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ABSTRACT

The emergence of new Asian regionalisms such as ASEAN+3 (China, Korea and Japan) and the proposed ASEAN+5 (ASEAN+3 plus Australia and New Zealand) and other bilateral, plurilateral and multilateral free trade agreements in recent years requires research into these important developments and their underlying fundamental trade-growth causation. The paper extends the gravity theory to time-series data and applies a new flexible modelling approach to construct a simultaneous-equation model of trade and growth for the ASEAN and the East Asia 3. Using data from the World Bank national accounts and CHELEM regional and international trade over the period 1968-2000, the paper then estimates the model by both standard (OLS and 2SLS) and improved estimation methods to provide superior MSE impact estimates. Implications of the findings for ASEAN+3's economic integration, trade policy and prospects for trade and welfare improvement for this FTA will also be discussed.

Keywords: *New Asian Regionalism, Free Trade Agreement, Economic Integration, ASEAN, ASEAN+3, Trade and Growth, Gravity Theory, Causality, Economic Modelling, Estimation Methods, Economic and Trade Policy.*

JEL: *C32, C51, C52, F02, F14, F15, F42, O11, O41, O53*

1 Introduction

The recent emergence of new Asian regionalism ASEAN+3 (i.e., 10 ASEAN countries plus China, Korea and Japan) and other bilateral, multilateral and plurilateral free trade agreements (FTAs) such as Australia-US, Japan-Singapore, Korea-Chile and the proposed ASEAN+5 (ASEAN+3 plus Australia and New Zealand) as well as the Cotonou-type regional economic integration advocated by the European Union (EU) in order to promote 'organic' growth and 'normal' opportunities (see Barker, 2002) compels new research into the fundamental issues of trade, integration and growth, and the viability, sustainability or expansion of these important developments. While an apparent reason for this emergence may be its country members' proximity (distance, size and area) in the Asian region, other economic and non-economic factors may also play an important and interdependent part. To date however, not much work has been done and reported on the causal and quantitative significance of these factors (see ASEAN, 2002). The paper proposes in this context first to extend the standard gravity theory (see for example Linneman, 1966, Harrison, 1996, Frankel and Romer, 1999) to construct appropriate simultaneous-equation trade-growth models in flexible functional form (Tran Van Hoa, 1992a). It then uses 2002 World Bank World Tables national accounts and France's CHELEM trade time-series data and recent improved 2SHI estimation methodologies (Tran Van Hoa, 1985, 1986b, 1986c, 1997, and Tran Van Hoa and Chaturvedi, 1997) to fit these models to provide empirical evidence on ASEAN+3 trade-growth causality and historical support (or a lack of it) for this FTA. Trade and growth policy implications and sustainable prospects for ASEAN+3 countries are also briefly discussed, and possible applications to other free trade agreements and economic integration suggested.

2 Genesis of New Asian Regionalisms and ASEAN+3

The ASEAN+3 proposal, also known as the Young-Ho Kim proposal, named after Korea's former Minister of Commerce who strongly put it forward, was discussed in the mid- and especially late-1990s by ASEAN leaders, and implemented notably through the Hanoi Plan of Action in 1998 for ASEAN Vision 2020 (ASEAN, 2002). A number of factors can be attributed to its recent emergence. First, it was the result of decades of fast growth and a number of economic, financial and restructuring developments in North East Asia and in other major trading blocs in the world. Second, it was the result of developments and shifts in focus in North America and the EU in the aftermath of the damaging Asia crisis starting in Thailand in July 1997 and its subsequent contagion to a number of 'once miracle' economies in East and South East Asia, the former USSR, and to a lesser extent, North and South Americas and the EU (Tran Van Hoa, 2000). Third, it was the result of a benign neglect from such international organizations as the International Monetary Fund (IMF) or the economic power of North America and the EU on the plights of crisis countries in Asia and the former's lack of interest in seriously helping to solve the economic, financial and social problems arising from the Asia crisis (Tran Van Hoa, 2002d).

In 2001 and early in 2002, other new developments in East and South East Asia gained prominence and assisted in giving rise to a number of new Asian economic integrations or regionalisms (NARs) and Asian FTAs. These developments include the quick recovery and recurring growth in Korea, the emergence of China as a fast post-Asia crisis growing economy, and the continuing stagnant state of the world's second largest economy (namely Japan). The current recovery and growth of Korea have also been put forward by some authors as the leader in the post-crisis 'flying geese' theory for ASEAN+3 economies (see Harvie and Lee, 2002).

The NARs and FTAs are indeed numerous and proliferating at an amazing speed at the behest of government leaders especially in the Asian region. They include bilateral and multilateral FTAs such as first ASEAN, ASEAN+3, then ASEAN+5, ASEAN+5+Taiwan, Japan+Singapore, Japan+Korea, Japan+Mexico, Korea+Mexico+Chile, Singapore+New Zealand, China+Japan+Korea, Hong Kong+New Zealand, Australia-Japan (NARA), Australia-Japan, and last but not the least, Vietnam+US. There was currently even a discussion on the setting up of a North Asian FTA in which Japan will play an important part. In mid-2002, a protocol was also being negotiated between Washington and Canberra to address key US complaints about the Australian market and to prepare for the setting up of a sweeping US-Australia FTA, as proposed by the Australian government (Hartcher, 2002), to the dismal of New Zealand which wanted on the other hand a trilateral US-CER (Close Economic Relations between Australia and New Zealand). About at the same time, there was a suggestion by New Zealand Prime Minister Helen Clark to set up an Australia-New Zealand Economic Cooperation (ANZEC) to boost the low-activity 19-year old CER. The EU has also been strongly advocating regional integration and liberalisation for the Pacific nations to create EU-type transnational economic partnerships within the Cotonou framework to stimulate trade and create growth among them (Barker, 2002).

The main focus and objective of the NARs and Asian FTAs (as separate from currency or customs unions) are to promote trade either among the Asian economies themselves or with the membership of other economies outside Asia such as the US, Mexico and Chile in the Americas, and Australia and New Zealand in the Oceania. Prominent among these NARs and Asian FTAs is the ASEAN+3 proposal above and part of it, the ASEAN+1 or ASEAN+China FTA which has a 1,700 million people market, a USD2 trillion GDP, and USD1.2 trillion trade. ASEAN+China was endorsed by the 10 leaders of ASEAN in Brunei in November 2001 and its details were being worked out at a negotiating meeting in Beijing in May 2002.

3 Nexus between ASEAN+3 and Gravity Theory

Since the principal objectives of FTAs are trade liberalisation and welfare improvement (as well as economic integration) for member countries, the FTA premises are that trade (international and domestic) directly and other determinants of trade indirectly significantly and causally affect economic welfare (see Raimondos-Moller and Woodland, 2002) and growth (for developed countries – see Frankel and Rose, 1998, Frankel and Romer, 1999) and development [for developing countries, see Harrison (for all countries), 1996, Frankel et. al., (for 10 East and South East

Asian countries), 1996, and Tran Van Hoa (for ASEAN, China, Korea and Japan), 2002a]. The outcomes also are mutually beneficial in many other non-economic aspects (e.g. closer international cooperation and collaboration, social harmony, political stability and prosperity), and, in the context of globalisation, conducive to regional or international economic integrations (ASEAN, 1999).

In view of the expected final outcomes of higher growth or development improvement for trading partners or FTA member countries, a useful causality concept in the form of a gravity theory using geographical, demographic and other common or concurrent attributes (see for example Linneman, 1966 and the specification in Table 3 in Frankel et. al., 1996) to explain trade flows between countries has been proposed and widely applied in empirical studies of this kind (see also Rose, 2000). Some extensions to this theory's determinants using OECD country data have also been attempted to deal with trade correlations and output fluctuations (see for example, Otto et. al., 2002). In the case of Asian economies or especially the ASEAN+3 member countries in a bilateral context which are our focus for study, not much research on the validity of the required premises underlying the foundation of this FTA (namely, given their regional proximity but diverse culture, history and development components, does trade cause growth in the member countries?) both of a qualitative or quantitative kind has been done or reported.

4 A Trade-Growth Model for ASEAN+3

Consider, for convenience and without loss of generality, a simple model of two simultaneous implicit functions (extension to more functions is straightforward more variables are considered and endogenised) comprising and extending the basics of gravity theory linking trade and growth between 2 trading countries. This extended gravity theory may comprise geographic or demographic attributes (for ASEAN and its neighbouring Asian 3), economic factors, and the requirements of regional economic integration or FTA. Since the geographical attributes (such as distance and area) in the ASEAN+3 region are a priori assumed to be a rationale for setting up the ASEAN and ASEAN+3 and, further, we will use time-series data below, we can then focus on other relevant demographic (eg, population as proxy for size – see Frankel and Romer, 1999), economic and non-economic determinants of trade and growth in our model.

In this model, trade (named T) may be defined as exports or imports or openness (exports plus imports) and may include domestic trade (Frankel and Romer, 1999), and growth (Y) may be defined as GNP or, by convention, GDP. The 2 countries may be comprehensively all possible pairs of the 13 ASEAN+3 members or, more specifically and within our focus, as pair-wise (bilateral) combinations of the ASEAN as a group and one of these East Asian member countries separately. Thus

$$F1(a,Y,T) = 0 \qquad (1)$$
$$F2\,(b,T,Y,X,W) = 0 \qquad (2)$$

where F1 and F2 are two arbitrary functionals, a and b are parameter vectors, X and W denote, respectively, other economic (fiscal, monetary, trade and industry policy – see Sala-i-Martin, 1991) and non-economic (eg, distance, area, size, policy shifts and external shocks – see Johansen, 1982) variables, relevant to a country or a group of countries' growth or development. Importantly, in addition to T and Y, data for X and W must be available and consistent with published time-series data in a standard Kuznets-type accounting framework (eg, SNA93), or the accounting system of Stone (1988), or the recent World Bank World Tables.

Taking the total differentials of (1) and (2) and neglecting terms of second and higher –order (see for example Allen 1960 and Tran Van Hoa, 1992a), the 2-equation model (1)-(2) can be written in stochastic forms and in terms of the rates of change (Y%, T%, X% and W%) of all the included exogenous and endogenous variables (Y, T, X and W) as

$$Y\% = a1 + a2T\% + u1 \quad (3)$$
$$T\% = b1 + b2Y\% + b3X\% + b4W\% + u2 \quad (4)$$

In (3)-(4), the equations are linear and interdependent in the sense of Marshall or Haavelmo, a's and b's the elasticities, and u's other unknown factors outside the model (Frankel and Romer, 1999) or the disturbances with standard statistical properties. In (3)-(4), circular and instantaneous causality in the sense of Granger (1969) or Engle-Granger (1987) exists or is regarded as testable hypothesis. In their non-stochastic forms, these equations form the basis of applied or computable general equilibrium (CGE) models of the Johansen class in which all elasticities are usually assumed to be given or known a priori, and the impact of endogenous or endogenised variables (say T) on Y is dependent on the exogenous variables and calculated system-wise using such iterative procedures as the Gauss-Euler algorithm.

It can be verified that our so-called flexible (or function-free) trade-output growth equation (3) in the model above is econometrically identified in the sense of mathematical consistency. An impact study of endogenous trade (or exogenous X and W) on growth can be analysed directly via its 2SLS (or reduced-form adjusted) form structurally given in (5) below or indirectly via its reduced form given in (6) in terms of all the exogenous economic and non-economic variables in the model. It is well-known in the theory of econometrics that the use of OLS will, in this case, produce biased parameter estimates. These 2 equations can be written as

$$Y\% = a1 + a2\,\check{T}\% + v1 \quad (5)$$
$$Y\% = p1 + p2X\% + p3W\% + v2 \quad (6)$$

where Ť is T as estimated by the OLS of its reduced form equation [that is, (6) with T% replacing Y%] and v's the new disturbances with standard statistical properties.

An important feature of our modelling approach here is that, contrary to the CGE approach, our impact study is data-consistent as all required elasticities are derived from available data and have asymptotically and statistically desirable and consistent (an important issue in the gravity theory's empirical applications – see Frankel and Romer, 1999) properties when suitable estimation and forecasting methods (eg, 2SLS or other instrumental variables (IV) methods) are employed. Another important feature is that, contrary to other SNA93-based or Keynesian approaches, our impact study has the general flexibility in modelling specification in assuming explicitly no a priori functional forms for the equations in the model and can handle data on trade or budget deficits and real rates of interest when inflation exceeds the nominal interest rate. Log transformation cannot do this.

To implement the model (3)-(4) above to empirically investigate the causal relationship between for example ASEAN trade and its growth, we can use, given fixed geographical components (distance and area) as discussed and, for time-series data, population (a proxy for size), conventional economic determinants of trade (see for example Frankel and Rose, 1998, Frankel and Romer, 1999, and Rose, 2000, and Otto et. al., 2002) and/or other relevant factors (eg, shocks – Johansen, 1982) with available data. One such an extended model relevant to our focus of study on the possible causality between ASEAN+3 trade and its growth may be written in either the reduced-form adjusted equation (7) and supplemented by the full reduced-form equation for T (8) (and similarly for Y).

$$Y\% = a1 + a2\ \check{T}\% + a3ST + v1 \qquad (7)$$

$$T\% = p1 + p2\ YT\% + p3\ FT\% + p4\ MT + p5\ PT + p6ERT + p7IT + p8POT + p9ST + v2 \qquad (8)$$

In (7)-(8), ASEAN trade (T%) with its trading partner is assumed to cause, together with ST, ASEAN growth (Y%) but this trade is also affected by economic activities, trade-related policies and external or internal shocks in the ASEAN and its trading partner (either China, Korea or Japan or all 3 East Asian economies combined). Assuming for convenience that ASEAN's trade [traditionally defined as its exports (or imports, see Barro and Helpman, 1991)] with its trading partner is affected by this partner's GDP and other major economic activities, trade-related policies (see Coe and Helpman, 1993 for this approach) or external or internal shocks in its trading partner, then Equation (8) in its reduced form simply assumes that ASEAN partner's trade is simply affected by the exogenous factors such as GDP (named YT), inflation (PT) – see Romer (1993), fiscal policy (FT), monetary policy (MT), trade policy and exchange rates (ERT) – see Rose (2000), industry structure (IT) – see Otto et. al. (2002), population (POT) – see Frankel and Romer (1999), and internal or external shocks (ST) – see Johansen (1982) - of its trading partner.

In deriving (7) and (8) for 2 trading countries, we assume that Country 1's trade affecting its growth is a testable hypothesis and this trade itself is essentially a demand equation for either imports (from Country 2) and exports (to Country 2) or vice versa or both. For the economies of the ASEAN and the East Asia 3, geographic attributes (that is, being in the neighbouring region) are assumed to be the prime facie reason for setting up the ASEAN+3, and the distance and area characteristics are omitted as all of our variables are expressed in terms of time-series (Distance and area may not be appropriate with high-trade countries like Singapore and Brunei in ASEAN+3). All variables in the model, that is, Y, T, YT, FT, MT, PT, ERT, IT and POT are expressed as their rates of change so the units of measurement for the trading countries' variables are irrelevant. ST is a qualitative variable representing shocks having either one-off effects or temporally permanent effects on trade and growth with discrete values.

The implications of our model above are important for studying the transmission mechanism or relationship between trade and growth of ASEAN and the East Asian 3.

This relationship, if empirically substantiated, can provide powerful evidence on the trade and welfare enhancement relationship of these countries as trading partners, and, as a result, it would lend crucial support for the viability, sustainability and promising prospects of the new Asian regionalism, namely, ASEAN+3.

5 Alternative Estimation and Forecasting Methods

The importance of using a suitable estimation method for our model (or similar models) to get more accurate or unbiased results has been emphasised in previous trade-growth studies using gravity theory (see for example Frankel and Romer, 1999). These studies deal mainly with the OLS and IV estimation methods. In this section, we briefly survey the various estimation and forecasting methods that are available and their appropriate use can produce more accurate econometric outcomes on the trade-growth relationship.

More specifically, in our model, the equations in differential and reduced form as given in (8) for Y% [or, similarly, for T% to provide Ť% in (7)] can be written more generally with a sampling size T and k independent variables (possible causal components) in matrix notation as

$$\underset{(Tx1)}{y} = \underset{(Txk)}{Z} \underset{(kx1)}{ß} + \underset{(Tx1)}{u} \qquad (9)$$

where y=Y%, Z=the rate of changes of the exogenous and predetermined variables (both static and dynamic), ß =the parameters, and u the disturbance satisfying all standard statistical assumptions.

We now define our evaluation criterion (Wald risks) for an arbitrary estimator $\hat{\beta}a$ for β in (9) as Wald risk ≡ MSE($\hat{\beta}a$) = ($\hat{\beta}a$-β)'W($\hat{\beta}a$-β) where W is positive definite. Under Wald risks, we can estimate (9) which is essentially a general linear model for structural or behavioral analysis or for direct forecasting and policy studies (see Pindyck and Rubinfeld, 1998) by using the OLS or, at a more statistically efficient level, any of the explicit (Baranchik, 1973) Stein or Stein-rule methods as described below.

More specifically, using (9), the basic and most well-known and used method to produce estimates and forecasts of y (or Y%) is the OLS estimator of ß (denoted by $\hat{\beta}$) and written as

$$\hat{\beta} = (Z'Z)^{-1}Z'y \qquad (10)$$

A more efficient method is the explicit Stein estimator of ß (Baranchik, 1973) and given by

$$\hat{\beta}s = [1 - c(y-Zb)'(y-Zb)/b'Z'Zb]\ \hat{\beta}$$

$$= [1 - c(1-R^2)/R^2]\ \hat{\beta} \qquad (11)$$

where c is a characterizing scalar and defined in the range $0 < c < 2(k-2)/(T-k+2)$, and R^2 is the square of the sample multiple correlation coefficient.

A still more efficient method (to avoid, in one respect, implausible results on plausible OLS parameter estimates) is the explicit positive-part Stein estimator of ß (Anderson, 1984). This estimator is defined as

$$\hat{\beta}+s = [1 - \min\{1\ ,\ c(y-Z\hat{\beta})'(y-Z\hat{\beta})/\hat{\beta}'Z'Z\hat{\beta}\}]\ \hat{\beta}$$

$$= [1 - \min\{1\ ,\ c(1-R^2)/R^2\}]\ \hat{\beta} \qquad (12)$$

A new method to obtain estimates and forecasts of ß in (9) with better properties in Wald risks has been proposed (see Tran Van Hoa, 1985, Tran Van Hoa and Chaturvedi, 1988, 1990, 1997). It is in a class of explicit improved Stein-rule or empirical Bayes (also known as the two-stage hierarchical information or 2SHI estimators for some linear regression models). This estimator includes the explicit Stein and the double k-class (Ullah and Ullah, 1978) estimators as subsets (Tran Van Hoa, 1993a). Other applications of the Stein, Stein-rule, and 2SHI estimators to linear regression models with non-spherical disturbances and to Zellner's seemingly unrelated regression model have also been made (see Tran Van Hoa et al, 1993, in the case of regressions with nonspherical disturbances, and Tran Van Hoa, 1992b, 1992c, and 1992d, in the case of seemingly unrelated regressions).

The explicit 2SHI estimator is a *bona fide* or fully operational estimator and defined as

$$\hat{\beta}h = [1 - c(1-R^2)/R^2\} - c(1-R^2)/\{R^2(1+c(1-R^2)/R^2)\}]\ \hat{\beta} \qquad (13)$$

and its positive-part counterpart (Tran Van Hoa, 1986a) is given by

$$\hat{\beta}+h = [1 - \min\{1\ ,\ c(1-R^2)/R^2\} - \{1/((R^2/c(1-R^2)) + 1)\}]\ \hat{\beta} \qquad (14)$$

While all the estimators given above can be applied to the general linear model (9) for structural and forecasting analysis, their relative performance in terms of historical, *ex post* or *ex ante* (Pindyck and Rubinfeld, 1998) forecasting MSE can differ. Thus, it is well-known that, in MSE and for $k \geq 3$ and $T \geq k + 2$, $\hat{\beta}s$ dominates (that is, it performs better in forecasting MSE) $\hat{\beta}$, and $\hat{\beta}s$ is dominated by $\hat{\beta}+s$ (Baranchik, 1973, Anderson, 1984). However, it has also been demonstrated (Tran Van Hoa, 1985, Tran Van Hoa and Chaturvedi, 1988) that, in MSE, $\hat{\beta}h$ dominates both $\hat{\beta}$ and $\hat{\beta}s$, and more importantly, $\hat{\beta}+h$ dominates $\hat{\beta}+s$ (Tran Van Hoa, 1986a).

A further important result of the 2SHI theory has recently been proved (see Tran Van Hoa and Chaturvedi, 1997): *the dominance of the 2SHI over the OLS and Stein exists anywhere in the range $0 < c < 2(k-1)/(T-k)$*. This indicates that the 2SHI produces better (in terms of smaller Walk risk or generalized Pitman nearness) estimates and forecasts even if the estimating and forecasting equation has only one independent variable in it. *The condition for the optimal Stein dominance in the linear equation up to now requires that $0 < c < 2(k-2)/(T-k+2)$* [see Anderson, 1984].

Remarks

First, since one of the best known IV estimators, namely the 2SLS, has been demonstrated to be dominated in MSE by the 2SHI in errors-in-variables models and in identified structural equations of simultaneous-equation models (see Tran Van Hoa, 1986b and 1986c) such as Equation (7), the so-called IV (see Frankel and Romer, 1999) impact of the trading partner's trade on ASEAN growth can be directly studied via the application of the 2SHI to (7).

Second, while some application of the 2SHI forecasting methods to predictions of economic activities in some developed countries such as Australia (see Tran Van Hoa, 1992d) has been made, these methods have not been investigated explicitly within an open trade-growth theoretical framework and an empirical context using more recent economic data for the major economies in ASEAN and the East Asia 3. This issue is taken up in the study below for some of the fastest growth economies or group of economies in the world in recent years (even after the Asia crisis of 1997) but with highly fluctuating investment and being very sensitive to foreign trade and capital flows in the region (see Tran Van Hoa and Harvie, 1998).

Third, an interesting feature of our study is that the 2SHI estimators are finite-sample estimators (which converge to the OLS or 2SLS when $T \to \infty$) with optimal MSE properties (see above). Since all data used here are necessarily annual and have, as usual, a small sample size, the study outcomes are therefore finite-sample optimal.

Finally, the 2SHI dominates other conventional estimators when measurement errors exist (Tran Van Hoa, 1986b). Since the poor quality of economic data from the Asian countries and other less developed countries economies is well known, one by-product of our study is that the findings are also optimal in errors-in-variables cases.

The results of our experimental study on the forecasting performance evaluated in terms of the Wald risk criterion of the standard gravity theory using ASEAN+3 data (see the specification in (8) above) are given in Table 4. The results are based on stochastic Monte Carlo simulation with finite-sample data (1968-1998) and obtained for 3 different ex-post forecasting timeframe horizons: short (2-years ahead)-, medium (5-years ahead)- and long (9-years ahead)-terms, and for 3 possible cases of measurement errors (that is, σ^2) on ASEAN+3 total trade data: actual estimated value of σ^2, 10 times more (low data quality) and 100 times more (very low data quality). The evidence reported in Table 4 shows that ASEAN+3 total trade ex-post forecasts based on the 2SHI dominate substantially the other ex-post forecasts based on the OLS and positive Stein estimation theories in all 9 models of total trade for the ASEAN+China, ASEAN+Korea and ASEAN+Japan free trade agreements, and for all 3 scenarios of measurement errors on trade data and also for all 3 forecasting timeframes under study.

5 Substantive Evidence on ASEAN+3 Trade-Growth Relationship

This section reports substantive results for a number of trade-growth simultaneous-equation models based on several plausible extensions (see below) to time-series data of the gravity theory in planar approximation (to any arbitrary functionals) and given in (7) and (8) above. For comparison with the findings of previous studies, these results are obtained by the OLS, 2SLS and 2SHI for the structural equation of growth (7).

Data – Due to the limitation of the required data in our studies, all original data are obtained as annual and then transformed to their ratios (when appropriate). The ratio variables include trade (exports and imports), government budget, and money supply (M2) all divided by GDP, and labour force divided by population. Other non-ratio variables include exchange rates, population and binary variables representing the occurrence of the economic, financial and other major crises over the period 1961 to 2001. All non-binary variables are then converted to their percentages. This percentage measurement is a main feature of our modelling approach and avoids the problem of a priori functional forms (see above) and also of logarithmic transformations for negative data [such as budget (fiscal) or current account deficit].

The data for national (eg, China, Japan and Korea) and regional (eg, ASEAN) trade (exports (X) and imports (IM) respectively), GDP and estimated mean population (named POP) are retrieved from 2001 France's CHELEM international trade databases. Openness between 2 trading countries is defined as T=X+IM although the separate effects of either X or IM have been experimented with (see below). All economic data are at current prices. Fiscal, monetary, trade and industry policy data for ASEAN or each of the Asia 3 are obtained from the 2002 World Bank World Tables and proxied, respectively, by government budget/GDP (BUR), M2/GDP (M2R), exchange rates per US dollar (ER), and employment rate (employment/population or UR). In addition to the usual demographic and economic components in our model, we also identified 4 major world crises that had affected the ASEAN+3 economies (and other economies) during our sampling period and included them as 4 dummy variables with persistent effects after their occurrence (the one-off effects was postulated but discarded as implausible in the study). These are the first oil crisis of 1975 (named C75), the stock market crash of 1987 (C87), the Gulf War of 1991 (C91), and the Asia crisis of 1997 (C97). For China whose data can go back only to 1978, we substitute the country's crisis of 1989 (the Tiananmen Square event) for C75 and call this C89. Various modelling experiments in our study also show that these crises all have a permanent effect on growth in ASEAN.

The Estimated Models - The various bilateral trade-growth models for the ASEAN and each of the East Asia 3 are based on these data. The 2-simultaneous equation trade-growth model for ASEAN and Japan for example in our studies that is based on (7)-(8) for example can be written fully for estimation and analysis as

$$YA\% = \alpha_1 + \alpha_2 TJP2A\% + \alpha_3 C75 + \alpha_4 C87 + \alpha_5 C91 + \alpha_6 C97 + v1 \quad (15)$$

$$\begin{aligned} TJP2A\% = \beta_1 + \beta_{12} YJP\% + \beta_3 BUR\% + \beta_4 M2R\% + \beta_5 IPD\% \\ + \beta_6 ER\% + \beta_7 UR\% + \beta_8 POP\% + \beta_9 C75 \end{aligned}$$

$$+ \beta_{10}C87 + \beta_{11}C91 + \beta_{12}C97 + v2 \qquad (16)$$

where, in percentages, YA=ASEAN's GDP, TJP2A= Japan's total trade (exports+imports or openness) with ASEAN, and YJP=Japan's GDP. The variables BUR, M2R, IPD, ER, UR and POP denote respectively fiscal, monetary, inflation, trade, industry policy and population in Japan. v's are the disturbances representing other unknown factors on YA and TJP2A respectively (see Frankel and Romer, 1999). The trade-growth models for ASEAN and Korea and China can be similarly constructed.

The Empirical Findings – Three sets of empirical findings for 3 trade-growth models and based on the equations (15)-(16) above for ASEAN and Japan, ASEAN and Korea, and ASEAN and China are given in Table 1. Due to the importance of the estimation methods used that can provide greatly different results even for the same model (see further detail in Frankel and Romer, 1999) and also for the purpose of statistical efficiency comparison, three types of estimated structural parameters have been calculated for each model. These are the OLS, the 2SLS and the 2SHI (applied on the 2SLS). For testing hypothesis, the 2SHI has approximately the same asymptotic properties as the OLS and 2SLS. Due to very limited data on government budget for some ASEAN+3 countries, BUR has been omitted from the estimation altogether.

TABLE 1
ASEAN Growth and Trade with China, Japan and Korea
Extended Gravity Theory in Flexible Functional Form
1968 to 1998

	ASEAN-Japan			ASEAN-Korea			ASEAN-Extended China		
Variables	OLS	2SLS	2SHI	OLS	2SLS	2SHI	OLS	2SLS	2SHI
Constant	-0.57	-1.31	-1.26	6.70@	-1.63	-1.21	5.37**	3.64	3.12
Openness/GDP	0.56**	0.59**	0.57**	0.28**	0.50**	0.37**	0.45**	0.31@	0.27@
Oil Crisis 75	5.84*	6.42**	6.13**	-2.39	2.16	1.60			
Stock Crash 87	-4.87	-5.21*	-4.98*	-0.55	-3.64	-2.70	-4.80	0.47	0.40
China Crisis 89							3.87	3.28	2.81
Gulf War 91	6.19*	6.41**	6.13**	3.80	6.13	4.55	1.22	0.75	0.64
Asia Crisis 97	-9.41**	-15.06**	-14.40**	-13.17**	-8.42**	-6.25**	-12.77**	-26.55**	-22.75**
R^2	0.82	0.87	0.93#	0.55	0.51	0.81#	0.60	0.76	0.85#
F	23.71**	28.06**	69.62**	6.31**	4.49**	20.77**	7.80**	7.46**	16.74**
DW	2.15	1.95		1.91	2.43		1.77	1.40	

Sources of data: 2002 World Bank World Tables, 2001 CHELEM International Trade Data.
*Notes: ** significant at 5% level, * significant at 10% level @ significant at 15% level. # correlation coefficient between ASEAN's growth and its estimate by the 2SHI. Tests on 2SHI estimates are based on their asymptotic properties as T -> ∞.*

From the results given in Table 1, we note 3 important findings. First, while modelling output growth has been difficult to have high success, all 3 estimated models of ASEAN growth vis-à-vis each of its major trading partners in Asia (the East Asia 3) have statistically significant and higher modelling performance (that is, R^2 reaching up to 87 per cent) relative to other trade-growth causality models as reported in previous studies. A graph of the observed and estimated growth fluctuations in the ASEAN for all 3 models for the period under study also indicate that the peaks, troughs and turning points of this growth are accurately predicted for most of the periods under study. All estimated models also appear free from autocorrelation-induced inefficiency problems. Second, trade, as defined by total trade/GDP between the ASEAN and each of the East Asia 3, has statistically significant and plausibly positive impact (with an elasticity reaching 0.59 for ASEAN+Japan) on ASEAN growth. Third, while the impact of the oil crisis of 1975, the stock market crash of 1987 and the Gulf War in 1991 has a mixed effect on ASEAN growth, the Asia economic and financial crisis starting in 1997 in Thailand has uniformly a significant and deep negative impact on ASEAN growth in all 3 models. More specifically, the impact of this crisis on ASEAN growth, as calculated by the 2SLS, ranges between -8.42 in the ASEAN-Korea model, -15.06 in the ASEAN-Japan model, and -26.55 in the ASEAN-China model.

In other modelling experiments to verify the use of other definitions of trade (see above), we decomposed total trade into ASEAN's imports (i.e., the trading partner's exports) and the trading partner's imports (i.e., ASEAN's exports) separately and included them in the growth-trade equation (15). The empirical findings for the impact of ASEAN's imports and exports on its growth for the 3 models: ASEAN and Japan, ASEAN and Korea, and ASEAN and China, are given in Table 2.

TABLE 2
ASEAN Growth and Trade with China, Japan and Korea
Extended Gravity Theory in Flexible Functional Form
1968 to 1998

	ASEAN-Japan			ASEAN-Korea			ASEAN-Extended China		
Variables	OLS	2SLS	2SHI	OLS	2SLS	2SHI	OLS	2SLS	2SHI
Constant	12.60**	7.48@	5.74@	14.27**	15.71**	8.15**	10.87**	8.26**	4.28**
Openness/GDP									
Imports/GDP	0.46**	0.21	0.15	0.25**	0.22	0.04	0.30**	-0.09	-0.05
Exports/GDP	0.15	0.61*	0.47*	-0.001	-0.06	-0.01	0.01	-0.13	-0.07
Oil Crisis 75	-0.94	4.10	3.15	-6.24	-7.19	-3.83			
Stock Crash 87	-6.67@	-3.87	-2.97	1.52@	2.04	1.44	-0.51	5.85	3.03
China Crisis 89							-2.43	2.35	1.22
Gulf War 91	6.43	6.53	5.01	1.31	0.66	0.33	5.40	-2.03	-1.05
Asia Crisis 97	-25.99**	-35.67**	-27.40**	-31.94**	-31.60**	-8.91**	-29.73**	-30.51**	-15.80**
R^2	0.76	0.61	0.78	0.61	0.60	0.77	0.56	0.54	0.46
F	12.99**	6.17**	14.26**	6.19**	5.09	13.54	5.16**	2.96**	2.03**
DW	1.46	2.18		1.38	1.36		0.94	1.50	

Footnote. See Table 1.

The first observation from Table 2 is that, in terms of the modelling performance (R^2) of the 2SLS estimation, all 3 estimated models with separate exports and imports are not as successful as the models with total trade or openness. More specifically, while the predictions of peaks, troughs and turning points are still fairly accurate and serial correlation is absent in these models, trade to and from Japan, Korea or China is not a significant contribution to ASEAN's growth at the conventional 5% critical level, and crises other than the Asia turmoil of 1997 hardly have any impact on ASEAN growth.

The results reported in Table 2 show one thing clearly: the Asia crisis is the principal agent explaining the growth decline in ASEAN.

6 Trade Policy Implications and Prospects for ASEAN+3 FTA

While the models we used for study above may be simple in their structure, they contain the main and conventional ingredients of trade-growth analysis and are fairly consistent with similar previous studies for comparison. The empirical findings reported in the preceding section also provide a number of interesting results on trade-growth causation with important international trade or co-operation policy implications in the economies of ASEAN+3 in particular or in other regional and international economic integrations with similar interest and objectives. Some of our findings may be useful in providing significant evidence and information for trade-growth analysis, discussions and policy consideration. While some of the previous trade-growth analysis are based purely on cross-section data or a mix of panel data, our studies are based completely on time-series data. The two approaches are therefore complementary.

Does Trade Cause Growth? This is an important topic in economics that has attracted some of the best minds in the field over the last 10 years or so (see for example Frankel and Romer, 1999, for some survey), and the conclusions have not be finalised for all cases. Our results above show that in the specific case of ASEAN+3, ASEAN's trade, when defined as its relative size of openness, has ample empirical support as a significant and positive determinant of the region's growth. Importantly, for the East Asia 3 in focus and for the available data at our disposal (1968-1998), a strong trade-growth causation is found especially for developed OECD-level countries with high trade activities such as Japan and Korea. For developing China, the impact is, even though less significant, still positive. This less successful finding for China is due perhaps to more limited sampling size and thus less available information for the country's study.

When trade is decomposed into its 2 components, exports and imports, the findings of trade-growth causation are not so clear-cut for the ASEAN and the East Asia 3. This result is not a case of multicollinearity as ASEAN's exports and imports cannot be assumed to be collinear even for time-series data and the East Asia 3. The East Asia 3's exports to ASEAN seemed the main contribution to ASEAN's growth.

Do Crises Affect ASEAN's Growth? When openness is used as a proxy for trade between ASEAN and the East Asia 3, crises and trade do appear to affect ASEAN's growth. It is interesting to note that high-trade countries such as Japan seem to be affected by more crises than less high-trade countries like Korea and especially China. When decomposed trade is used however, the Asia crisis of 1997 is found to be the only factor that has exerted a strong and uniform impact on ASEAN's growth in all 3 ASEAN+3 models. A natural conclusion is that a contemporary trade-growth model for ASEAN+3 (or even for other regions or countries) studies without the inclusion of these recent shock factors (as implied by Frankel and Romer, 1999, or stipulated by Johansen for policy analysis, 1982) may have serious and biased results on the causation being explored.

Are Trade-Growth Causation Results Affected by Estimation Methods? In previous studies of trade-growth, OLS results of trade-growth models based on the gravity or similar theory seem to indicate an underestimation of the trade effect. 2SLS or generally IV estimates of the trade effect are usually found to be larger with these IV estimates. Four reasons have been put forward to support the underestimation of the OLS and two explanations for the overestimation of the 2SLS (see Frankel and Romer, 1999, for a brief survey). In our studies using openness, the overestimation of the 2SLS is found for the trade effect in the ASEAN-Japan and ASEAN-Korea models, but the reverse is found for the ASEAN-China case. In studies with decomposed trade however, the 2SLS estimated impact is lower than that of the OLS for all 3 models and only in terms of ASEAN's imports from the East Asia 3. For ASEAN's exports, the OLS-based trade elasticities are uniformly larger than their 2SLS counterpart.

It is well known from the bias $-\beta Cov(Vu)$ of the OLS in errors-in-variables models (that is, $y=\beta X^*+u$, but X^* is unobserved and proxied by observed X with $X=X^*+V$, where V is measurement errors) or equivalently simultaneous-equation models that the specification of the model or the instruments [as captured through Cov(Xu)] solely determines a downward or upward bias of the OLS. In our view it is the nature of the model and the characteristics of the instruments that determine the estimation bias. A general conclusion may not be made in this case.

When we are focused on higher efficiency for the estimates of the models that are subject to misspecification (eg, omitted relevant variables) or measurement errors or simultaneity, then the 2SHI estimates should be used. In this case, the impact based on the OLS and 2SLS are both overestimated. The smaller MSE estimates of the trade impact as obtained by the 2SHI and compared to the 2SLS are given for all models in Tables 1 and 2.

Are Reduced-form Estimates of Trade Good Proxy for Trade? This is a question on the accuracy and reliability of the trade-growth model and the instruments used (a point often raised in the literature, see Frankel and Romer, 1999). The answer in this case has to be relative as different models will have different instruments and therefore different accuracy or reliability outcomes. To answer this question on our models, we have calculated the proxy for T, namely Ť, from its reduced form for each of the estimation requiring a knowledge of Ť. Standard evaluation criteria such as the correlation coefficient and the Theil-MSE-decomposition Um (bias), Us (variation) and Uc (covariance) are then used to evaluate the proxy performance of Ť as compared to its actual T in each model reported in Table 1. The results of this evaluation are given in Table 3.

We first note from Table 3 that, as in the cases earlier with GDP, the Ť can fairly accurately emulates all troughs, peaks and turning points of the actual T in all 3 models ASEAN-Japan, ASEAN-Korea and ASEAN-China. In addition, the results indicate that, according to the evaluation criteria used in Table 3, the Ť seems to be a good estimated proxy to T in all models. This finding would enhance the robustness of our 2SLS estimation of the impact of trade on ASEAN's growth.

TABLE 3

Reliability of Trade Proxy in ASEAN+3 Trade-Growth Models
Openness (Exports+Imports)/GDP
1968 to 1998

Model	ASEAN-Japan	ASEAN-Korea	ASEAN-China
Correlation Coefficient	0.85	0.68	0.75
RMSE	10.37	18.78	8.35
Mean Error	0.00	0.00	0.00
Um	0.00	0.00	0.00
Uc	0.08	0.19	0.14
Us	0.92	0.81	0.86

Notes. Ub+Us+Uc = 1. See Pindyck and Rubinfeld (1998) for further detail on these evaluation criteria. The estimates are based on TSP.

Do We Have Empirical Support for ASEAN+3 FTA? As we have mentioned earlier, the objectives of setting up an ASEAN+3 TFA are, in addition to better regional cooperation and stability, to enhance trade between its 13 members and to improve their welfare. These objectives necessarily require that trade does in fact directly and positively affect growth. What are the determinants of trade and how they affect growth provide only auxiliary information on the interaction of the various activities in the trading country partners, and to provide a more accurate measurement of the trade impact. Our findings reported above lend ample support to the hypothesis that trade between ASEAN and Japan, Korea and China does affect ASEAN's growth, and this is sufficient to provide an empirical basis to Asian policy-makers to push for bilateral regional FTAs such as ASEAN+Japan, ASEAN+Korea and ASEAN+China.

The findings also indicate that, while trade of the East Asia 3 plays an important part in improving ASEAN's growth, major external shock factors and especially the Asia crisis of 1997 have been found to be influential in causing a decline in ASEAN's growth. A pure gravity theory may, in this case, not be able to integrate these factors in its successful explanation of trade-growth causality. In addition, better economic crisis management to minimise or even prevent similar future crises is seen to be a main ingredient to promote ASEAN+3 trade and growth (Tran Van Hoa, 2002b, 2002c and 2002d).

ASEAN+3 Trade Policy and Growth Prospects: The above conclusions appear to indicate that trade and crises are crucial to ASEAN+3 growth and development. More specifically, trade (exports) from the East Asia 3 to ASEAN is the more important contribution. Since the East Asia 3 are known to be more competitive, in terms of development stages, advanced technology, comparative advantages, and size, than the majority of the ASEAN, our findings on ASEAN's growth dependence on this trade seems plausible. A good trade or integration policy emanating from the ASEAN should take this into account. From the East Asia 3 perspective, an emerging good and large export market in the neighbourhood is a guarantee against volatility in terms of export income or political and social order in the region.

In our earlier study (Tran Van Hoa, 2002a), it was pointed out that while trade between the East Asia 3 reflects an important historical trend in the past 30 years or so, the composition of trade by tradable commodities is also important in promoting growth and development. Since the majority of trade between the East Asia 3 and other advanced economies in North America and the EU involve groups of tradable commodities of a hi-tech nature, it was claimed that this technology transfer is essential to growth and development in the East Asia 3. The implications of this are twofold. First, while showing an interest in improving trade with the ASEAN, the East Asia 3 and especially Japan and Korea, could still prefer to trade more with North America and the EU where most of the recent technological advances in production, marketing and distribution have been made. A closer FTA with ASEAN may not detract the East Asia 3 from this policy. Second, while the ASEAN may still benefit from a transmission of North America and EU hi-tech to them via the East Asia 3's trade, this transmission channel may be slower than direct involvement by the ASEAN and, in addition, this kind of filtered-down hi-tech may not involve the most current technology available in the global market.

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TABLE 4

Performance in Ex-post Forecasts of ASEAN+3 Trade
Based on Extended Gravity Theory and the OLS, Positive STEIN and 2SHI
Results of Stochastic Monte Carlo Simulation
1968-1998

Estimation period									
	1968 to 1979			1968 to 1979			1978 to 1989		
Forecasting period									
	1980 to 1981			1980 to 1984			1990 to 1998		
	σ^2	$10\sigma^2$	$100\sigma^2$	σ^2	$10\sigma^2$	$100\sigma^2$	σ^2	$10\sigma^2$	$100\sigma^2$
Relative Ex-Post Forecasting MSE: Informational Gain (%)									
1. PREDICTING FUTURE ASEAN+JAPAN OPENNESS									
R(ml/s)	8.85	21.60	20.12	7.96	18.91	32.76	7.19	20.40	18.29
R(ml/h)	17.73	42.70	40.07	16.14	36.51	58.91	14.51	35.16	33.05
R(s/h)	8.16	17.35	16.61	7.57	14.80	19.70	6.83	12.27	12.49
2. PREDICTING FUTURE ASEAN+KOREA OPENNESS									
R(ml/s)	14.62	25.84	20.15	22.64	19.69	26.36	14.57	22.72	15.01
R(ml/h)	28.76	50.42	40.68	39.56	36.72	48.00	26.62	39.67	26.76
R(s/h)	12.34	19.54	17.10	13.79	14.22	17.13	10.52	13.81	10.22
3. PREDICTING FUTURE ASEAN+CHINA OPENNESS									
R(ml/s)	12.24	33.60	29.24	10.75	22.50	26.51	11.68	29.50	36.08
R(ml/h)	24.43	70.13	57.02	21.85	43.89	48.15	22.43	53.82	70.89
R(s/h)	10.86	27.34	21.49	10.02	17.46	17.11	9.63	18.78	25.58

NOTES. *$\hat{\beta}$ = OLS, $\hat{\beta}s$ = positive-part Stein (STEIN), $\hat{\beta}h$ = positive-part 2SHI. R(ml/s)=R($\hat{\beta}/\hat{\beta}s$)= 100[MSE($\hat{\beta}$)/MSE($\hat{\beta}s$)-1], where MSE($\hat{\beta}$) = E($\hat{\beta}$-ß)'($\hat{\beta}$-ß) with ß calculated from the OLS estimates of each equation using 500 repetitions (with the error terms only random from trial to trial), and used as the true parameter vector. Similarly for $\hat{\beta}h$ and $\hat{\beta}s$, i.e., R(ml/h)=R($\hat{\beta}/\hat{\beta}h$) and R(s/h)=R($\hat{\beta}s/\hat{\beta}h$). Relative efficiency in ex-post forecasting MSE of say $\hat{\beta}h$ over $\hat{\beta}s$ exists whenever R(s/h) = R($\hat{\beta}s/\hat{\beta}h$) ≥ 0. σ^2 = OLS-based disturbance variance. In our stochastic simulation study, all results are based on 100 statistical trials and c is optimally set as c = (k-2) /(T-k+2) (see Baranchik, 1973, and Anderson, 1984). All data are from the 2002 World Bank World Tables DX databases and 2001 CHELEM trade databases. For the derivation of the ASEAN+3 standard gravity theory trade equation used, see (7) in text. The 'benchmark' parameter estimates of this equation are obtained as the mean parameters from 500-iteration stochastic simulations with the equation variances equal the actual residual variance σ^2.*