

**“North-South Trade and Food Standards:  
What Can Equilibrium Analysis Tell Us?”**

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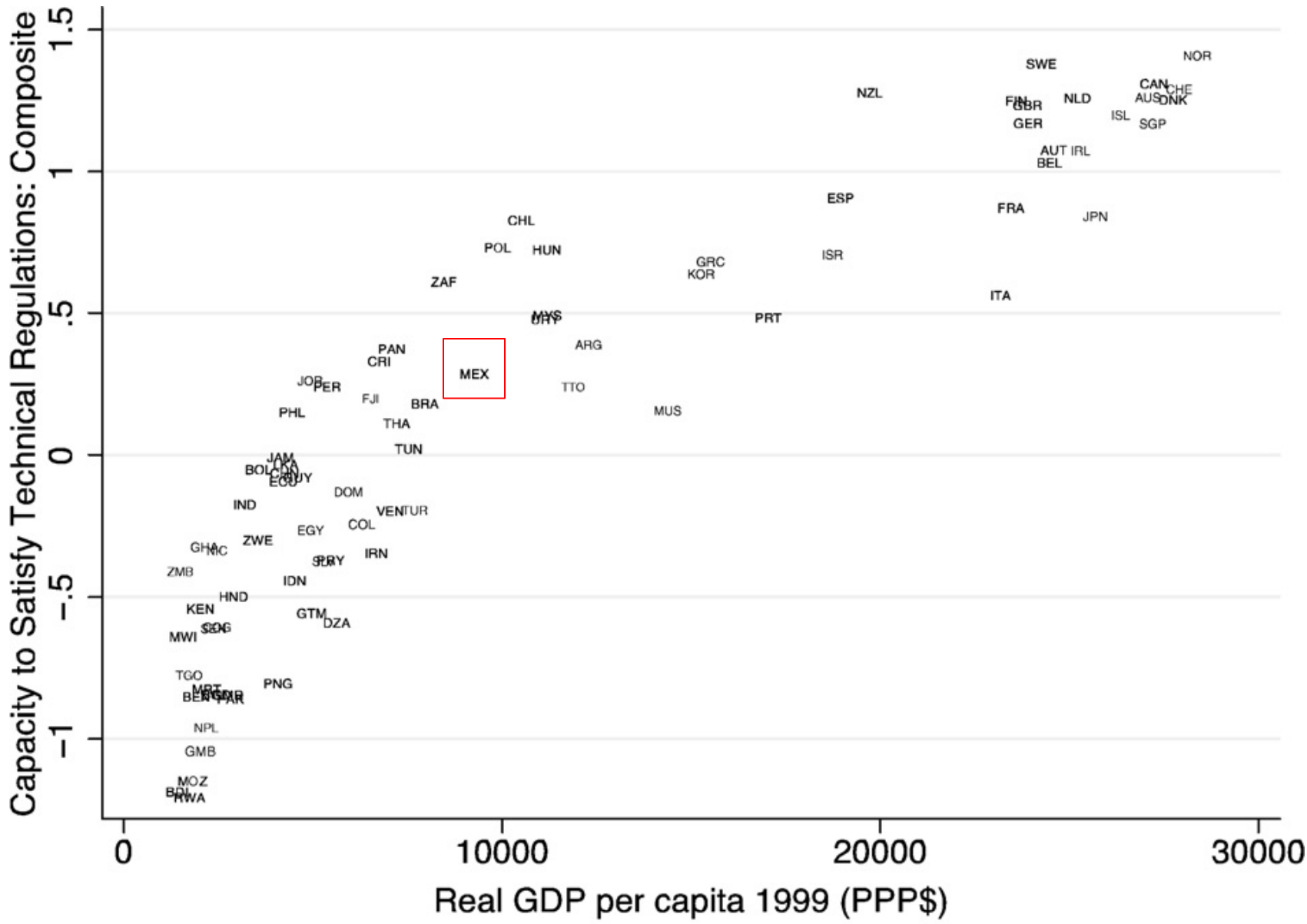
## **Motivation**

**Standards often justified as solving for specific market failures, e.g., externalities, public goods, and imperfect information (Casella, 1996)**

**Developing countries hampered in ability to meet standards due to lack of necessary human capital, and poor governance (Maskus and Wilson, 2001)**

**Essaji (2008) presents empirical evidence to support notion that capacity to satisfy standards is correlated with GDP, developing countries specializing away from industries with heavier regulatory burdens**

**How far can one get with general equilibrium model of trade with standards that captures stylized facts?**



Source: Essaji (2008)

# General Equilibrium - Production

Adapt model of Copeland and Taylor (1994)

Assume developed North, and less developed South, producing along a continuum of goods  $z \in [0,1]$ , with one input, effective labor  $l$

Local public bad  $b$  produced jointly with  $z$ , and output  $y$  of good  $z$  is function of  $b$  and  $l$ :

$$(1) \quad y(b, l; z) = \begin{cases} l^{1-\alpha(z)} b^{\alpha(z)} & \text{if } b \leq \lambda l \\ 0 & \text{if } b > \lambda l \end{cases}$$

where  $\lambda > 0$ ,  $\alpha(z)$  varies across goods, and assuming:

$$\alpha(z) \in [\bar{\alpha}, \hat{\alpha}], \text{ with } 0 < \bar{\alpha} < \hat{\alpha} < 1$$

## General Equilibrium - Production

(1) available to North and South, and each has same number of workers  $L$ , supply of effective labor being  $A(h)L > A(h^*)L$ , where  $h$  is human capital/worker, and  $h > h^*$  (\* denotes South)

Standard  $s$ , set for level of public bad, varies in income  $I$  - modeled as compliance costs  $c_b$

Given effective wage  $w_e$  cost minimization implies:

$$(2) \quad \frac{w_e}{c_b} = \frac{1 - \alpha(z) b}{\alpha(z) I}$$

Share of costs in meeting standard is  $\alpha(z)$ , goods being ordered in terms intensity of  $b$ ,  $\alpha'(z) > 0$

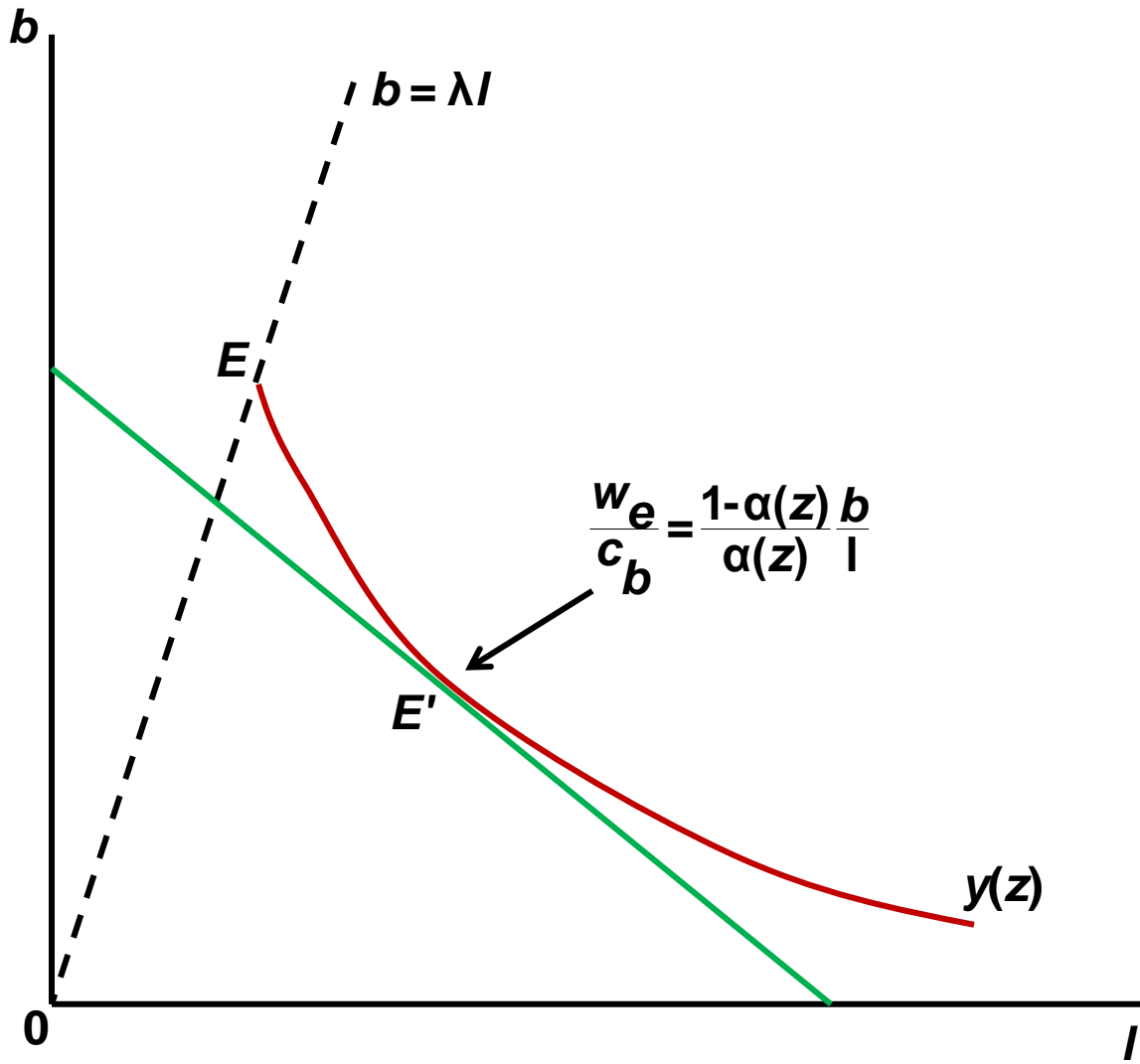


Figure 1

## General Equilibrium - Consumption

Consumers in North and South have identical indirect utility functions,  $z$  and  $b$  being separable in utility, and share of spending on  $z$  is constant:

$$(3) \quad V = \int_0^1 f(z) \ln[x(z)] dz - \int_0^1 f(z) [\ln p(z)] dz + \ln i - \frac{\beta D^\gamma}{\gamma}$$

$x(z)$  is consumption of  $z$ ,  $f(z)$  is budget share for each good in continuum,  $\int_0^1 f(z) dz = 1$

$p(z)$  is continuum of prices and  $i = Y/L$  is income per capita

$D$  is aggregate production of public bad;  $\beta$  is disutility from public bad,  $\gamma \geq 1$  implies willingness to pay for reducing bad is non-decreasing in level of bad

## General Equilibrium – Comparative Advantage

Given (1) and (2), unit cost function is:

$$(4) \quad a(w, p_b; h, z) = \Omega(z) p_b^{\alpha(z)} [w / A(h)]^{1-\alpha(z)}$$

$\Omega(z) \equiv \alpha^{-\alpha} (1-\alpha)^{-(1-\alpha)}$ , and  $w$  is wage rate for raw labor

$z$  produced in North if:  $a(w, p_b; h, z) \leq a^*(w^*, p_b^*; h^*, z)$ ,

$$(5) \quad \tilde{\omega} \equiv \frac{w}{w^*} \leq \frac{A}{A^*} \left( \frac{c_b^*}{c_b} \right)^{\alpha(z)/(1-\alpha(\tilde{z}))} \equiv T(\tilde{z})$$

$T(z)$  is decreasing in  $z$  as  $c_b > c_b^*$ , and  $\alpha'(z) > 0$

For any  $\omega$ ,  $T(z)$  determines point where goods are produced in North  $z \in [0, \tilde{z}]$ , and South  $z \in [\tilde{z}, 1]$



## General Equilibrium – Trade Balance

Income spent on Northern and Southern goods:

$$(6) \quad \psi(\tilde{z}) \equiv \int_0^{\tilde{z}} f(z) dz$$

$$\psi^*(\tilde{z}) \equiv \int_{\tilde{z}}^1 f(z) dz$$

Balanced trade defined as:

$$(7) \quad \psi^*(\tilde{z})wL = \psi(\tilde{z})w^*L^*$$

$$(8) \quad \tilde{\omega} = \frac{\psi(\tilde{z})}{\psi^*(\tilde{z})} \equiv B(\tilde{z})$$

Combining  $T(z)$  and  $B(z)$ , determines  $\tilde{z}$  and  $\tilde{\omega}$  (Fig.2)

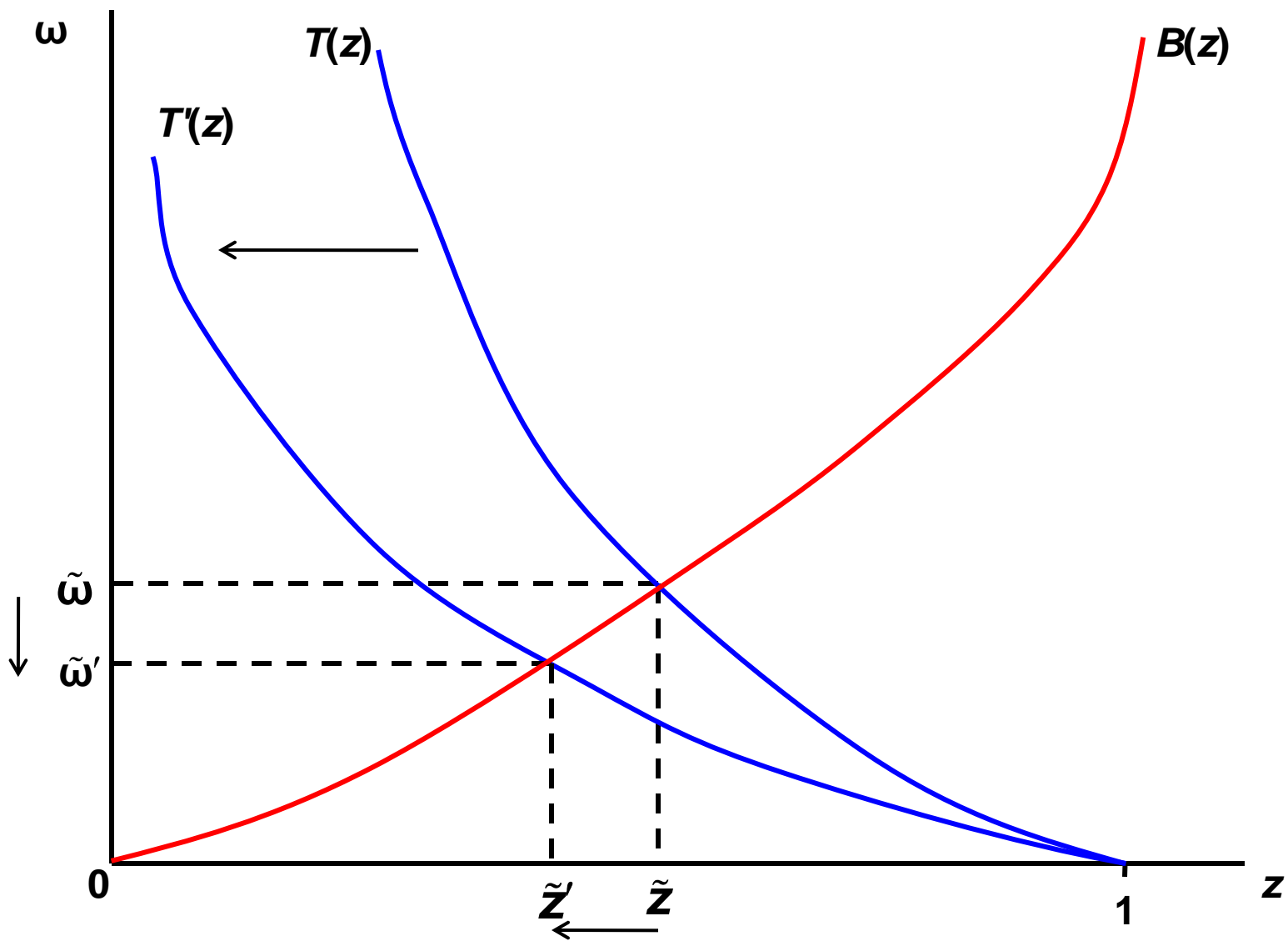


Figure 2

## Standards as “barriers” to trade

Suppose public bad in South has spillover effects in North, e.g., pesticide residues in food

Northern standards applied to imports from South, but Southern producers unable to meet higher compliance costs in North due to  $h > h^*$

Treat higher compliance costs in North as iceberg transport costs  $g^*$  facing exports from South to North,  
 $a(.) \leq [a^*(.)] / g^*$

In Fig.3 range of non-traded goods ( $\tilde{z} - \tilde{z}'$ ) with new schedule,  $T'(\tilde{z}) / g^*$

Standards are “barriers” to trade – not necessarily protectionist if they satisfy GATT Article III and SPS

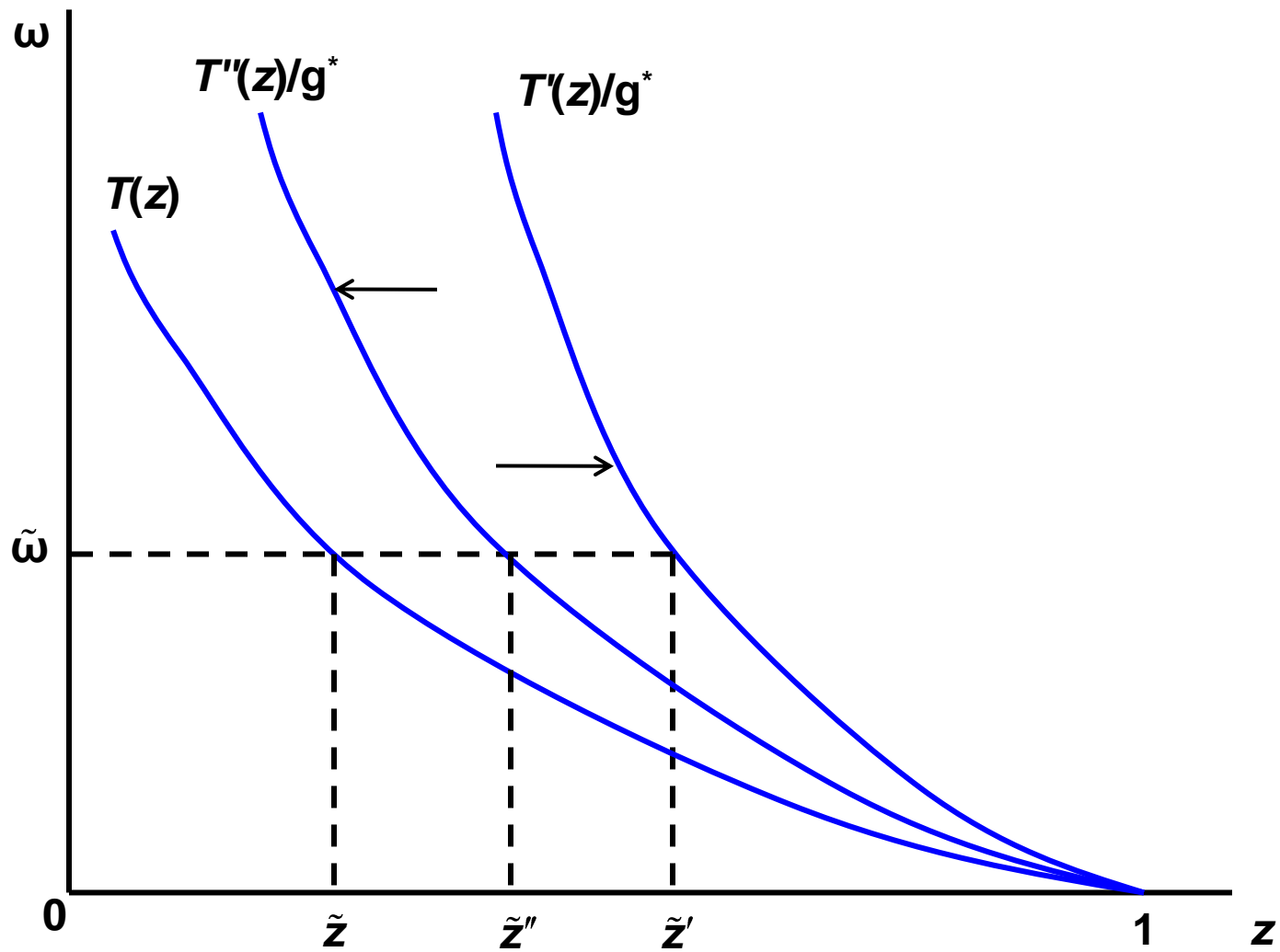


Figure 3

## **Standards as “catalysts” or aid for trade?**

**Claimed South will innovate in face of higher standards in North (Henson and Jaffee, 2008)**

**Increase in  $h^*$  causes  $T'(\tilde{z})/g^*$  to shift to  $T''(\tilde{z})/g^*$**

**However considerable doubt raised about idea of regulatory-induced innovation (Palmer *et al.*, 1995)**

**Increase in  $h^*$  also observationally equivalent to aid for trade (and activities of MNCs)**

**Aid for trade can generate labor-augmenting technical change in South through increasing  $h^*$ , resulting in downward shift in  $T(\tilde{z})$  (see Fig.2)**

**Quite different to direct aid which causes upward shift in  $T(\tilde{z})$  due to income effects in North**

## **Conclusions**

**Standards can be benign where public bad is local, and South has less human capital than North – over time growth in South results in convergence**

**Where there is potential for spillover effects, higher standards in North may be “barrier” to trade – although not necessarily protectionist**

**Limited theoretical and empirical support for notion of standards as “catalysts” to trade – need robust theory of regulatory-induced innovation**

**Aid for trade may be optimal approach for helping South deal with higher standards in North – needs empirical research on impact**