Welfare and Growth in Open Economies

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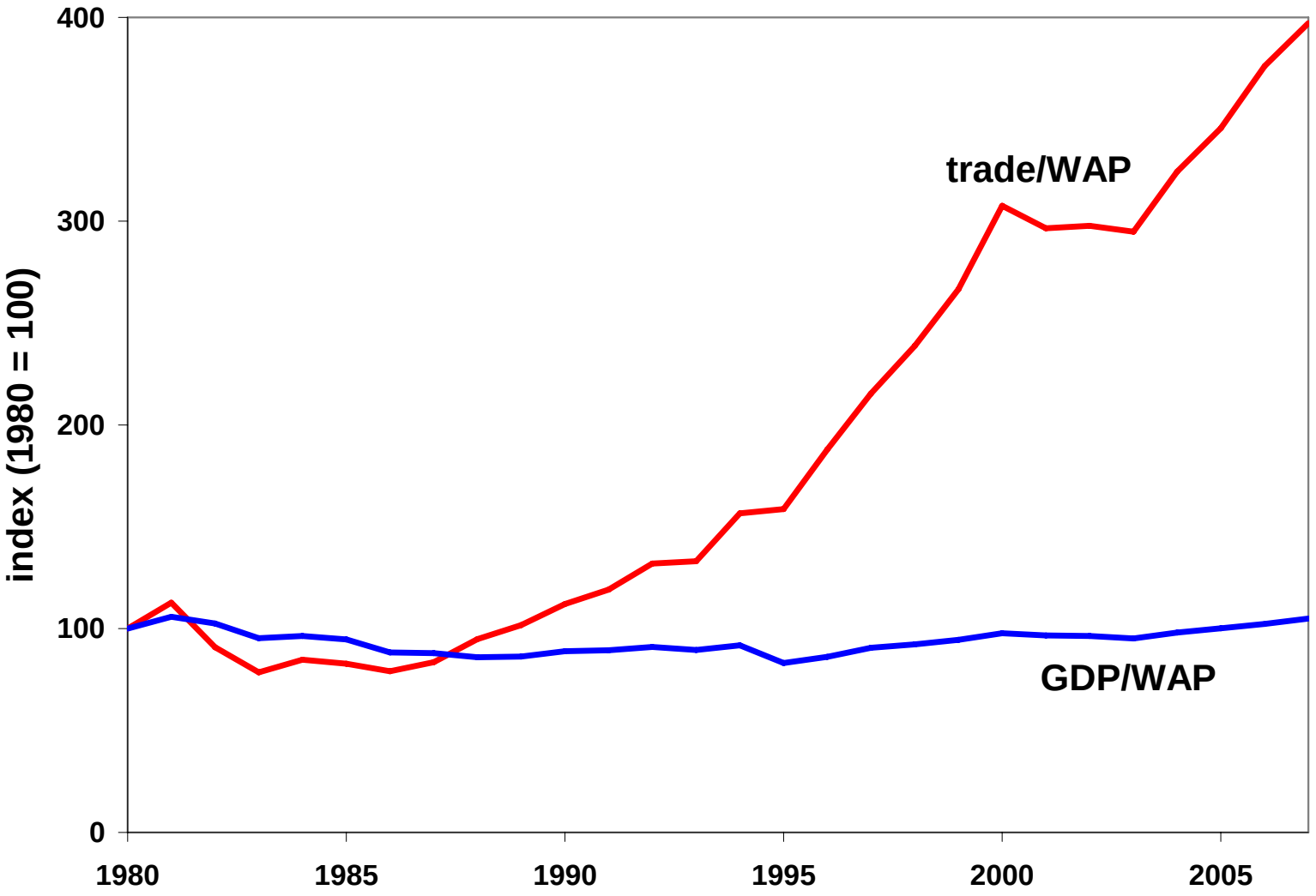
Has Mexico gained from trade?

- Has liberalized trade policy starting in mid 1980s.
- Has had dramatic increase in trade.
- Has had no increase in GDP per capita.

Mexican trade and growth



Does this imply that Mexico has not gained from trade?

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No!

How has Mexico gained from trade?

- We find gains from trade

  In welfare

  Not in real GDP per capita

- We need theory for welfare

Bajona, Gibson, Kehoe, and Ruhl (2009)

We need theory for welfare

- Two workhorse theories:

  Heckscher-Ohlin models

  Heterogeneous firm trade models

- Both theories tell us trade

  Increases welfare,

  Does not increase GDP.

Results extend to other theories — Ricardian models:
Eaton-Kortum (2002), Alvarez-Lucas (2007), Waugh (2007)

Heckscher-Ohlin models

Heckscher-Ohlin models

- In static model, opening to trade

  Increases welfare,

  Decreases GDP.

- In dynamic model, opening to trade

  Increases consumption in capital-poor countries,

  Decreases capital accumulation in capital poor countries.

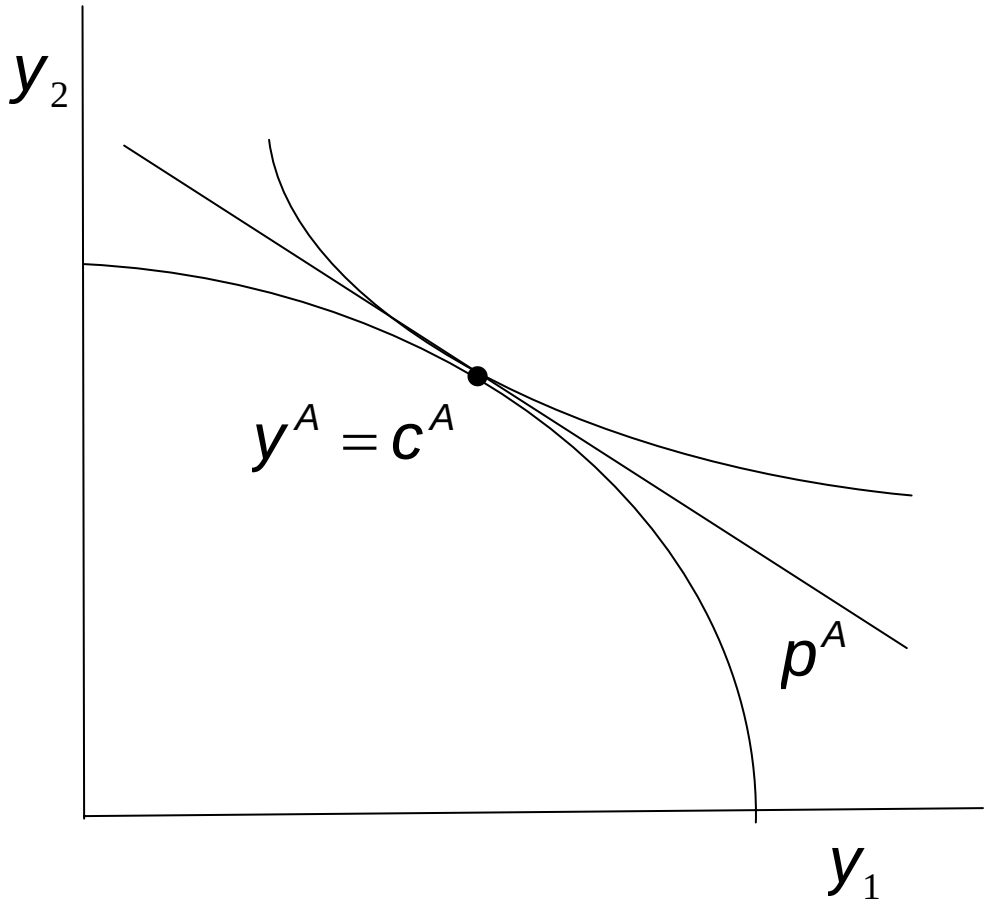
Static Heckscher-Ohlin

- 2 factors of production — physical capital, labor
- 2 goods — capital intensive, labor intensive
- Stylized analysis of trade liberalization

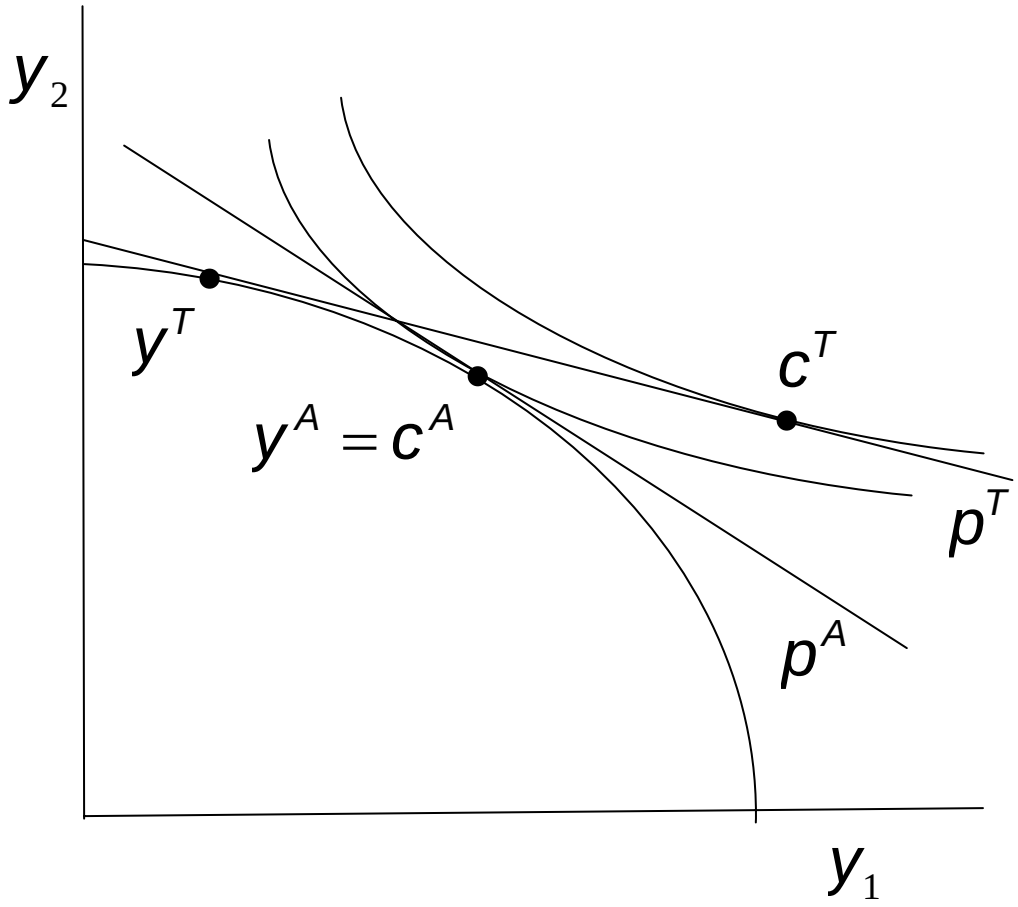
  autarky → free trade

What happens to trade and GDP when we open to trade?

Welfare: Start in autarky

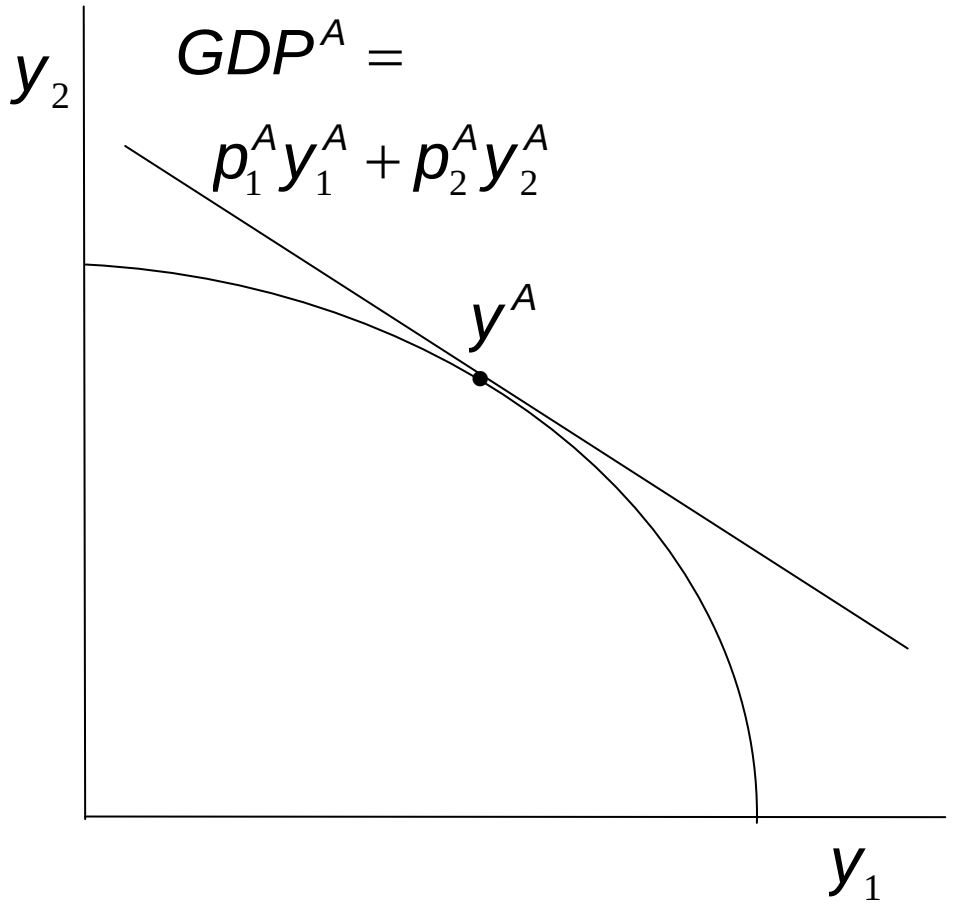


Welfare: Open to trade



Welfare increases

Real GDP: Start in autarky



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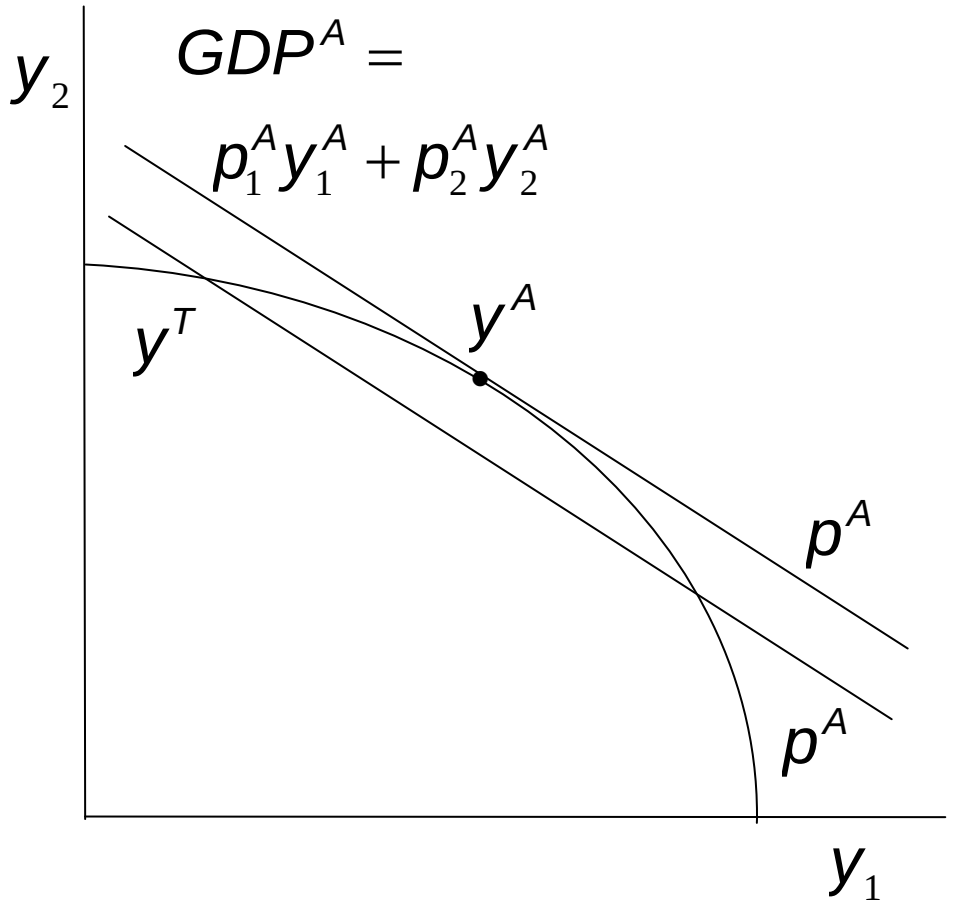
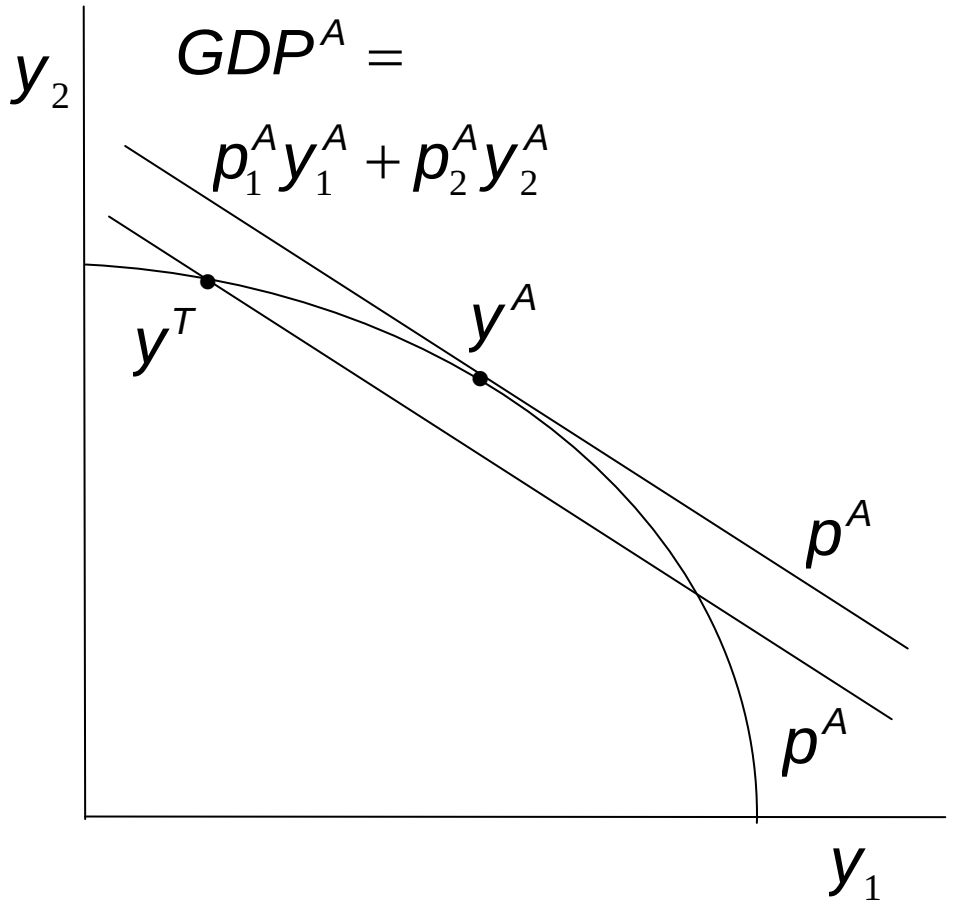


Real GDP decreases

Real GDP: Open to trade



What about capital accumualtion and growth?

Dynamic Heckscher-Ohlin

- 2 goods, 2 factors, n countries, populations L_i
- Goods mobile across countries, factors not mobile
- Infinitely-lived consumers

$$\max \sum_{t=0}^{\infty} \beta^t u(c_{1t}^i, c_{2t}^i)$$

$$\text{s.t. } p_{1t} c_{1t}^i + p_{2t} c_{2t}^i + x_t^i = w_t^i + r_t^i k_t^i$$

$$k_{t+1}^i - (1-\delta) k_t^i = x_t^i$$

$$c_{jt}^i \geq 0,\ x_t^i \geq 0$$

$$k_0^i = \bar{k}_0^i.$$

- Investment good

$$k_{t+1}^i - (1-\delta) k_t^i = x_t^i = f(x_{1t}^i, x_{2t}^i)$$

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This is potentially very complicated!

Simplifying assumptions

- Factor intensities are extreme:

$$\phi_1(k_1, \ell_1) = k_1$$

$$\phi_2(k_2, \ell_2) = \ell_2.$$

- Utility function is transformation of investment function:

$$u(c_1, c_2) = \log\big(f(c_1, c_2)\big).$$

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Bajona-Kehoe (2006a, 2006b) generalize Ventura (1997).

Simpler Problem

We solve for the equilibrium of the world economy by solving

$$\max \sum_{t=0}^{\infty} \beta^t \log c_t$$

$$\text{s.t. } c_t + x_t = f(k_t, 1)$$

$$k_{t+1} - (1-\delta)k_t = x_t$$

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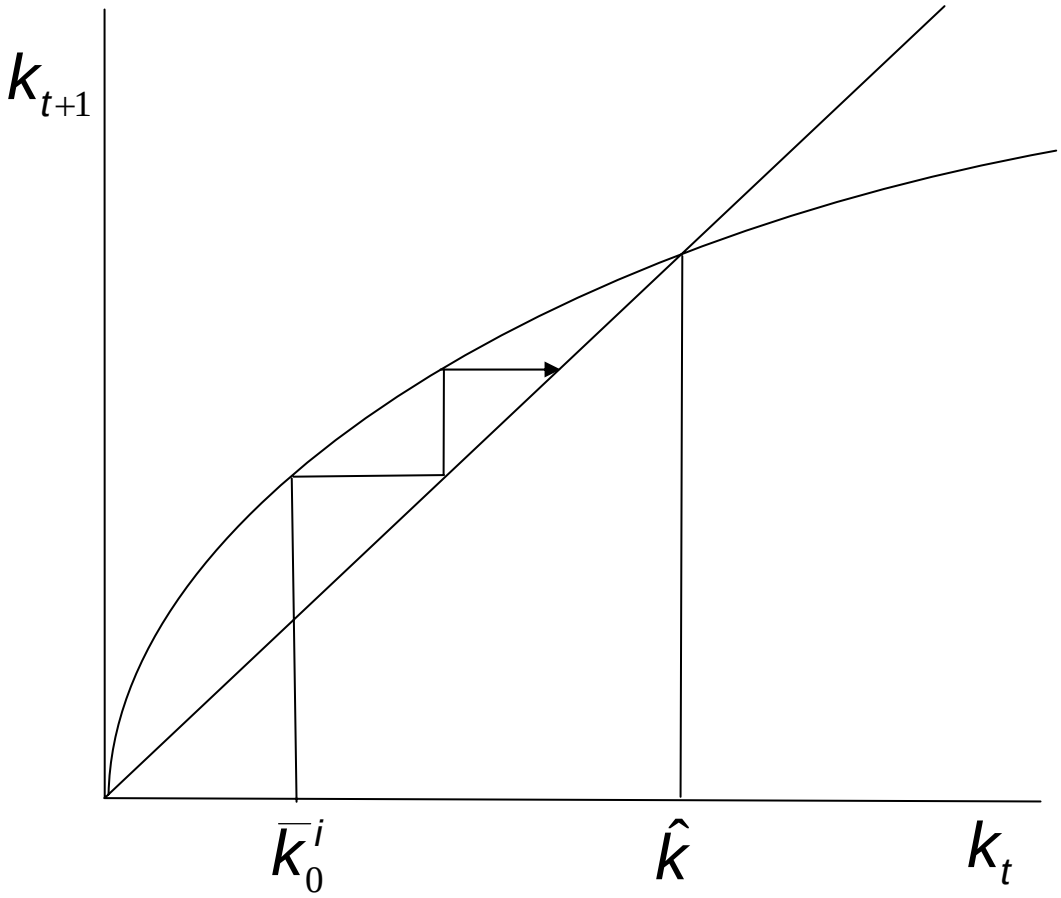
Growth model in first-year macro,

especially case where $\delta = 1$ and $f(k,1) = dk^{a_1}$.

Convergence of closed countries



Intuition

- In a world of closed countries,

  Rental rates higher in poorer countries than in richer,

  Poorer countries grow faster.

- In a world of open countries,

  Rental rates same in poorer countries as in richer,

  No convergence in cross section.

Proposition

Define GDP per capita in i:

$$y_t^i = p_{1t} y_{1t}^i + p_{2t} y_{2t}^i = r_t k_t^i + w_t = f(k_t^i, 1).$$

Suppose that $\delta = 1$, then

$$\frac{y_t^i - y_t}{y_t} = \frac{c_t / y_t}{c_0 / y_0} \left(\frac{y_0^i - y_0}{y_0} \right).$$

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Notice that

- c_t / y_t comes from solution to the one-sector model
- If c_t / y_t increases, income levels diverge.
- If c_t / y_t decreases, income levels converge.

Proposition

$$\frac{y_t^i - y_t}{y_t} = \frac{c_t / y_t}{c_0 / y_0}\left(\frac{y_0^i - y_0}{y_0}\right)$$

$f(x_1, x_2) = d x_1^{a_1} x_2^{a_2}$

$\Rightarrow$ c_t / y_t constant

$\Rightarrow$ no convergence in cross section

$f(x_1, x_2) = d\left(a_1 x_1^b + a_2 x_2^b\right)^{1/b}$, $b < 0$

$\Rightarrow$ c_t / y_t increases as the world economy grows

$\Rightarrow$ divergence in cross section

What happens to poor country's welfare?

- Answer: it increases

  $t = 1$: static gains due to change in prices

  $t > 1$: dynamic gains due to saving less

- Gain depends on elasticity of substitution, factor intensities, discount factor.

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Trade equilibrium allocation is in the core: a closed economy always gains from opening to trade.

What happens to poor country's real GDP?

- Answer: it decreases

  $t = 1$: static decrease due to change in prices

  $t > 1$: slower capital accumulation due to lower rental rate

- Loss depends on elasticity of substitution, factor intensities, discount factor.

Heterogeneous firm trade models

Heterogeneous firm models

Opening to trade

- Increases welfare
- Does not change real GDP (with popular functional forms)

Gibson (2007)

Heterogeneous firm models

- Consumers

  Preference for variety: $u(c) = (1/\rho)\log\int_z c(z)^{\rho}\, dz$

- Firms

  Monopolistic competition

  Heterogeneous productivities: $x \sim 1-\gamma(\theta / x)^{\gamma}$

  Fixed cost of production

Melitz (2003), Chaney (2008)

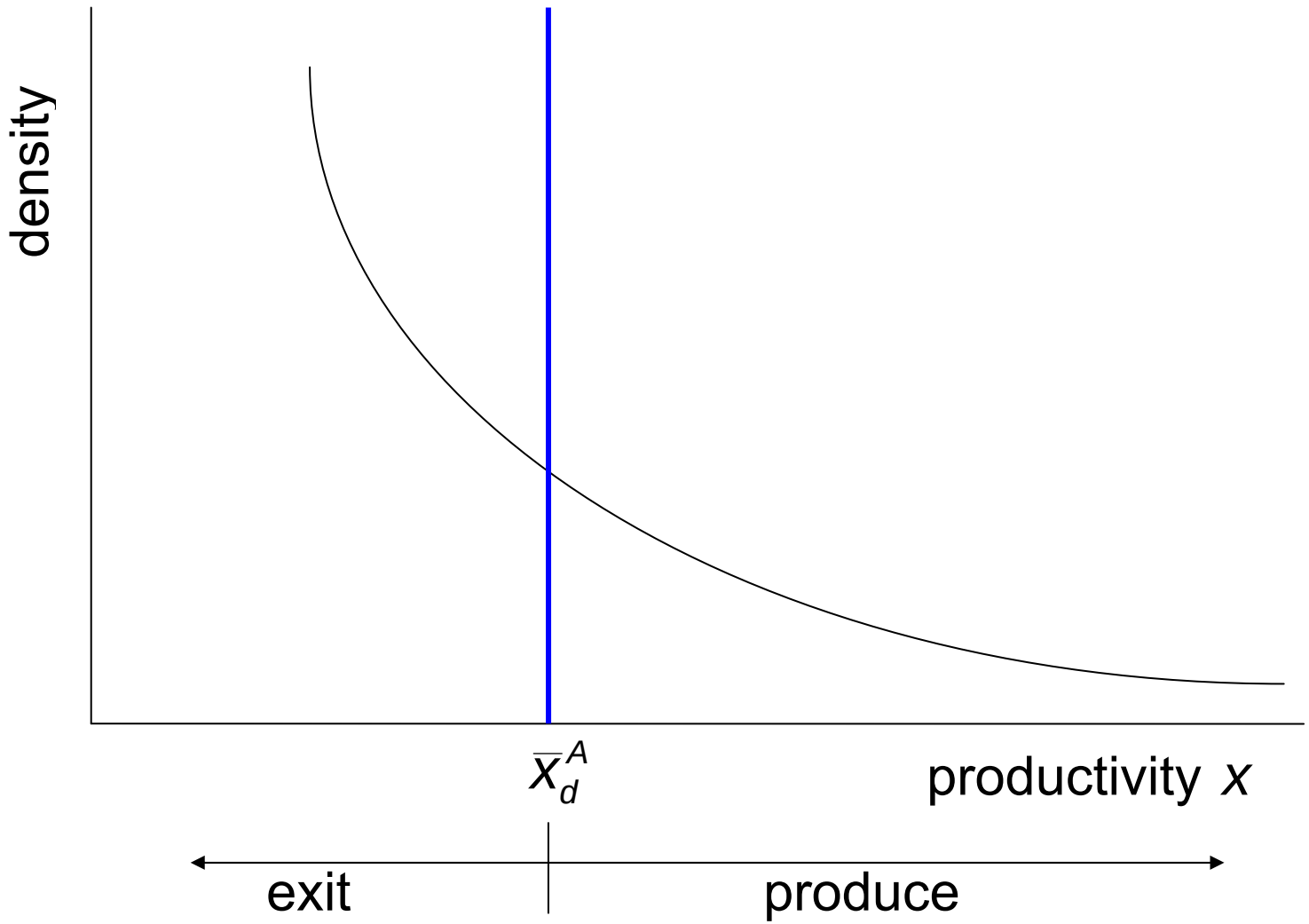
Start in autarky

- Cutoff productivity

  Firms with $x < \bar{x}_d^A$ do not produce

  Firms with $x > \bar{x}_d^A$ produce for domestic market

Start in autarky



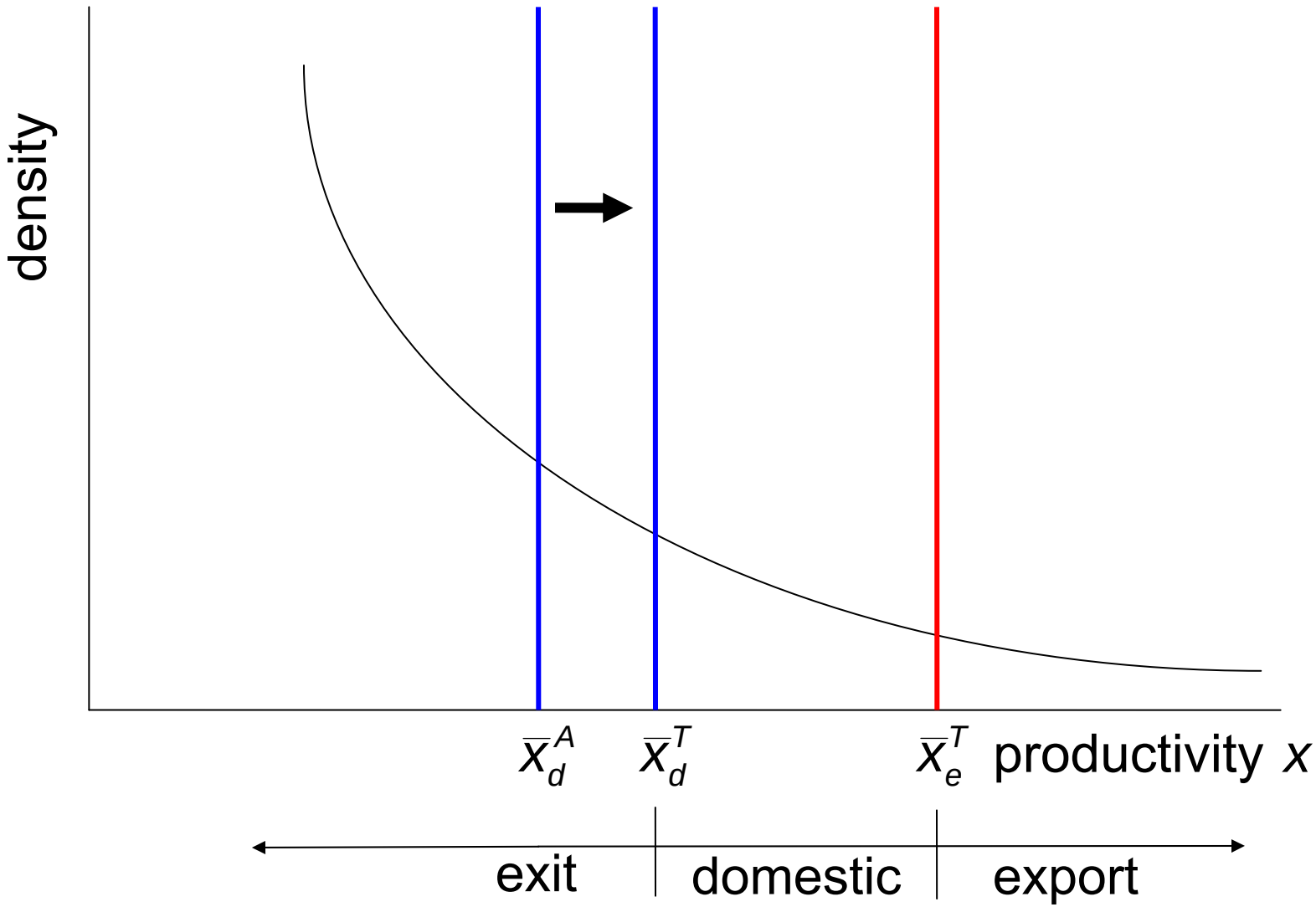
Open to trade

- 2 symmetric countries
- Additional fixed cost to export
- New cutoff productivity

  Firms with $x < \bar{x}_e^T$ do not export

  Firms with $x \geq \bar{x}_e^T$ export

Open to trade



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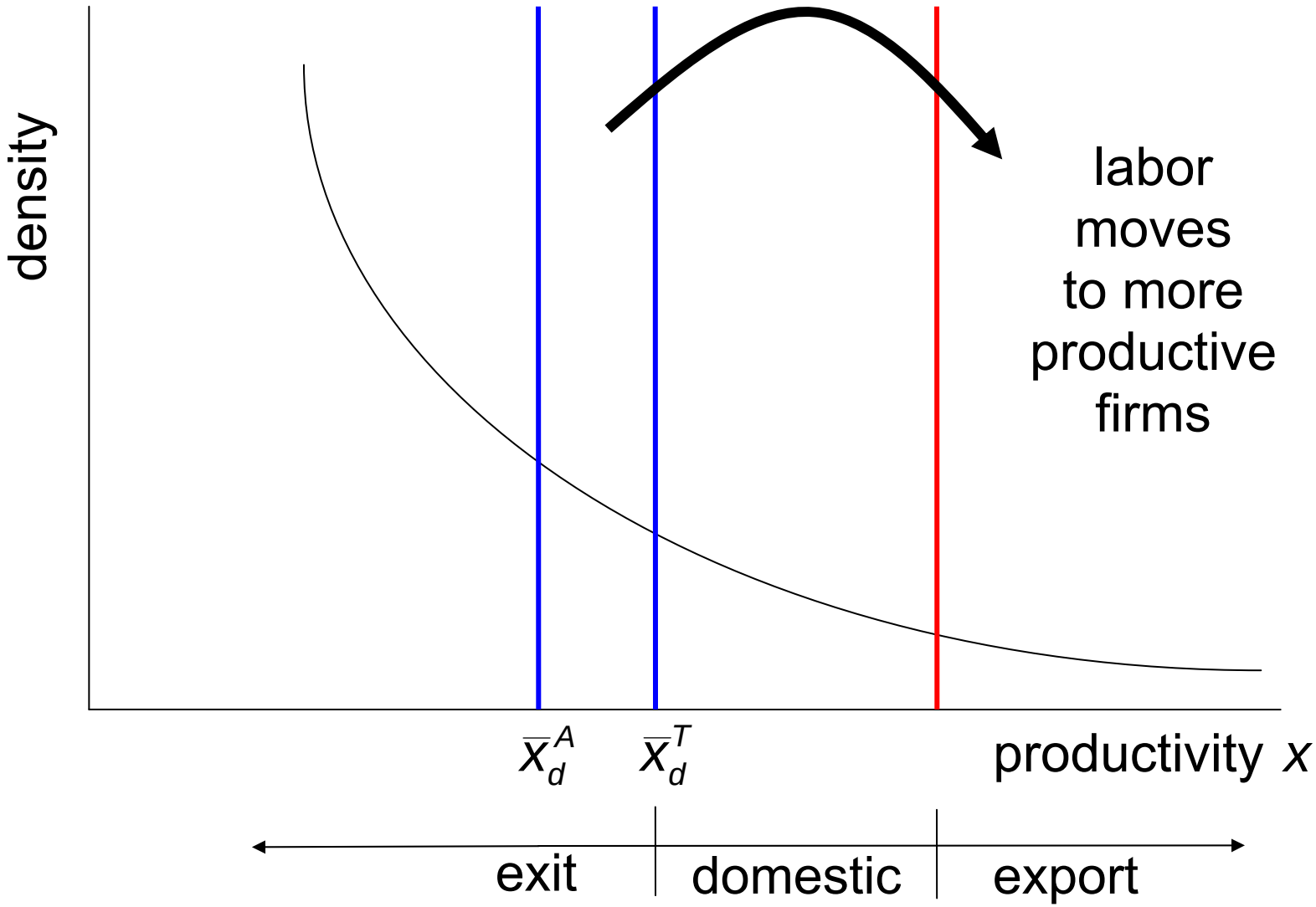

What happens to welfare?

- More physical units of goods
- Gain depends on

  Elasticity of substitution

  Distribution of productivities

Feenstra (1994), Klenow-Rodriguez-Clare (1997), Broda-Weinstein (2006)

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In Melitz model, number of varieties consumed goes down.

What happens to real GDP?

$$GDP^A = \mu \int_{\bar{x}_d^A}^{\infty} p^A(x) y^A(x) dF(x)$$

$$GDP^T = \mu \int_{\bar{x}_d^T}^{\infty} p^A(x) y^T(x) dF(x)$$

With C.E.S. utility,

$$p^T(x) = p^A(x) = \frac{w}{\rho x}.$$

More efficient firms have larger markets only because they charge lower prices.

What happens to real GDP?

- Labor moves from low productivity to high productivity firms

Increases GDP

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Increases GDP

- Labor moves from high price to low price firms

Decreases GDP

What happens to real GDP?

- Labor moves from low productivity to high productivity firms

Increases GDP

- Labor moves from high price to low price firms

Decreases GDP

With C.E.S. and Pareto,

these two forces exactly cancel out.

GDP is unchanged.

Lessons from theory

- Match concepts in theory with those in data.
- Measure gains in welfare, not in GDP per capita.
- Tell Mexican friends not to worry.

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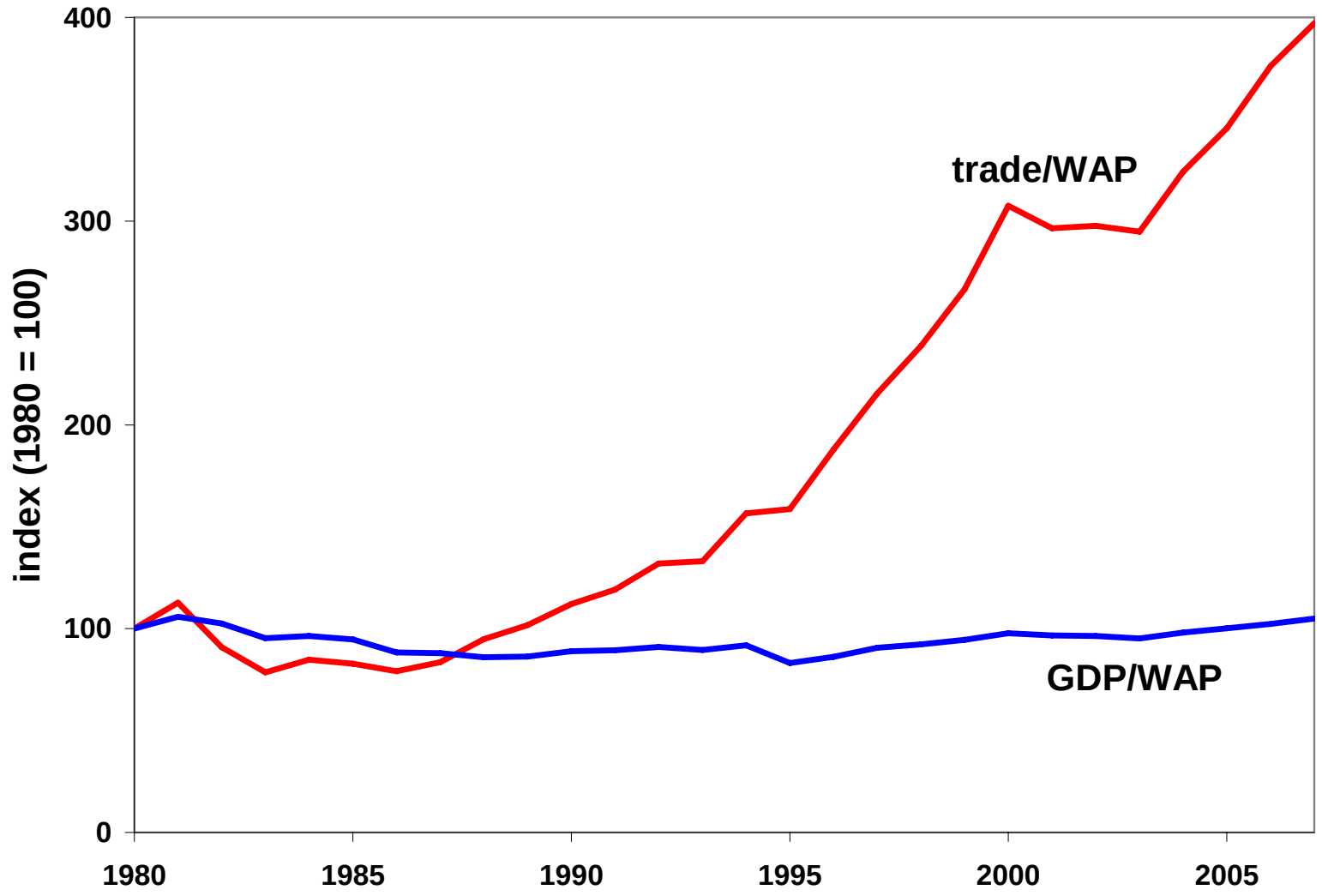
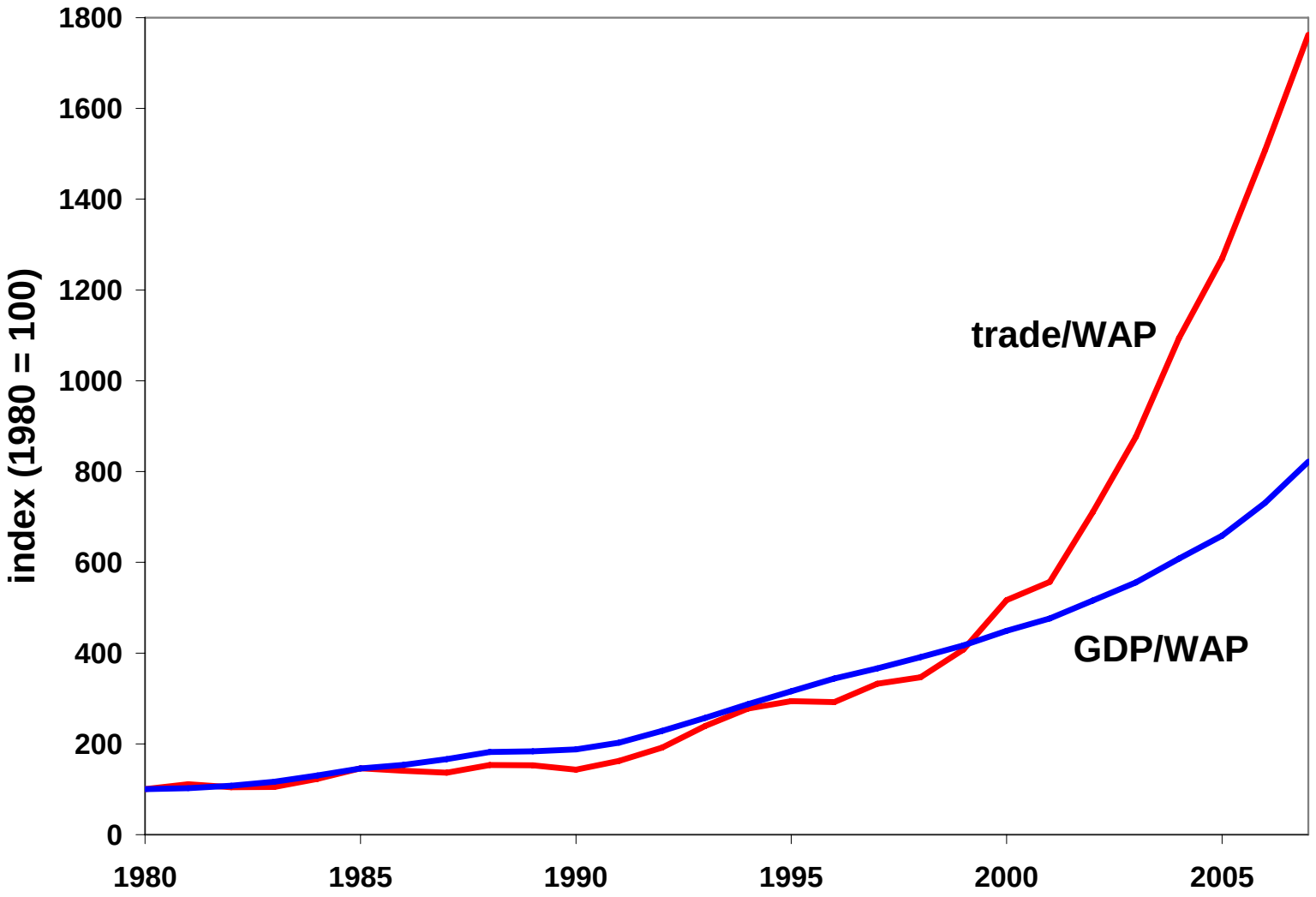
…or should they?

Mexican trade and growth



What about China?

Chinese GDP per capita has grown

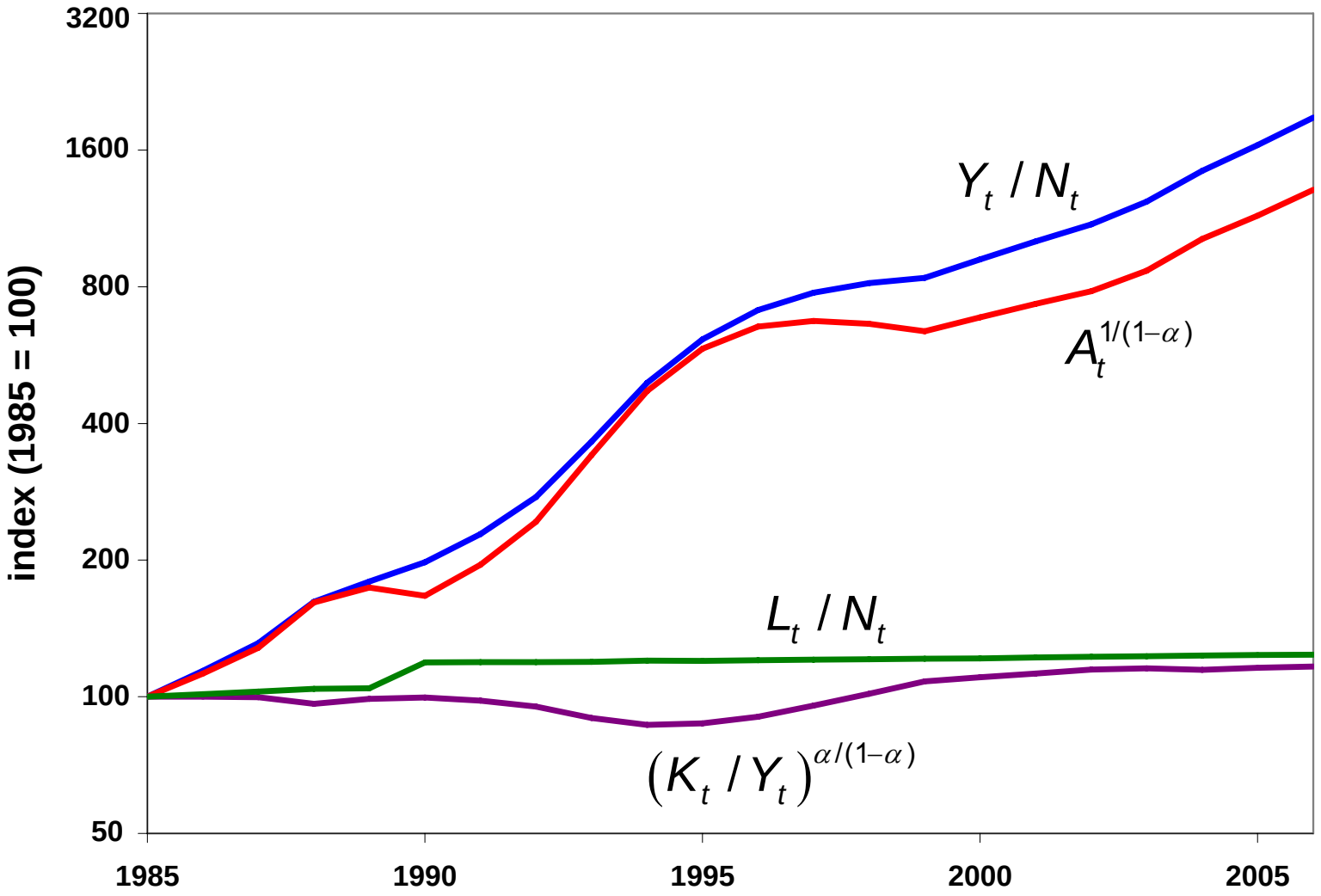


Growth accounting for China

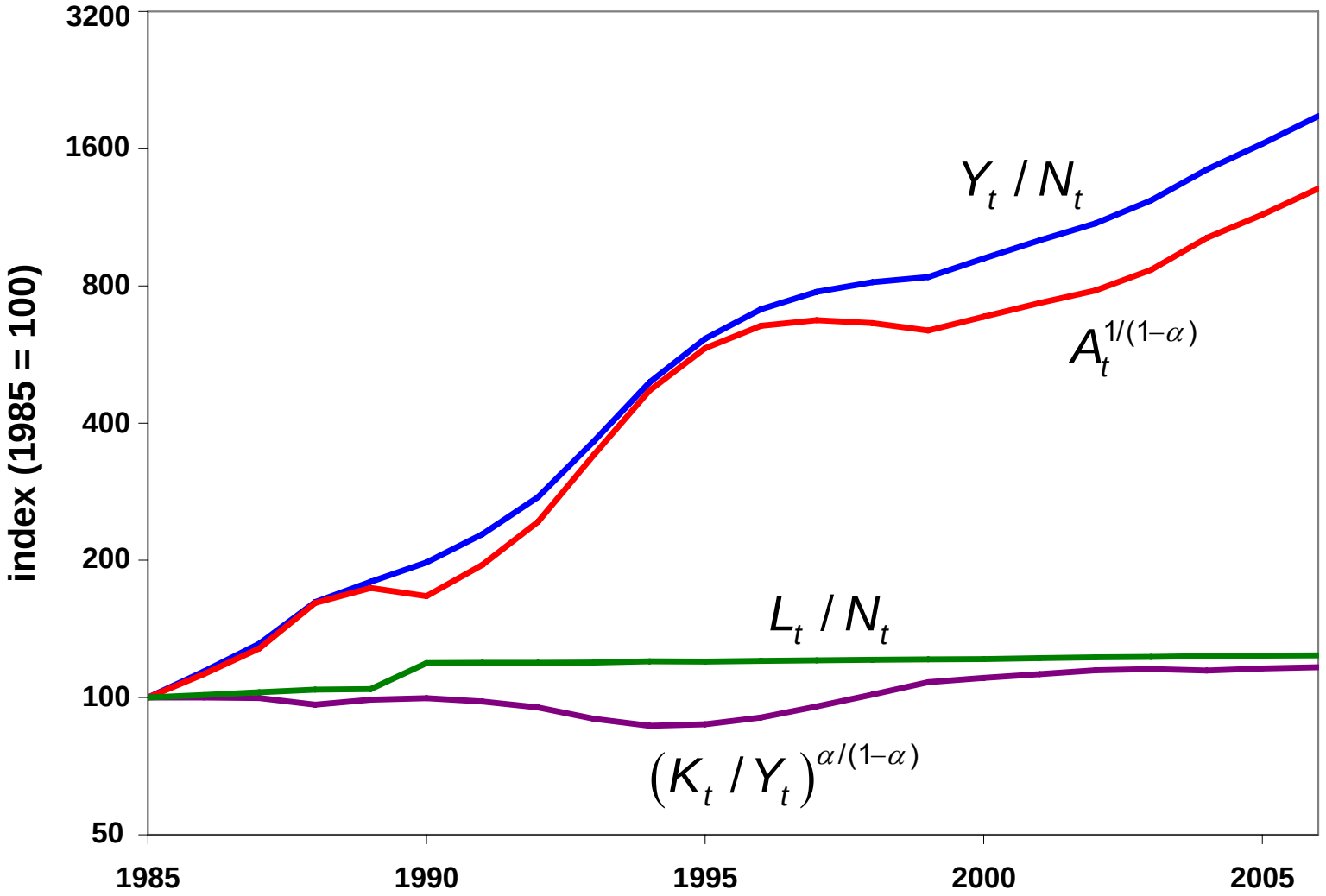
$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$$

$$\frac{Y_t}{N_t} = A_t^{1/(1-\alpha)} \left(\frac{K_t}{Y_t} \right)^{\alpha/(1-\alpha)} \frac{L_t}{N_t}$$

Growth accounting for China



Chinese growth has been driven by productivity



Standard trade theory does not explain productivity growth.

What theories of openness can do so?

Induced technological change: Costantini-Melitz (2007), Gibson (2007), Holmes-Schmitz (2001), Schmitz (2005)

Technology transfer through FDI: Helpman-Melitz-Yeaple (2004), McGrattan-Prescott (2007), Ramondo-Rodriguez-Clare (2008)

Incentives for internal reforms: Bajona-Chu (2008)