Unbalanced Economic Growth and Dynamic Trade Specialization

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Abstract

This paper examines the impact of unbalanced economic growth upon countries' dynamic trade specialization. Firstly, we identify theoretically the impact. Secondly, we construct an econometric model to investigate the impact. We employ revealed symmetric comparative advantage (RSCA) index as an indicator of trade specialization and coefficient of variation (CV) of sectoral output growth as an indicator of unbalanced economic growth. Thirdly, we apply empirically the model in the cases of Korea, Singapore, Indonesia and Malaysia. We conclude that domestic unbalanced economic growth has a positive and statistically significant impact on dynamic trade specialization in the cases of Indonesia and Malaysia, but not in the cases of Korea and Singapore. However, the world unbalanced economic growth has a statistically insignificant impact on the all selected countries' dynamic trade specialization.

Keywords: Impact, unbalanced economic growth, RSCA.

A. Introduction

Theory of static comparative advantage postulates that countries will specialize in products with comparative advantage and import products with comparative disadvantage. Factor endowments affect countries' capacity to produce goods and services as reflected by their production possibility frontiers (PPF). The effects of factor endowments on international trade therefore become a critical issue since they also determine countries' comparative advantage. Countries with abundant factor endowments have more opportunities to attain economies of scale in the production of goods and services. Heckscher[2] and Ohlin[3] examine the effects of factor endowments on international trade. The trade model of theirs is often referred to as the Heckscher-Ohlin (H-O) model.

In fact, a country's comparative advantage shifts dynamically due to the changes in supply and demand sides in both domestic and international markets. The supply side is related to PPF; meanwhile, the demand side is related to community preference (community indifference curve, CIC). On this matter, Echevarria[4] notes two relevant findings. *First*, in the long run, comparative advantage is driven by total factor productivity (TFP) differential. This explains the fact that less developed countries are likely to export primary commodities even though they are not less capital-intensive. *Second,* non-homothetic preferences imply fewer countries export only or mostly primary commodities as

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[2] Hecksher, E.F., "The Effect of Foreign Trade on The Distribution of Income," in Howard S. Ellis and Lloyd A. Metzler, (Eds.). Readings in the Theory of International Trade. American Economic Association. Philadelphia: Blakiston, 1919.

[3] Ohlin, B. *Interegional and International Trade.* Cambridge, MA: Harvard University Press, 1933.

[4] Echevarria, C. "International Trade and The Sectoral Composition of Production," *Review of Economic Dynamics* 11 (2008):192-206.

the global economy develops. Many other researchers also consider a country's comparative advantage in dynamic sense rather than static one. So far, the dynamic theory of comparative advantage has put greater attention on changes of the supply (production) side. This is related to how specific determinants affect the output (economic) growth and, in turn, comparative advantage. Redding[5] finds that comparative advantage is endogenously determined by the past technological changes and innovation. The dynamics of comparative advantage might be also caused by the role of input trade[6], the friction in international trade and investment flows due to geography, institutions, transport, and information cost[7], the transmission of knowledge across borders[8], the technological differences across border[9], and the monopolistic competition in differentiated products with increasing return to scale.[10]

This paper aims to examine the impact of unbalanced economic growth upon dynamic trade specialization. Korea, Singapore, Indonesia and Malaysia are chosen for the case studies. The rest of this paper is organized as follows. Section II describes the theoretical framework. Section III shows the methodology. Sections IV represents results and analysis. Finally, several conclusions are presented in Section V.

B. Theoretical Framework

This section describes theoretically the relationship between economic growth and trade specialization. Suppose a small country (price taker in international market) uses its available inputs labor (L) and capital (K) to produce competing outputs X (*labor-intensive* good) and Y (*capital-intensive* good). Let us assume the country is relatively a labor-abundant country. In addition, the country has a production possibility frontier (PPF) and a community indifference curve (CIC), as depicted by PPF_0 and CIC_0 in Figure 1, respectively. The international term of trade is $(P_X/P_Y)_{Int}$. The initial equilibriums in both production and consumption are at points A and B, respectively. The volume of international trade is shown by the triangle ABC i.e. exports of X (quantity: CA) for the imports of Y (quantity: CB).

With economic growth, the PPF shifts outward, allowing the country to choose different production combinations of X and Y. The various new possible equilibriums in production are located within the regions fixed by the mini-axes drawn through the original production equilibrium at point A. If the new equilibrium in production lies on the straight line 0P, the economic growth is *product-neutral*, since productions of the export good and the import competing good have increased in the same rate. If the new equilibrium lies in region I_p, it is *protrade-biased* (reflecting the relatively greater availability of the export good);

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5 Redding, S. "Specialization Dynamics," *Journal of International Economics* 58 (2002): 299-334.

6 Jones, R.W. *Globalization and the Theory of Input Trade* (Cambridge: MIT Press, 2000).

7 Venables, A.J. "Geography and International Inequalities: The Impact of New Technology," (Paper Prepared for ABCDE, World Bank, Washington DC, 2001).

8 Grossman, G.M. and Helpman, E. *Inovation and Growth in the Global Economy* (Cambridge: The MIT Press, 1991).

9 Trefler, D. "The Case Missing Trade and Other Mysteries," *American Economic Review* 85(5):1029-46, 1995.

10 Krugman, P.R. "Increasing Returns, Monopolistic Competition, and International Trade," *Journal of International Economics* 9 (1979): 469–79.

in region II_p, it is *ultra-protrade-biased*; in region III_P, it is *antitrade-biased* (reflecting the relatively greater availability of the import-competing good); and in the region IV_P, it is *ultra-antitrade-biased*.

Figure 1 about here.

In addition, the economic growth will also affect the consumption equilibrium. The consumption effect of growth on trade can be isolated by the mini-axes whose origin is at initial consumption equilibrium B. If the new equilibrium point is on the straight line 0K, consumption of both goods X and Y will increase proportionally and the consumption trade effect will be *neutral*. If the new consumption equilibrium point falls in region $I_{C,}$ it is *a pro-trade consumption* effect; in region II_C, it is an *ultra-protrade consumption* effect; in region III_C, it is an *anti-trade consumption* effect; and in region IV_C, it is *ultra-antitrade consumption* effect.

Economic growth can result from the changes in technology (i.e. *factor-neutral*, *labor-saving* or *capital-saving*) or the accumulation of factors of production (i.e. factor-neutral growth, relatively higher growth in capital or relatively higher growth in labor). Economic growth can be categorized into two types, balanced and unbalanced growth.[11] The former is shown by the shifts out of PPF in an equiproportional manner and the later is shown by the shift out of PPF not in the same proportion. They are depicted in panels (a) and (b) of Figure 2, respectively. In panel (a), the balanced economic growth affects *product-neutral* in consumption and *neutral* in consumption. This creates bigger amount of international trade shown by the bigger triangle A'B'C' than ABC. In panel (b), the unbalanced economic growth affects *antitrade-biased* in production and *neutral* in consumption. This creates smaller amount of international trade shown by triangle A"B"C" which is smaller than ABC.

Figure 2 about here.

Figure 2 only shows the two of possible relationships between economic growth and trade specialization. Whether a country becomes more-specialized or less-specialized after the economic growth depends upon the kinds of growth (balanced or unbalanced), the effects on production (*ultra-protrade, protrade, neutral, anti-trade* or *ultra-antitrade*) the effects on consumption (*ultra-protrade, protrade, neutral, antitrade* and *ultra-antitrade*) and the initial country's factor endowments (L-abundant or K-abundant).[12] All the possible relationships are described in Table I.

Table I about here.

C. The Method And Data

The previous section describes theoretically various possible impacts of economic growth upon dynamic trade specialization. In this section, we show an econometric model to analyze empirically the impact.

1. Index of comparative advantage

In this paper, an index of trade specialization namely the Revealed Symmetric Comparative Advantage

[11] Todaro, M. and S. Smith. *Economic Development* 9th ed. (Addison-Wesley series in economics, 2006).

[12] Appleyard, D.R. and Field, A.J.JR. *International Economics.* Fourth Edition. (New York: McGraw-Hill, 2001).

(RSCA) index is employed. The index is a simple transformation of the Revealed Comparative Advantage (RCA) index by Balassa (1965).[13] The RCA and RSCA are formulated as follows:

$$(1)\quad RCA_{ij} = \left(x_{ij} / x_{in}\right) / \left(x_{rj} / x_{rn}\right)$$

$$(2)\quad RSCA_{ij} = \left(RCA_{ij} - 1\right) / \left(RCA_{ij} + 1\right)$$

where RCA_{ij} denotes revealed comparative of country i for group of products (Standard International Trade Classification, SITC) j and x_{ij} represents total exports of country i in group of products (SITC) j. Subscript r denotes all countries without country i, and subscript n stands for all groups of products (SITC) excepting group of product j. By excluding the country and group of products under consideration, double counting is avoided; therefore, bilateral exchange of goods between two countries is more exactly represented.[14] [15]

The values of the RCA index range from zero to infinity ($0 \leq RCA_{ij} \leq \infty$). RCA_{ij} greater than one implies that country i has comparative advantage in group of products j. In contrast, RCA_{ij} less than one means that country i has comparative disadvantage in product j. Since the RCA_{ij} turns out to have values that cannot be compared on both sides of one, the index is made to be a symmetric index.[16] The index is called Revealed Symmetric Comparative Advantaged (RSCA). The $RSCA_{ij}$ index ranges from one to one (or $-1 \leq RSCA_{ij} \leq 1$). $RSCA_{ij}$ greater than zero implies that country i has comparative advantage in product j and if it is less than zero implies that country i has comparative disadvantage in product j.

2. *Dynamics of trade specialization*

The RSCA index is used to examine dynamic changes in comparative advantage.[17] The following simple regression model is applied:

$$(3)\quad RSCA_{ij,T} = \alpha_{i,0-T} + \beta_{0-T} RSCA_{ij,0} + \varepsilon_{ij,T}$$

where $RSCA_{ij,T}$ and $RSCA_{ij,0}$ are Revealed Symmetric Comparative Advantage of country i in product j for years T and 0, respectively. ε_{ij} denotes white noise error term. The coefficient β_{0-T} indicates whether the existing comparative advantage or specialization patterns have been reinforced or not during the period of observation (0-T).

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13 Balassa, B. "Trade Liberalization and 'Revealed' Comparative Advantage," *The Manchester School of Economics and Social Studies* 33(2): 99-123, 1965.

14 Wörz, J. "Dynamic of Trade Specialization in Developed and Less Developed Countries," *Emerging Markets Finance and Trade* 41(3): 92-22, 2005.

15 Vollrath, T.L. "A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage," *Weltwirtschaftliches Archiv* 127 (1991): 265-80.

16 Laursen, K. "Revealed Comparative Advantage and The Alternatives as Measures of International Specialization. *DRUID Working Paper.* No 98-30. Danish Research Unit for Industrial Dynamics (DRUID), 1998.

17 We apply RSCA instead of RCA for at least three reasons as mentioned by Volrath (1991), Laursen (1998) Aiginger (1999) and Wörz (2005), among others. *First,* RCA is not comparable on both side of unity since the index ranges from zero to infinity. A country is said not to be specialized in a given product if the index ranges from zero to one. In contrast, a country is said to be specialized in a given product if the index ranges from one to infinity. *Second,* if RCA is used in estimating the econometric model, one might obtain biased estimates. RCA has disadvantage of an inherent risk of lack of normality in its distribution. A skewed distribution violates the assumption of normality of the error term in regression analysis, thus not providing reliable inferential statistic. *Third,* the use of RCA in regression analysis gives much more weight to values above one, when compared to observation below one.

We define a product as the 3-digit Standard International Trade Classification (SITC). For illustration of dynamic trade specialization, Figure 3 represents RSCAs for SITC 001 and SITC 002 in 1995 (horizontal axis) and 2005 (vertical axis), respectively. If $\beta_{1995\text{-}2005}$ is not significantly different from one ($\beta_{1995\text{-}2005}$=1), there is no change in the overall degree of specialization. The difference between $RSCA_{001,1995}$ and $RSCA_{002,1995}$ (AB) equals the difference between $RSCA_{001,2005}$ and $RSCA_{002,2005}$ (DE). $\beta_{1995\text{-}2005}$ greater than one indicates increased specialization of the respective country. The difference between $RSCA_{001,1995}$ and $RSCA_{002,1995}$ (AB) is smaller than difference between $RSCA_{001,2005}$ and $RSCA_{002,2005}$ (EF). Finally, $0<\beta_{1995\text{-}2005}<1$ indicates despecialization – that is, a country has gained comparative advantage in industries where it did not specialize and has lost competitiveness in those industries where it was initially heavily specialized (Wörz, 2005).[18] In the event of $\beta_{1995\text{-}2005}$ less than or equal to zero, no reliable conclusion can be drawn on purely statistical grounds; the specialization pattern is either random, or it has been reversed.

Figure 3 about here.

Since the data for estimating equation (3) is cross section (by SITC); we might have to deal with the violation of the assumptions of the classical regression. Conventional wisdom says that the problem of autocorrelation is a feature of time series data and heteroscedasticity is a feature of cross-sectional data.[19] Therefore, we can expect that heteroscedasticity might be in our case. Wörz[20] also finds that heteroscedasticity is initially a problem; therefore, the robust standard errors computed using the White/ sandwich estimator of variance is then employed.

The existence of autocorrelation also might be possible. When the form of heteroscedasticity is not known, it might not be possible to get efficient estimates of the parameter using weighted least squares (WLS). The ordinary least squares (OLS) gives consistent parameter estimates in the presence of heteroscedasticity but the usual OLS standard errors will be incorrect and should not be used for the inference purposes. Therefore, this paper applies Heteroscedasticity and Autocorrelation Consistent Covariance (HAC) when the usual OLS has violated the homoskedasticity or no-autocorrelation assumptions.[21]

There are two possible approaches to be applied i.e. Heteroscedasticity Consistent Covariance (White) and HAC Consistent Covariance (Newey-West). [22] To determine which approach is suitable for a specific model, we follow three stages. *First,* the OLS is applied and then the residual testing on heteroscedastity and

18 Ibid.

19 Gujarati, D. *Basic Econometrics* (New York: McGraw Hill, 1991).

20 Ibid.

21 It is important to note that HAC (either the White Heteroscedasticity consistent or the Newey-West HAC consistent covariance estimates) does not change the point estimates of the parameters, only the estimated standard errors.

22 See EViews 4 User's Guide for the detailed explanation. White (1980) formulates a heteroscedasticity consistent covariance matrix estimator that provides correct estimates of the coefficient covariance in the presence of heteroscedasticity of unknown form. The White covariance matrix assumes that the residuals of the estimated equation are serially uncorrelated. Newey and West (1987) derive a more general estimator that is consistent in the presence of both heteroscedasticity and autocorrelation of unknown form.

autocorrelation are conducted. If the test shows that there are no autocorrelation and heteroscedasticity simultaneously, then we use the OLS estimates. *Second,* if only heteroscedasticity exists, we apply the White Heteroscedasticity Consistent Covariance. *Third,* if the autocorrelation and heteroscedasticity exist, we apply the HAC Consistent Covariance (Newey-West).

3. Unbalanced economic growth

From the data of Gross Domestic Product (GDP) by sectors, we calculate the output growth of a specific sector s for the period 0-T in country i:

$$(4)\quad g_{is,0-T} = \left(GDP_{is,T} - GDP_{is,0}\right)/GDP_{is,0}$$

where $GDP_{is,T}$ and $GDP_{is,0}$ are the country i's growth rate of sector s in years T and 0, respectively. The output growth of a specific sector might differ from that of other sectors. This is referred to as unbalanced economic growth. Hence, the unbalanced economic growth can be shown by the dispersion of output growth of sectors. We use the coefficient of variation (CV) to indicate the dispersion of output growth of sectors (unbalanced economic growth). The coefficient of variation of sectoral output growth for the period 0-T is formulated as follows:

$$(5)\quad CVG_{0-T} = \frac{\sqrt{\left(\sum_{s=1}^{n}\left(g_{is,0-T} - \bar{g}_{i,0-T}\right)^2\right)/n}}{\bar{g}_{i,0-T}}$$

where $\bar{g}_{i,0-T}$ is the country i's average growth rate for the period 0-T. It is clear that if all sectors have the same growth of output (balanced economic growth), the coefficient of variation will equal zero. This equation (5) is applied to calculate the unbalanced domestic economic growth ($CVGD_{0-T}$) and the unbalanced world economic growth ($CVGW_{0-T}$)

4. Econometric model

To investigate the impact of unbalanced economic growth on the dynamic trade specialization, we make and estimate the following regression model:

(6)

$$DS_{0-T} = \mu_0 + \mu_1 CVGD_{0-T} + \mu_2 CVGW_{0-T} + \varepsilon_T$$

where DS_{0-T} is the degree of dynamic specialization ($\hat{\beta}_{0-T}$) in the period 0-T obtained from the estimation of Equation (3); $CVGD_{0-T}$ and $CVGW_{0-T}$ represent the coefficients of variation of domestic economic growth and of world economic growth for the period 0-T, respectively; μ_0, μ_1 and μ_2 denote constant and coefficients; and ε_T is the white noise error term.

The interpretation of Equation (6) is obvious. When a country (i) and the world have a balanced economic growth ($CVGD_{0-T} = 0$ and $CVGW_{0-T} = 0$), the degree of dynamic trade-specialization will be constant and equal to μ_0. In contrast, when the country (i) and the world have an unbalanced economic growth ($CVGD_{0-T} \neq 0$ and $CVGW_{0-T} \neq 0$), the impact of unbalanced economic growth depends on the estimated coefficients μ_1 and μ_2. If μ_1 and μ_2 are negative, the unbalanced economic growth of domestic and the world contribute to the decreasing specialization (de-specialization). In contrast, μ_2, if μ_1 and μ_2 are positive, the unbalanced economic growth of domestic and the world contribute to the increasing specialization.

5. Data

We use data on exports by the 3-digit Standard International Trade Classification (SITC) Revision 2 obtained from the United Nations Commodity Trade Statistics Database (UN-COMTRADE) and data on Gross Domestic Products (value added) by economic activities (sectors) taken from the United Nations Statistics Division (UNSD) for the period 1979-2005. GDP are broken down into seven following sectors: (1) Agriculture, hunting, forestry and fishing, (2) Mining, manufacturing and utilities, (3) Manufacturing, (4) Construction, (5) Wholesale, retail trade, restaurants and hotels, (6) Transport, storage and communication, (7) Other activities.

6. Estimation

Since our data for estimating Equation (6) is time series one, we might have to deal with the serial autocorellation (or heteroscedasticity) problem. Therefore, original Ordinary Least Squares (OLS) method for estimating might be not appropriate. We proceed to estimate the equation by using the simplest and most widely used model of serial correlation, i.e. assuming error term is an autoregressive AR(1) process. The error term is specified as $\varepsilon_T = \rho\varepsilon_{T-1} + \upsilon_t$, where the parameter ρ is the first-order serial correlation coefficient, υ_t is a white noise error term.

D. Results and Analysis

To show the empirical relevance of the model previously described, we apply the model in the cases of Korea, Singapore, Indonesia and Malaysia.

1. Trends in trade specialization and unbalanced economic growth

In Figure 4, panels (a), (b), (c) and (d) show trends in the coefficients of dynamic specialization (DS) obtained by applying Equation (3), and the coefficients of variation of the world and domestic sectoral-growth (CVGW and CVGD, respectively) obtained by applying Equation (4) in the cases of Korea, Singapore, Indonesia and Malaysia. In general, the coefficients of dynamic specialization are relatively constant and just under unity (1). This implies that all countries show de-specialization process over time. The countries may have trade-off between specialization in their existing products (with high comparative advantage but low level in technology) and specialization in the other products with much potentiality for comparative advantage in the future as the result of high productivity growth. The Asian financial crisis in 1997 has hit the Korean comparative advantage harder than the three other countries. This is shown by the more drastic decrease in the coefficient of Korean dynamic specialization during the period 1997-2001. The decrease means that Korea has de-specialized enormously her comparative advantage during that period.

Figure 4 about here.

All the selected countries are in the East Asian region where intra-regional trade (IIT) and inter-dependent activities, such as product fragmentation, have increased significantly. De-specialization has been strongly promoted by the shifts in the pattern of trade in the region. International production fragmentation

has become an interesting phenomenon[23] and led to *de facto* economic integration in East Asia.[24] [25] It is defined as cross-border dispersion of component production/assembly within the vertically integrated production process, with each country specializing in particular stage of the production sequence.[26] The international production sharing is strongly supported by the belief that the most important determinant of productivity (economies of scale) or unit costs is not the size of plant but how production is organized within a plant of a given size. As far as the production fragmentation is concerned, the convergence in the pattern of comparative advantage takes place in the region. As a result, de-specialization occurs in the countries in the region.

The shifts in the pattern of comparative advantage in East Asian countries follow the 'flying geese' (FG) pattern[27] [28] Rana[29] finds some links between changes in the pattern of trade and economic development, and points out that the shifts in comparative advantage were significant from Japan to the NIEs and the ASEAN4 and from the NIEs to the ASEAN4. Similarly, Fukasaku (1992)[30] finds that the pattern of trade within Asia has gradually shifted away from inter-industry trade toward intra-industry trade. As far as the Asian economies become increasingly integrated and interdependent, the intra-industry trade has stronger grounds to exist. More recently, Dowling and Cheang (2000)[31] find that comparative advantage has shifted from Japan to the NIEs and the ASEAN4 during the period 1985 to 1995. In addition, they also note that Japanese FDI has

[23] The alternative names are frequently used such as 'vertical specialization' (Hummels *et al.,* 2001, Yi 2003), 'slicing the value chain' (Krugman 1995).

[24] Fouquin, M., D. Hiratsuka and F. Kimura. "Introduction: East Asia's De Facto Economic Integration". In Hiratsuka, Daisuke (ed.). *East Asia's De Facto Economic Integration.* New York: Palgrave Macmillan. pp. 1-15, 2006.

[25] Ng, F. and A. Yeats. "Major Trade Trends in East Asia: What Are Their Implications for Regional Cooperation and Growth"? *Policy Research Working Paper*. The World Bank, Development Research Group Trade, June 2003.

[26] Athukorala, P. and N. Yamashita. "Production Fragmentation and Trade Integration: East Asia in A Global Context," *North American Journal of Economic and Finance* 17(3): 233-256, 2006.

[27] The 'flying geese' paradigm was introduced by Kaname Akamatsu in the 1930s in the several articles available only in Japanese. Kaname Akamatsu showed himself in the world academia after the World War II in the two articles (1961, 1962) in English. 'Flying geese' model intends to explain the catching-up process of industrialization of latecomer economies from intra-industry, inter-industry and international aspects. It might be argued that the structural transformation of industrialization in East Asia follows this 'flying geese' formation. Garment, Steel, Popular TV, Video and HDTV are frequently used to illustrate the formation. Those products have been transferred from Japan to Newly Industrializing Economies (NIEs: Hog Kong, Taiwan, Singapore and Korea); from NIEs to the ASEAN4 (Malaysia, Indonesia, Thailand and Philippine); from the ASEAN4 to latecomers and latest-comers.

[28] Kojima, K. "The 'Flying Geese' Model of Asian Economic Development: Origin, Theoretical Extensions, and Regional Policy Implications," *Journal of Asian Economics* 11 (2000): 375-401.

[29] Rana, P.B. "Shifting Comparative Advantage among Asian and Pacific Countries," *The International Trade Journal* 4 (1990): 243-257.

[30] Fukasaku, K. "Economic Regionalization and Intra-industry trade Pacific-Asian Perspective," Research Program on Globalization and Regionalization OECD, 1992.

[31] Dowling, M. and Cheang, C.T. "Shifting Comparative Advantage in Asia: New Tests of The 'Flying Geese' Model," *Journal of Asian Economics* 11 (2000): 443-463.

been used to recycle comparative advantage and to use resources in the ASEAN4.

The coefficients of variation of sectoral growth in the four selected countries and in the world are not zero and fluctuated over time. This indicates unbalanced economic growth in the countries and in the world. By comparing the coefficient of variation of domestic and the world sectoral growths, it is clearly shown that domestic sectoral-growth is more unbalanced and even more fluctuated than that of the world. Theoretically, non-homothetic preference causes "structural change" from agricultural sector basis toward manufacturing and services.[32] [33] [34] This typically companies unbalanced economic growth. The relative change in contribution of each sector to total output is a consequence of Engel's law, where aggregate consumption of agricultural commodities increases less that proportionally with growth of per capita income. Extensive industrialization in East Asia has also been the main reason for unbalanced economic growth. It is spurred by the innovation[35] [36], role of technology[37] and accumulation of human capital.[38] Following the FG pattern, the increasing number of industries in East Asian region plays important role in the shifts of comparative advantage.

2. Estimation results

Table II shows the estimation results of the econometric model (6) in the cases of Korea, Singapore, Indonesia and Malaysia. The constant (μ_0) shows the dynamic specialization when the domestic economic growth and the world economic growth are balanced type. Excepting Singapore, the constants are estimated to be less than unity. This implies that Korea, Indonesia and Malaysia will have de-specialization if the domestic economic growth and the world economic growth are simultaneously balanced type. It is estimated that if Korea, Indonesia, Malaysia and the World had balanced economic growth, Korea would have faster de-specialization than Indonesia and Malaysia since her constant (0.852) is smaller than the two countries (0.94 and 0.76 for Indonesia and Malaysia, respectively).

Table II about here.

We find mixed results about the impact of unbalanced economic growth upon the countries' dynamic specialization. In the cases of Korea, Indonesia and Malaysia, their domestic unbalanced sectoral-growth has caused the increase in specialization. Moreover, the coefficients are statistically significant for Indonesia and Malaysia. The more unbalanced is the domestic economic growth, the more specialized is the exports. This finding supports the argument on the positive relationship between growth and trade

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32 Ibid

33 Chenery, H. and Syrquin, M. *Pattern of Development, 1950-1970* (London: Oxford Univ. Press, 1975).

34 _____. "Typical Pattern of Transformation." In Chenery, H., Robinson, S., Syrquin, M. (Eds.). *Industrialization and Growth: A Comparative Study.* New York: Oxford Univ. Press, 1986.

35 Romer, P. "Increasing Return and Long-run Growth," *Journal of Political Economy* 94 (1986): 1002-1037.

36 _____. "Endogenous Technical Change," *Journal of Political Economy* 98 (1990): S71-S102.

37 Edwards, S. 1992. "Trade Orientation, Distortions and Growth in Developing Countries," *Journal of Economic Development* 39 (1992): 31-57.

38 Lucas, R.E. "Making a miracle," *Econometrica* 61(1993): 251-272.

specialization. Many researchers also confirm the positive relationship based on various determinants: market expansion encourages new trade opportunities[39] [40]; transmission of technical relationships leads learning-by-trading[41] [42] [43]; the existing arrangement provides the possibility of knowledge spillovers (Grossman and Helpman 1991)[44] and imitation and diffusion.[45]

In contrast, in the case of Singapore the domestic unbalanced sectoral-growth has negative effect on its dynamic specialization. In this case, the more unbalanced is the domestic economic growth, the less specialized is the exports. Several criticism and controversies are addressed toward the argument on positive relationship between economic growth and trade specialization[46]. Edwards[47] and Rodrik[48] and Frankel et al.[49] note that trade reduce the incentive for research and in turn long-run growth. 'No sufficient common pool of knowledge' creates comparative advantage in the sector with the lesser long-run growth prospect.[50] [51]

In the global level, researches mostly agree that unbalanced development path affected the composition of the global trade. However, there are fewer researches on how unbalanced development path has affected country trade specialization.[52] We find that the all selected countries show that the world unbalanced economic growth has no significant effect on the countries' dynamic specialization. The estimate coefficients of unbalanced world economic growth (CVWG) are statistically insignificant. This implies that the countries' dynamic specialization is a domestic issue rather than an international competition one. In addition, the countries are considered as small countries in the world competition and they behave as 'price taker'. Hence, the world economic growth is as a given thing and the countries only adjust their trade specialization based on domestic supports such as technologies, infrastructures, human resources, capital, labor, etc. Chenery and Syrquin[53] [54] note a gradual shift away from agricultural production toward manufacturing and services. Kuznet[55] also indicates this shift.

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39 Ibid

40 Rivera-Batiz, L.A. and Romer, P.M. "Economic Integration and Endogenous Growth," *Quarterly Journal of Economics* 105 (1991): 531-555.

41 Goh, A. and Oliver, J. "Learning by Doing, Trade in Capital Goods and Growth," *Journal of International Economics* 56 (2002): 411-444.

42 Grossman, G.M. and Helpman, E. "Comparative Advantage and Long-run Growth," *American Economic Review* 80 (1990): 796-815.

43 Young, A. "Learning by Doing and Dynamic Effects of International Trade;" *Quarterly Journal of Economics* 106 (1991): 365-405.

44 Ibid

45 Segerstrom, P.S., Anant, T.C.A. and Dinopoulos, E. "A Schumpeterian Model of The Product Life Cycle," *American Economic Review* 80 (1990):1077-1092.

46 See, for example, Edwards (1998) and Frankel et al. (1996) for the detailed discussion.

47 Ibid

48 Rodrik, D. "The 'Paradoxes' of The Successful State," *European Economic Review* 41 (1997): 411-442.

49 Frankel, J.A., Romer, D., and Cyrus, T. Trade and Growth in East Asian Countries: Cause and Effect? *NBER Working Paper* No. 5732, Cambridge, 1996.

50 Matsuyama, K. "Increasing Returns, Industrialization and Indeterminacy of Equilibrium," *Quarterly Journal of Economics* 106 (1991): 617-650.

51 Ibid

52 Ibid

53 Ibid

54 Ibid

55 Kuznets, S. "Modern Economic Growth: Finding and reflections," *American Economic Review* 63 (1973): 247-258.

E. Conclusions

This paper examines the impact of unbalanced sectoral-growth upon countries' dynamic trade specialization. *First,* we identify theoretically the impact. Whether unbalanced economic growth causes the shifts in countries' trade specialization is ambiguous. The impact depends on the supply and demand sides as shown by the effects on production (*ultra-protrade, protrade, neutral, antitrade* and *ultra-antitrade*) and on consumption (*ultra-protrade, protrade, neutral, antitrade* and *ultra-antitrade*). *Second,* Korea, Singapore, Indonesia and Malaysia are chosen as the case studies. Using an econometric model, we confirm empirically the mixed results about the impact of unbalanced growth upon the countries' dynamic trade specialization. Only in the cases of Indonesia and Malaysia, domestic unbalanced growth has a positive and statistically significant impact on dynamic trade specialization. The world unbalanced economic growth has no significant impact on the selected countries' dynamic trade specialization.

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Figure 1. Equilibriums in Production and Consumption

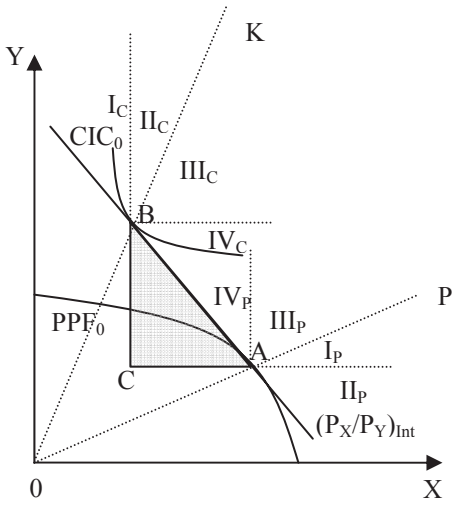


Figure 2. Two Possible Relationships between Economic Growth and Specialization

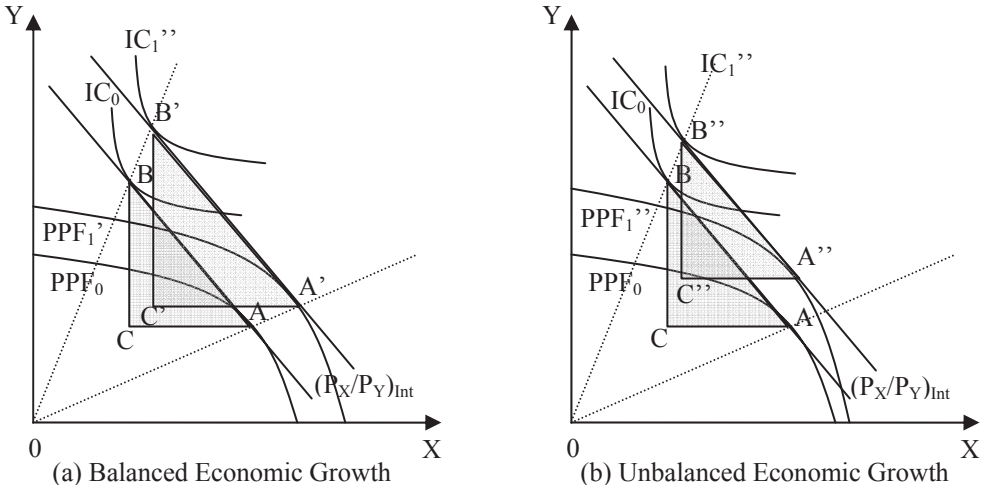


Figure 3. Dynamic Changes in Comparative Advantages

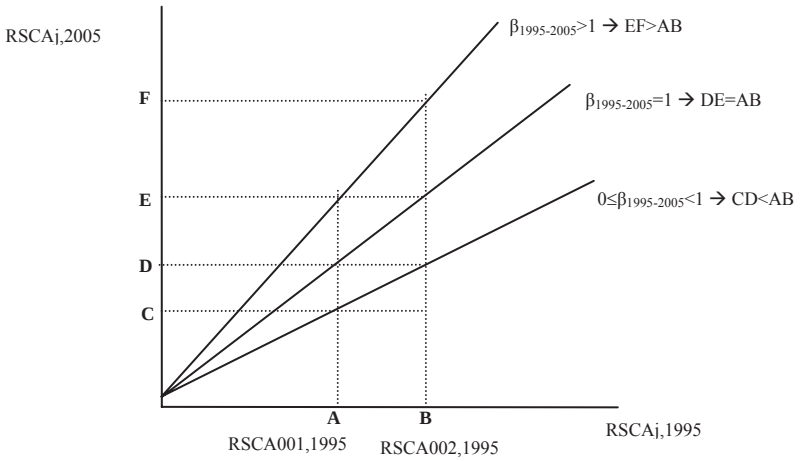
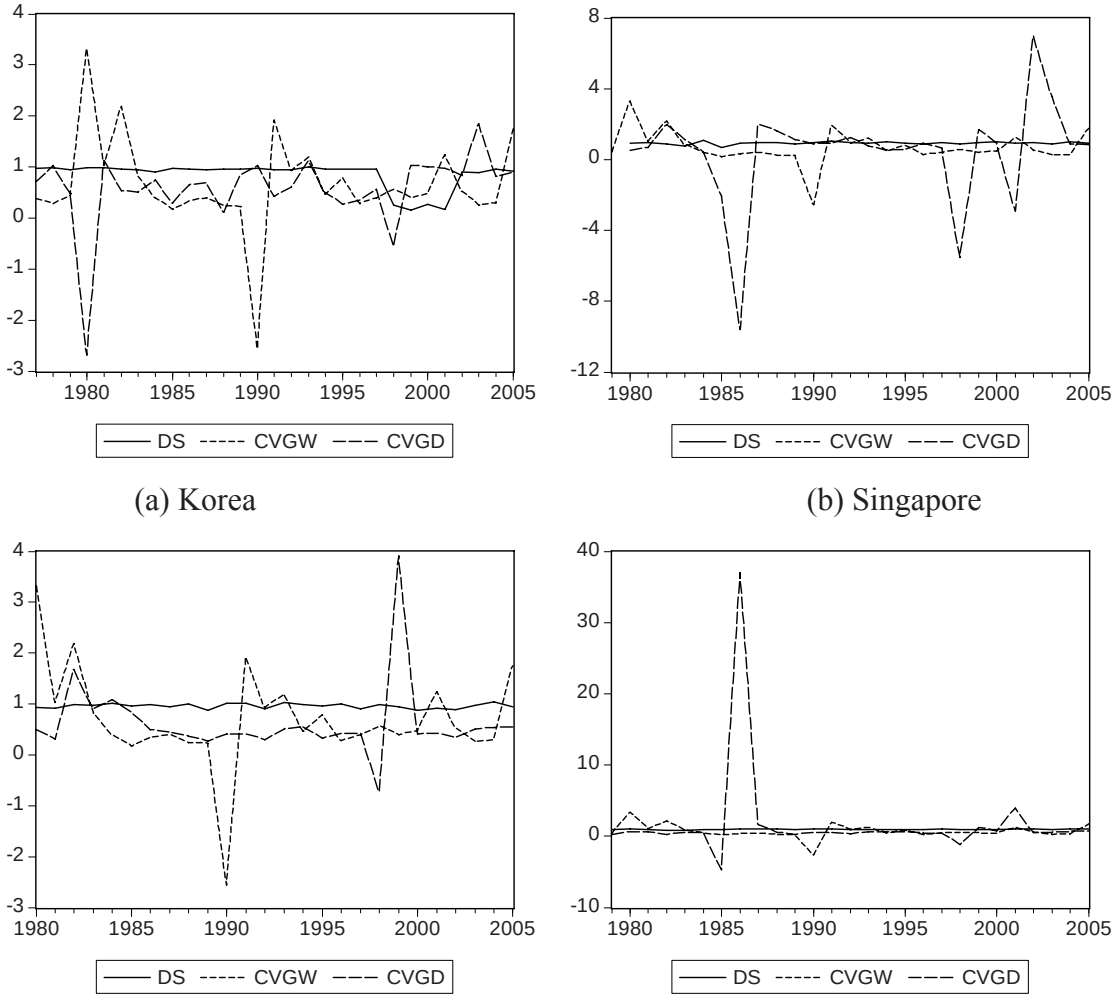


Figure 4. Trends in Dynamic Specialization (DS), World Unbalanced Economic Growth (CVGW) and Domestic Unbalanced Economic Growth (CVGD), 1980-2005



(a) Korea (b) Singapore

(c) Indonesia (d) Malaysia

Source: The UN-COMTRADE and UNSD, *author's calculation.*

Table I. **Possible Impacts of Economic Growth upon Dynamic Trade Specialization**

Country's Factor Endowments		Growth			Production Effect																									
					Ultra-protrade					Protrade					Neutral					Antitrade					Ultra-antitrade				
					Consumption Effect																									
					Ultra-protrade	Protrade	Neutral	Antitrade	Ultra-antitrade	Ultra-protrade	Protrade	Neutral	Antitrade	Ultra-antitrade	Ultra-protrade	Protrade	Neutral	Antitrade	Ultra-antitrade	Ultra-protrade	Protrade	Neutral	Antitrade	Ultra-antitrade	Ultra-protrade	Protrade	Neutral	Antitrade	Ultra-antitrade
K-abundant		Balanced													+	+	-/+	-	-										
		Unbalanced	K-intensive		+	+	+	-/+	-/+	+	+	+	-/+	-/+	+	+	+	-/+	-/+	-/+	-/+	-/+	-	-	-/+	-/+	-	-	-
			L-intensive		+	+	+	-/+	-/+	+	+	+	-/+	-/+	+	+	+	-/+	-/+	-/+	-/+	-/+	-	-	-/+	-/+	-	-	-
L-abundant		Balanced													+	+	-/+	-	-										
		Unbalanced	K-intensive		+	+	+	-/+	-/+	+	+	+	-/+	-/+	+	+	+	-/+	-/+	-/+	-/+	-/+	-	-	-/+	-/+	-	-	-
			L-intensive		+	+	+	-/+	-/+	+	+	+	-/+	-/+	+	+	+	-/+	-/+	-/+	-/+	-/+	-	-	-/+	-/+	-	-	-

Notes: (+) means more specialized (specialization); (-) means less specialized (de-specialization); (+/-) means uncertain results.

Table II. Estimation Results

Coefficient	Korea		Singapore		Indonesia		Malaysia	
Constant	0.852*	(0.14)	1.014*	(0.048)	0.94*	(0.02)	0.976*	(0.016)
Unbalanced domestic economic growth (CVDG)	0.0008	(0.046)	-0.07	(0.046)	0.06***	(0.03)	0.002**	(0.001)
Unbalanced world economic growth (CVWG)	-0.013	(0.037)	0.002	(0.018)	-0.01	(0.01)	0.001	(0.007)
AR(1)	0.72*	(0.14)	-0.113	(0.083)			0.485**	(0.203)

Notes: *, ** and *** mean statistically significant at the levels of significance 1%, 5% and 10%, repectively. Figures in parenthesis ( ) represent standard errors.

Source: The UN-COMTRADE and UNSD, *author's calculation.*