ($y_B > y_N$)
- **Porcile and Spinola (2018):** in a dual economy with "surplus labor" in the sense of Lewis (1954), labor supply is perfectly elastic in the modern sector
  - Hence n adjusts and therefore $y_N \rightarrow y_B$

Graphing the Palley and Setterfield adjustments to an initial disequilibrium at point *A*



Setterfield: end up at *A* (potential output grows faster)

Palley: end up at *C* (BP equilibrium growth slows down)

Empirical test of Palley vs. Setterfield by Cordeiro and Romero (2021)

- They estimate the potential output ("natural") growth rate (y_N) using the method of León-Ledesma and Thirlwall (2002)
  - The growth rate at which the unemployment rate U is constant
  - y_N = estimated coefficient $\hat{a}$ in a regression of $y_t = a - b(\Delta\%U_t) + e_t$
- They use a strategy of interactive dummy variables to determine whether the income elasticity η_M (Palley) or Verdoorn coefficient ρ (Setterfield) adjusts when growth is above (or below) potential
  - For Setterfield, they follow a suggestion of McCombie (2011) by estimating an equation for employment rather than for labor productivity, since by definition $q \equiv y - l$
  - They also use alternative econometric methods (OLS-FE, SYS-GMM, PMG)

Results of Cordeiro and Romero (2021)

- Sample of 38 countries for 1992-2014
- Dummy variable $D = 1$ if $y > y_N$ in a given country-year, 0 otherwise
  - An important sensitivity test would be to use utilization rates instead of growth rates
- They can reject the Palley hypothesis of an adjustment in η_M
- They cannot reject the Setterfield hypothesis of an adjustment in ρ
  - Except in the SYS-GMM results, but this method may not be appropriate for their data set
  - They also cannot reject the possibility that adjustments in labor force participation also play a role, along with adjustments in technological innovation
- **Main conclusion**: growth of aggregate supply (potential output) adjusts to growth of aggregate demand (actual output), not vice-versa

Table 4. Testing for the endogeneity of the income elasticity of demand for imports. (Test of Palley)

Independent Variable: Log of Real Imports	OLS		SYS-GMM		PMG	
Log Real GDP	1.750***	(0.078)	1.245***	(0.207)	0.860***	(0.052)
Log PPP	0.050**	(0.020)	0.568	(0.364)	0.077***	(0.016)
Interaction GDP(Dummy)	−0.012	(0.007)	−0.020	(0.046)	−0.020	(0.025)
Dummy	0.334*	(0.195)	0.564	(1.281)	0.492	(0.640)
Constant	−21.358***	(2.085)	−8.672	(6.142)	–	
Error Correcting Term	–		–		−0.097***	(0.030)

Table 5. Testing for the endogeneity of the verdoorn coefficient. (Test of Setterfield)

Independent Variable: Total working hours growth	OLS		SYS-GMM		PMG	
GDP Growth	0.540***	(0.078)	0.692***	(0.164)	0.650***	(0.041)
Interaction GDPg(Dummy)	−0.189***	(0.061)	−0.085	(0.233)	−0.308***	(0.057)
Dummy	0.004	(0.003)	−0.015*	(0.009)	0.009***	(0.002)
Constant	−0.002	(0.001)	−0.002	(0.002)	–	
Error Correcting Term	–		–		−0.820***	(0.050)

Source: Cordeiro and Romero (2021).

Extensions of the basic BPCG model

- International capital (financial) flows
  - The Thirlwall's law solutions are modified to allow for *either* a given growth rate of net capital inflows *or* a sustainable ratio of CA deficit (or external debt) to GDP,
    - Thirlwall and Hussain (1982); McCombie and Thirlwall (1997); Moreno-Brid (1998-99, 2003); Blecker (2013)
    - Bhering, Serrano, and Freitas (2019): if the constraint is the debt-***exports*** ratio (not debt-income), capital inflows affect the ***level*** of output but **not** the growth rate in the long run (original Thirlwall's law holds) [also noted by some previous authors]
- Two large countries (McCombie 1993)
  - If one country expands its economy and the other doesn't, the first one will have BP deficits that will force it to reverse the demand stimulus (global austerity)
  - **The "global Keynesian solution":** If the *other* country *also* adopts expansionary policies, both countries can grow faster without trade becoming imbalanced

Incorporating structural change: The "multi-sectoral Thirlwall's law" (MSTL)

- Due to Araújo and Lima (2007), Gouvêa and Lima (2010)
  - Their **original version** combines BPCG with Pasinetti's (1981, 1993) model of structural economic dynamics
    - Has been extended to global value chains (GVCs) by Tripp (2020)
- The BP-equilibrium growth rate of the global South (*S*) as a function of the growth rate of the global North (*N*):

$$y_{pc}^{S} = \frac{\sum_{i=1}^{G} \xi \eta_{X,i}^{S} x_i^{S} a_i^{S}}{\sum_{i=1}^{G} \eta_{M,i}^{S} m_i^{S} a_i^{S}} y_{pc}^{N}$$

where y_{pc} is the growth rate of *per capita* income
ξ is the ratio of Northern to Southern population (= employed labor force)
$\eta_{X,i}$ and $\eta_{M,i}$ are income elasticities of export and import demand for good i
x_i^j is foreign per capita demand for country j exports of good i
m_i^j is per capita demand for imports of good i in country j
a_i^j is the labor coefficient for producing good i in country j
G is the number of tradable goods

Simplified version of the MSTL

- The aggregate income elasticities of export and import demand are simply weighted averages of industry-level elasticities:

  - For any given "home" country, from Gouvêa and Lima (2013)

$$y_{B,t} = \frac{\sum_{i=1}^{G} \alpha_{i,t} \eta_{X,i}}{\sum_{i=1}^{G} \beta_{i,t} \eta_{M,i}} y_{f,t}$$

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

$$\sum_{i=1}^{G} \alpha_{i,t} = 1, \sum_{i=1}^{G} \beta_{i,t} = 1$$

Key features of the MSTL

- Structural change is modeled by changes in the industry shares of exports and imports, $\alpha_{i,t}$ and $\beta_{i,t}$
  - Shifting the **composition** of exports or imports to goods with higher (lower) income elasticities raises (lowers) the ***average*** elasticities
  - Thus structural change can change the BP-equilibrium growth rate even if the industry-level elasticities remain constant
- As a result, the BP-equilibrium growth rate $y_{B,t}$ ***varies over time***
  - Hence, a growth strategy should emphasize domestic production of goods with high income elasticities, so as to raise average η_X and lower average η_M
    - This provides a channel for relative prices or real exchange rates to affect LR growth through their impact on the composition of exports and imports (the weights $\alpha_{i,t}$ and $\beta_{i,t}$)

Relative price/real exchange rate (RER) effects in BPCG models

- The “canonical” Thirlwall model assumes no role for relative prices or the RER
  - These are assumed to either have a constant trend or negligible effects in the long run
  - Only “qualitative” or “non-price competition” is supposed to matter
  - But these assumptions apply only to ***continuous changes*** in relative prices or the RER
- Empirical evidence for RER effects on growth of exports and output is mixed, but many studies do find positive effects of depreciated RERs
  - There are definitely negative effects of RER *over*valuation (it could be nonlinear)
  - Estimated effects vary by type of country, trade specialization, types of goods, etc.
  - See Caglayan & Demir (2019), Rapetti (2020), Demir & Razmi (2022), Blecker (2022)
  - As in Boggio & Barbieri (2017) for the export-led growth model, positive effects are usually found for **levels** of relative prices, not rates of change

RER level effects in extended BPCG models: three theoretical approaches

1. The RER (or other measure of relative prices or relative costs) affects the **composition** of exports and imports (Cimoli et al. 2019)
   - RER depreciation induces **structural change** that raises (***weighted-average***) η_X relative to η_M
2. The RER affects **capital accumulation** in tradable goods industries (Razmi 2016)
   - A real depreciation encourages investment and hence **relaxes supply-side constraints on exports** in "small open economies"
3. A more competitive RER raises **income elasticities** for specialized export products (Missio et al. 2017; Marconi et al. 2021)
   - Export quality improves via induced innovation, technological upgrading (sophistication effect), and encouraging new products (diversification effect)

1. BPCG with RER level effects and structural change (Cimoli et al. 2019 – simplified version)

- An adaptation of the **Ricardian trade model with a continuum of goods**
  - Originally due to Dornbusch, Fischer, and Samuelson (1977)
  - See also Dosi and Soete (1990), Cimoli and Porcile (2014), Feenstra (2016)
- There is a ***continuum*** of goods $z \in [0,1]$, ordered from greatest to least Southern comparative advantage
  - Cimoli et al. (2019) assume these are also ranked in increasing order of income elasticity η
- Let W^j = nominal wage rate and $a_0^j(z)$ = labor coefficient (hours or workers per unit of output) in good z in country j ($j = S$ for South, N for North).
  - Note labor productivity is the reciprocal, $1/a_0^j(z)$
  - Wages are assumed equal across industries *within* each country (for simplicity)
- E is the nominal exchange rate of the South (pesos/dollar, rupees/pound, etc.); a higher E is a Southern depreciation

Trade and Southern specialization

- The South will produce and export all goods z for which Southern unit labor costs are lower or equal to Northern:

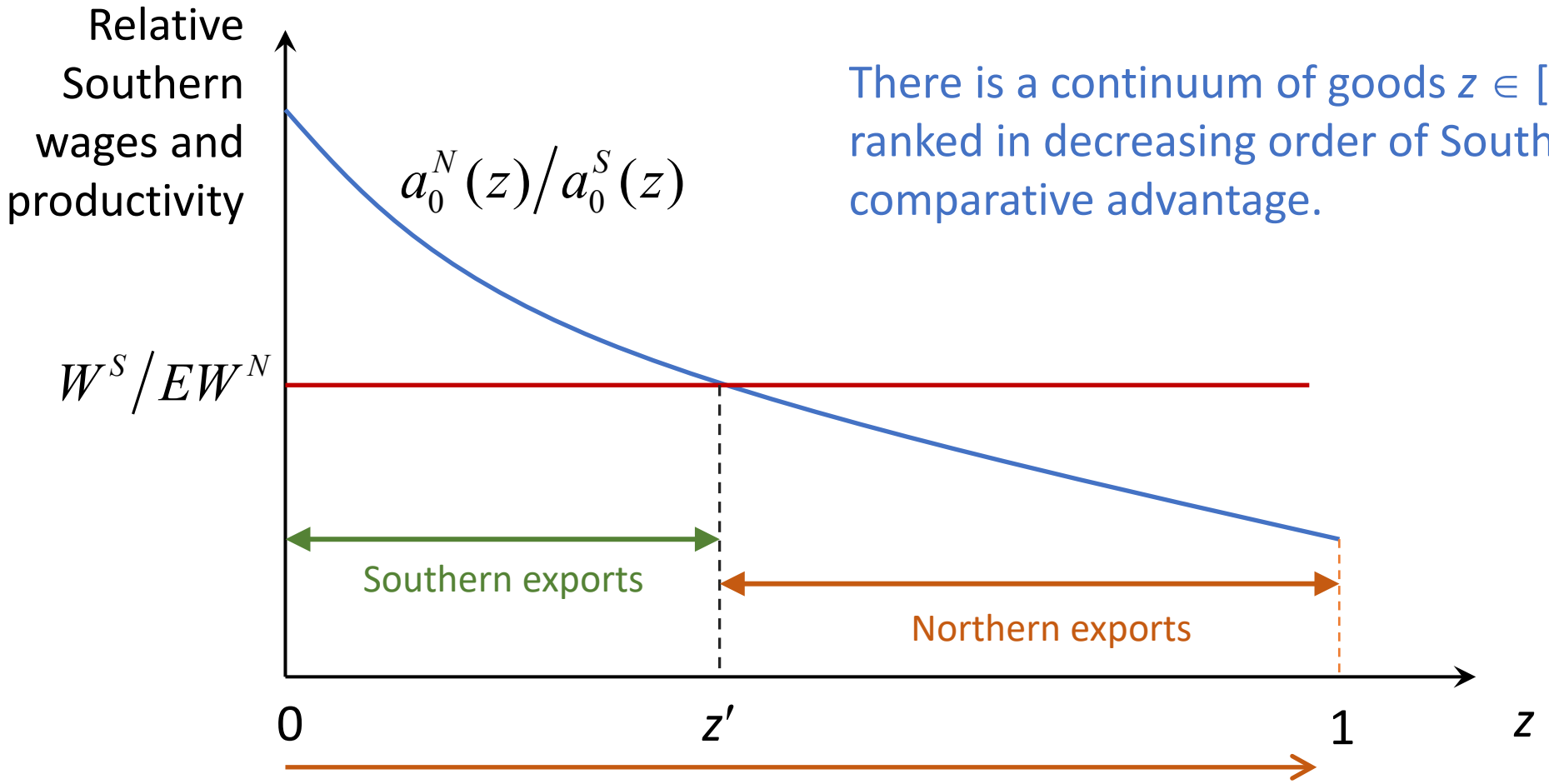
$$W^S a_0^S(z) \leq EW^N a_0^N(z)$$

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

$$\frac{a_0^N(z)}{a_0^S(z)} \geq \frac{W^S}{EW^N}$$

- This shows the importance of the South's real exchange rate (RER) in terms of wages, EW^N/W^S: a higher level of the RER (real depreciation) means that *the South gets to produce a wider range of goods* z

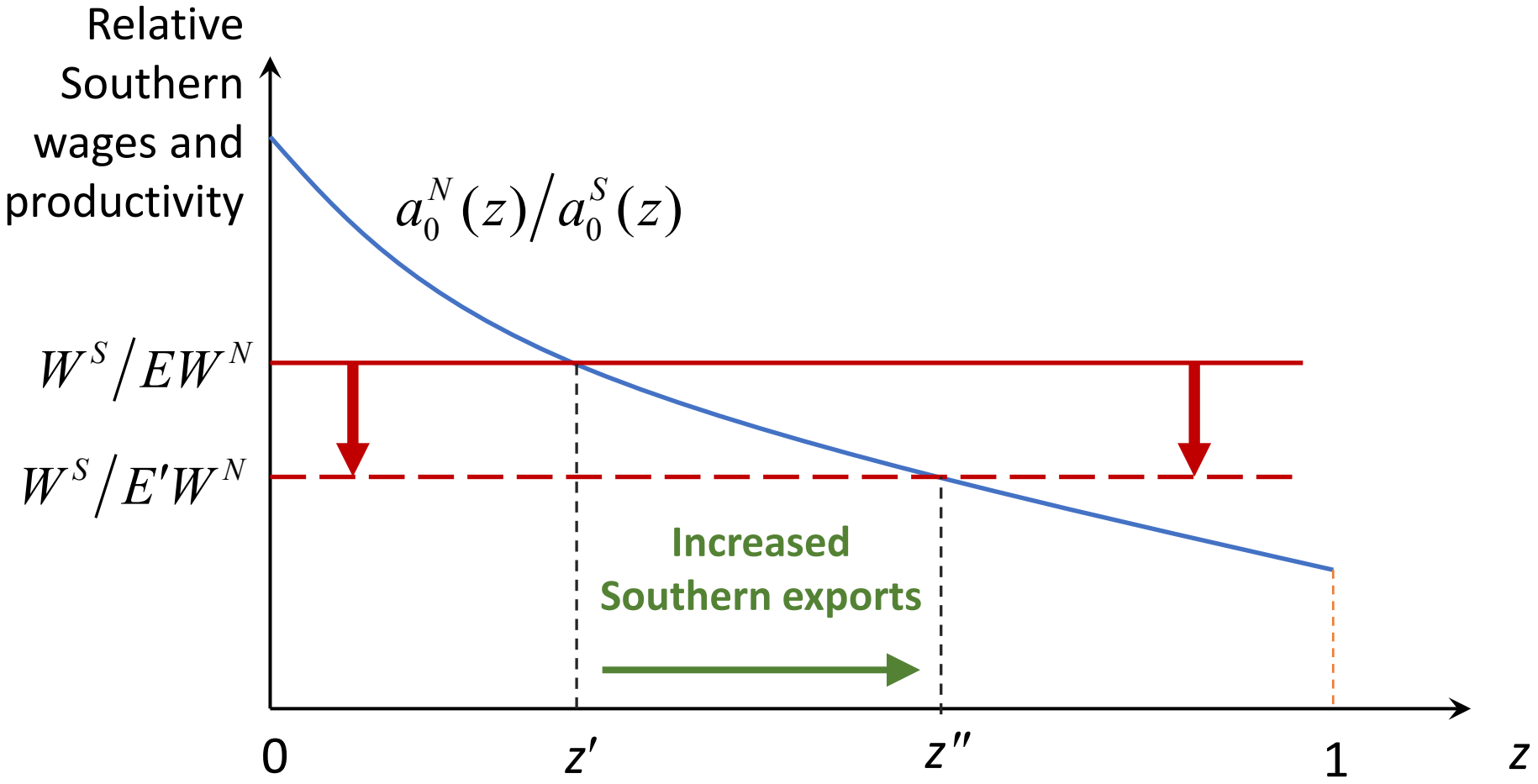
The Dornbusch-Fischer-Samuelson (1977) Ricardian trade model, applied to North-South trade by Cimoli et al. (2019)



There is a continuum of goods $z \in [0,1]$, ranked in decreasing order of Southern comparative advantage.

Key assumption: The income elasticities of the goods η are increasing as z increases i.e. in the goods typically produced in the North

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



Linking to Thirlwall's law

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

$$y^S = \frac{\eta_X}{\eta_M} y^N$$

Note: This version of Thirlwall's law was stated by Prebisch (1950), 29 years before Thirlwall (1979)!

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

$$y = \frac{y^S}{y^N} = \frac{\eta_X}{\eta_M} = \eta$$

Linking export diversification to relative growth

- As the number of southern goods rises from z' to z'', the South moves into goods of higher quality or greater technological intensity, for which income elasticities are higher
- The ***relative*** income elasticity of southern exports is ***assumed*** to increase and relative Southern growth (BP-equilibrium) rises accordingly:

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

But this isn't obvious, it's based on a strong assumption*

- The more goods the South produces, the faster it grows relative to the North
  - You can think of the shift to z'' as an indicator of "export diversification" for the South
  - The South needs a competitive real exchange rate (lower W^S/EW^N) to widen its range of exports, grow relatively more rapidly, and close the technological gap (converge)

*The numerator and denominator of $\eta = \eta_X/\eta_M$ **both** rise, so Cimoli et al. (2019) have to ***assume*** that the numerator rises proportionally more than the denominator.

2. The RER and capital accumulation in Razmi's (*CJE*, 2016) small country model

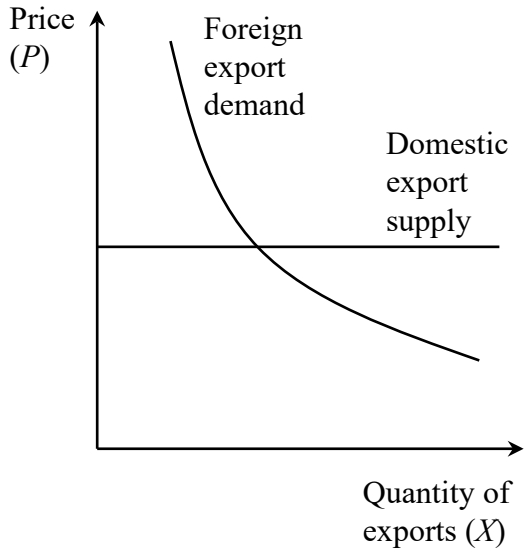
- Considers a "small open economy" (pure price-taker)
  - This again assumes an infinitely elastic supply of imports (similar to BPCG)
  - But it assumes instead perfectly elastic **demand** for exports at a given price (TOT)
  - Hence **exports are supply-constrained**
- A small country *is* BP-constrained
  - But the chief constraining factor on the export side is capacity (capital accumulation) in export industries, not foreign income
    - Foreign demand matters only via its effects on world prices
- Export capacity depends on investment (capital stock), 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 BP-equilibrium growth

Alternative assumptions about market structure

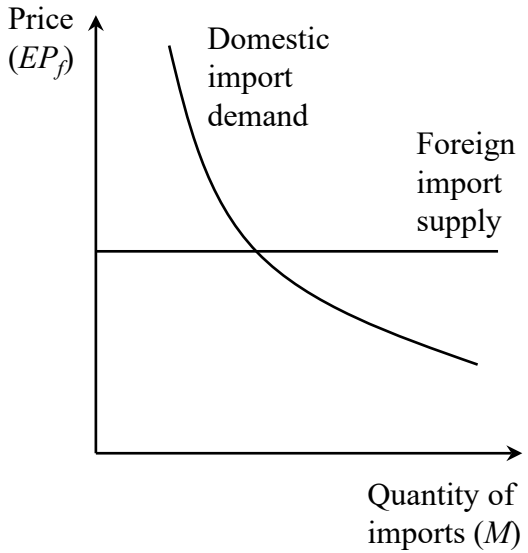
Small Keynesian open economy: infinitely elastic *supplies* of exports *and* imports; prices are fixed in seller's currency. Assumed in Marshall-Lerner condition, **Thirlwall BPCG model**

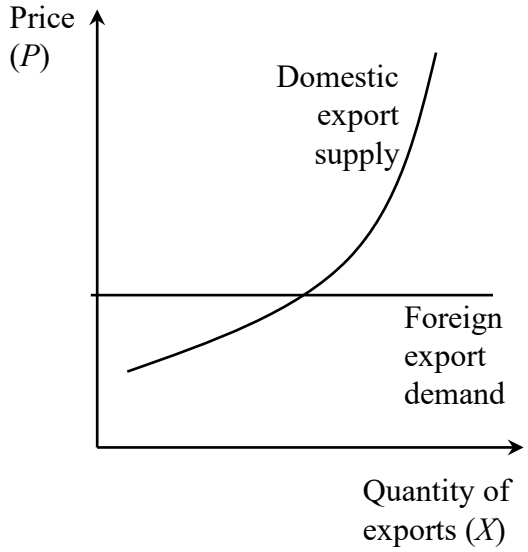
Small open economy model (pure price-taker): *demand* for exports and *supply* of imports (foreign curves) are infinitely elastic. Assumed in **Razmi's alternative model** of BP-constrained growth for a small country.

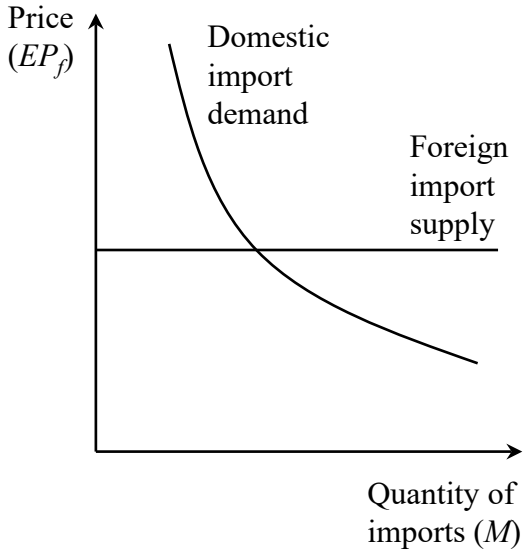
Export market



Import market







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

- Export **supply** function $x = \gamma_X \hat{P} + \delta_X g$
- Import demand function $m = -\varepsilon_M (\hat{E} + \hat{P}_f - \hat{P}) + \eta_M y$
- BP equilibrium condition $\hat{P} + x = \hat{E} + \hat{P}_f + m$
- Capital accumulation function $g = g\left(\frac{EP_f}{P}\right), \quad g' > 0$
- General model solution:* $y = \frac{\gamma_X \hat{P} + \delta_X g + (\varepsilon_M - 1)(\hat{E} + \hat{P}_f - \hat{P})}{\eta_M}$

*__Corrected__ equation (10.28) in book.

- Price assumptions (small country, price-taker): $\hat{P}_f = 0, \quad \hat{P} = \hat{E}$

Razmi ignores this term

- **Small-country (S) solution:** $y_S = \frac{\gamma_X \hat{E} + \delta_X g(EP_f/P)}{\eta_M}$

Note: γ_X is price elasticity of export supply; δ_X is capital stock elasticity of export supply; and $g = I/K = \hat{K}$

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*
- Yet such countries **do** face BP constraints and need to promote exports
- The key to their export success is capital accumulation that expands export capacity
  - This could include public infrastructure, "human capital," etc.
- To attract firms to locate in a given country, it must have a competitive RER
  - The RER thus matters in levels, and operates via the supply side
- The **strong** version of Thirlwall's Law does ***not*** apply to small open economies
  - But the **weak** version still holds ($y_S = x/\eta_M$); it really is weak, because it cannot distinguish whether exports are driven by foreign demand or domestic supply (capacity)

Reintegrating cumulative causation into BPCG

- Several theorists have effectively recombined ELCC and BPCG by bringing Verdoorn's law back into the analysis
  - Often for a "medium-run" time frame in which (continuous) changes in relative prices (RERs) are plausible
- Araujo (2013) incorporates Verdoorn's law for individual goods (industries) into the MSTL, with relative price effects in a medium-run, North-South framework
  - Holding relative wages and markups constant, relative prices are driven by relative productivity growth and changes in nominal E
    - À la Adam Smith, productivity increases faster and relative costs fall when a country exports a good
- Key take-aways from Araujo (2013):
  - The South benefits more when it exports products with high sectoral Verdoorn coefficients ρ_i
  - Faster productivity growth in either region (North or South) comes at the expense of slower productivity growth in the other region (because of shifts in global market shares)

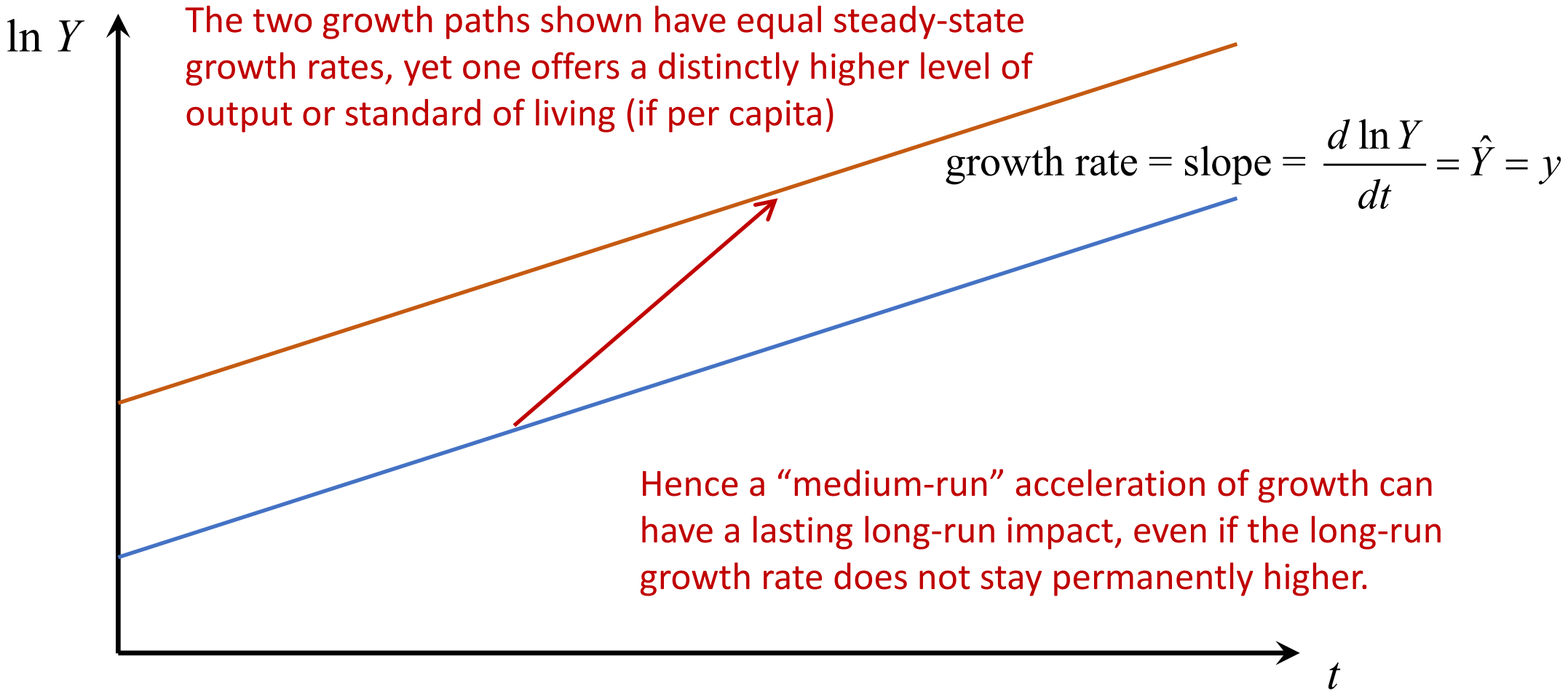
The three period model of Riberio et al. (2017)

Relative price changes matter in the short and medium run, in an aggregative model

- In the long run, the relative price is constant (by assumption)

1. **Short run:** BP-equilibrium growth is affected by changes in relative unit labor costs
   - Rates of change in the nominal wage, labor productivity, and exchange rate all matter, but are exogenous (similar to an open economy neo-Kaleckian model, but with a BP constraint)
2. **Medium run:** BP-equilibrium growth is affected by Verdoorn's Law feedbacks
   - Productivity growth is endogenous and affects cost competitiveness as the wage only partially adjusts (faster productivity growth depresses the wage share but bolsters exports) – similar to Kaldorian ELCC
3. **Long run:** Thirlwall's Law holds (positive feedbacks cease to operate)
   - The real wage grows at the same rate as productivity $\Rightarrow$ the labor share and RER converge to constant levels (there are no relative price changes by assumption)

Why “medium run” effects are important: output levels versus growth rates



Endogenizing income elasticities: Magacho & McCombie (2020)

- Similar to Araujo (2013), they assume that Verdoorn's law holds (feedbacks from output growth to productivity growth exist) at the industry level
  - Magacho & McCombie also assume that more rapid productivity growth implies *qualitative improvements that raise income elasticities* for exported goods
  - Changes in industry shares depend on *differences* in income elasticities (e.g. higher $\eta_{X,i}$ relative to average $\eta_X \Rightarrow$ rising share of good *i*), generating positive feedbacks *without* relative price effects
- Under certain assumptions, cumulative causation can be launched by structural change and does not necessarily require an initial increase in aggregate growth
  - It can start with faster growth of individual sectors with strong Verdoorn feedbacks and high income elasticities of export demand
  - Since the income elasticities are endogenous, long-run growth can be affected

Conclusions

- The BPCG model has become the “workhorse” model for post-Keynesian analysis of trade and growth in the long run
- But the ELCC model can still inform our analysis of medium-run growth ***and*** the long-run ***level*** of the output trend
  - Positive feedbacks do matter!
- Perhaps BPCG theorists have put too much emphasis on long-run analysis, and not enough on the “traverse” between steady-states
  - In the end, what we care about is income levels (and income distribution and ecological sustainability), not the long-run average growth rate per se
- **Deeper problem for discussion:** if the underlying parameters (income elasticities, industry shares) of the model are endogenous, what is the meaning of saying that long-run growth is “BP-constrained”?

Study Questions

1. In what sense is growth export-led in the export-led cumulative causation (ELCC) model? Is long-run growth also export-led in the balance-of-payments-constrained growth (BPCG) model? How are the two models similar and how do they differ, in regard to the causal role of exports and in their policy implications?
2. Why does the relative price (real exchange rate) play a decisive role in the ELCC model, but not in the BPCG model? How have some theorists sought to re-insert relative price (RER) effects into extended BPCG models?
3. Why does it make sense to regard ELCC as a growth model for the medium run (depicting a “conditional” or “provisional” equilibrium) and BPCG as a model for the long run? Does this mean that cumulative causation effects are unimportant in the long run? Why or why not?