Trade Volume and Economic Growth

2014/06/16

Shun-Fa Lee
Department of Industrial Economics, Tamkang University, Taiwan

Trade Openness
Benefits
Economic Growth?

Empirical Studies

♦ Rodriguez and Rodrik (2001) and Winters (2004): empirical studies are fragile.

The results are crucially dependent on the variables selection for trade openness and independent variables in the regressions.

Trade restriction perspective

♦ highly debated

Yanikkaya (2003), DeJong and Ripoll (2006), Lee et al. (2004), Billmeier and Nannicini (2009)

(1) Tariffs

(2) Non-tariff barriers to trade: (Import licenses, Export licenses, Import quotas, Subsidies, Voluntary Export Restraints, anti-dumping duties, excessive standards, bureaucratic creativity etc.)

(3) manipulation of the exchange rate

Trade volume perspective

♦ unanimity: trade volume and economic growth are positive correlated

Frankel and Romer (1999), Irwin and Terviö (2002), Yanikkaya (2003), Alcala and Ciccone (2004), Noguer and Siscart (2005) and Chang et al. (2009).

Theoretical literatures

♦ Controversial results: trade volume may benefit or harm economic growth

♦Trade restriction

♦R&D-based endogenous growth models

Romer (1990), Grossman and Helpman (1990), Rivera-Batiz and Romer (1991a), Dinopoulosa and Segerstrom (1999), Baldwin and Robert-Nicoud (2008) and Gustafsson and Segerstrom (2010)

♦ capital-accumulating endogenous growth models

Naito (2006b), Lee(2011)

♦trade volume

Osang and Pereira (1997), Doi et al. (2007)

Framework

♦ Trade volume: the ratio of exports plus imports to GDP

♦ Two countries (Home and Foreign) and two goods

♦Only one input: capital

♦Two goods are tradable, capital stock is not internationally mobile.

♦ international knowledge spillover: production externality

Coe and Helpman (1995), Ghosh and Mourmouras (2002) and Lee (2011)

Model Introduction

Firms in the two countries

- Production function of good *i* in the Home country is:

$$Y_i = A_i K_i^{1-\alpha} \bar{K}^{*\alpha}, \quad i=1, 2, \qquad (1)$$

where $i=1$ (resp. 2) corresponds to the consumption (resp. investment) good

$K = K_1 + K_2$,

Domestic firms: $\pi_1 = pY_1 - rK_1$ and $\pi_1 = Y_2 - rK_2$

Production function of good *i* in the Foreign country is:

$$Y_i^* = A_i^* K_i^{*1-\alpha} \bar{K}^{\alpha}, \quad i=1, 2,$$

Foreign firms: $\pi_1^* = pY_1^* - rK_1^*$ and $\pi_1^* = Y_2 - rK_2$

Households in the two countries

Home's Household's budget constraint:

$$rK + \pi = pC + I,$$

Capital accumulation is:

$$\dot{K} = I.$$

Lifetime utility:

$$U = \int_0^{\infty} e^{-\rho t} \ln C dt,$$

The behavior of Foreign's household is the same with $\rho = \rho^*$.

World Market Equilibrium

For free trade, the world commodity market-clearing condition for the consumption goods is:

$$C + C^* = Y_1 + Y_1^* .$$

Transformation

Denote $z=K^*/K$, $x=pC/K$, $x^*=pC^*/K^*$, $v=K_1/K$, and $v^*=K_1^*/K^*$.

$$x + x^* z = A_2 \left(\frac{z}{1-v} \right)^{\alpha} v + A_2^* \left[\frac{1}{(1-v^*)z} \right]^{\alpha} v^* z.$$

$$\left(\frac{v}{1-v} \right)^{\alpha} = \frac{A_1 A_2^*}{A_1^* A_2} \left(\frac{v^*}{1-v^*} \right)^{\alpha}.$$

$$\frac{\dot{x}}{x} = \frac{\dot{p}}{p} + \frac{\dot{C}}{C} - \frac{\dot{K}}{K} = x - \alpha A_2 \left(\frac{z}{1-v} \right)^{\alpha} - \rho.$$

$$\frac{\dot{x}^*}{x^*} = x^* - \alpha A_2^* \left[\frac{1}{(1-v^*)z} \right]^{\alpha} - \rho.$$

$$\frac{\dot{z}}{z} = \frac{\dot{K}^*}{K^*} - \frac{\dot{K}}{K} = A_2^* \left[\frac{1}{(1-v^*)z} \right]^{\alpha} - A_2 \left(\frac{z}{1-v} \right)^{\alpha} + x - x^*.$$

Long-Run Equilibrium

$$\left(\frac{\tilde{v}}{1-\tilde{v}}\right)^{\alpha} = \frac{A_1 A_2^*}{A_1^* A_2}\left(\frac{\tilde{v}^*}{1-\tilde{v}^*}\right)^{\alpha}.$$

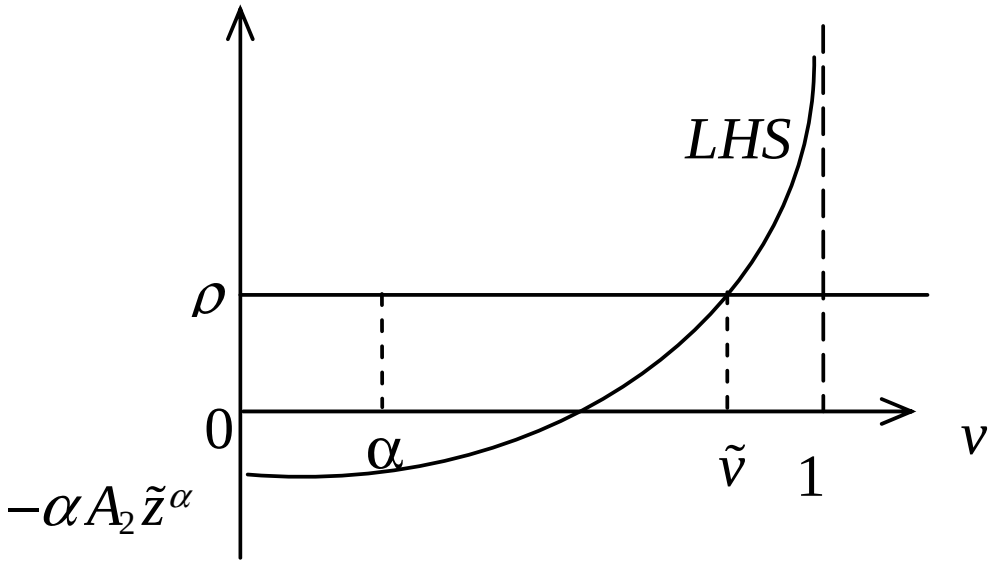
$$(1-\alpha)A_2\left(\frac{\tilde{z}}{1-\tilde{v}}\right)^{\alpha} - \rho = (1-\alpha)A_2^*\left[\frac{1}{(1-\tilde{v}^*)\tilde{z}}\right]^{\alpha} - \rho.$$

$$\Rightarrow \frac{A_2}{(1+\tilde{z})}\left(\frac{\tilde{z}}{1-\tilde{v}}\right)^{\alpha}[\tilde{v}-\alpha+\tilde{z}(\tilde{v}^*-\alpha)] = \rho$$

This equation determine $\tilde{v}$ uniquely.

Long-Run Equilibrium

Figure 1: long-run equilibrium



The long-run equilibrium is uniquely determined with incomplete specialization in each country.

Comparative static analysis for trade volume and growth

Trade Volume and Growth

Trade volume:

$$T = \frac{p(\tilde{C} - \tilde{Y}_1) + \tilde{Y}_2 - \tilde{I}}{pY_1 + Y_2} = \left[\frac{\rho}{A_2} \left(\frac{1-\tilde{v}}{\tilde{z}} \right)^{\alpha} - (\tilde{v} - \alpha) \right] - \tilde{z} \left[\frac{\rho}{A_2} \left(\frac{1-\tilde{v}}{\tilde{z}} \right)^{\alpha} - (\tilde{v}^* - \alpha) \right].$$

Growth:

$$g = (1-\alpha) A_2 \left(\frac{\tilde{z}}{1-\tilde{v}} \right)^{\alpha} - \rho.$$

Exogenous variation is only from production coefficients in both countries

Assume $A_1/A_2 = A_1^*/A_2^*$ at the beginning.

$\tilde{v} = \tilde{v}^*$, $\tilde{C} = \tilde{Y}_1$ and $\tilde{C}^* = \tilde{Y}_1^*$ which means this economy is like an autarkic economy

A_2 on trade Volume

Assume we change the value of A_2 and hold the other parameter values constant.

We assume A_2 increases a little bite such that $A_1/A_2<A_1^*/A_2^*$ and

$\tilde{v} < \tilde{v}^*$

$$\left[\frac{\rho}{A_2}\left(\frac{1-\tilde{v}}{\tilde{z}}\right)^{\alpha}-(\tilde{v}-\alpha)\right]+\tilde{z}\left[\frac{\rho}{A_2}\left(\frac{1-\tilde{v}}{\tilde{z}}\right)^{\alpha}-(\tilde{v}^*-\alpha)\right]=0.$$

T greater than zero. Then, $dT/dA_2>0$.

A_2 on Growth

Under $A_1/A_2=A_1^*/A_2^*$,

$$g=\rho\left(\frac{1-\alpha}{\tilde{v}-\alpha}-1\right).$$

$$\frac{d\tilde{v}}{dA_2}=\frac{-(1-\tilde{v})(\tilde{v}-\alpha)}{2A_2[\alpha(\tilde{v}-\alpha)+(1-\tilde{v})]}<0.$$

Hence, $dg/dA_2>0$

Theorefore, $\frac{dT}{dg}=\frac{dT/dA_2}{dg/dA_2}>0.$

Proposition

Proposition 2 *Assume the only variation in the economy is from the production coefficients in both countries and the difference of relative productivities is small enough. Trade volume and economic growth rate are positive correlated.*

Intuition

The higher Home's productivity for the investment goods means that Home has more comparative advantage in the investment goods, and hence exports more investment goods and imports more consumption goods. It follows a higher volume of trade. On the other hand, a higher this productivity also furthers marginal product of capital and the corresponding economic growth rate.

Concluding Remarks

We have presented a basic two-country endogenous growth model, which is regarded as an integration of a two-country economy and endogenous growth. We find that trade volume are positively related to economic growth rate when a variation from the production coefficients in both countries. This result is consistent with empirical studies.