ADB Working Paper Series on
Regional Economic Integration No. 10

Trade Intensity and Business Cycle Synchronization: The Case of East Asia

Pradumna B. Raną
Senior Advisor
Office of Regional Economic Integration
Asian Development Bank

June 2007

Office of Regional Economic Integration
Asian Development Bank

The ADB Working Paper Series on Regional Economic Integration focuses on topics relating to regional cooperation and integration in the areas of infrastructure and software, trade and investment, money and finance, and regional public goods. The Series is a quick-disseminating, informal publication that seeks to provide information, generate discussion, and elicit comments. Working papers published under this Series may subsequently be published elsewhere.

Key words: economic integration, trade intensity, intra-industry trade, business cycle synchronization, East Asia.

JEL Classifications: F15, F42

Unless otherwise noted, $ refers to US dollars.

Trade Intensity and Business Cycle Synchronization: The Case of East Asia

Pradumna B. Rana*
Senior Advisor
Office of Regional Economic Integration
Asian Development Bank

June 2007

Abstract:

This paper examines whether increasing trade intensity among East Asian countries has led to a synchronization of business cycles. It extends the work of Shin and Wang (2004) in two ways: by (i) improving the specification of their business cycle correlation equation, and (ii) extending the sample to cover the period after the Asian financial crisis. The study finds that intra-industry trade, rather than inter-industry trade, is the major factor explaining business cycle co-movements in East Asia, with important implications for the prospects for a single currency in the region.

*Corresponding author: e-mail: prana@adb.org; tel: (+63) 2 632 5458; fax (+63) 2 636 2183;. The author is grateful to Seok-Hyun Yoon for valuable discussions and to Ferdinand O. Sia for excellent research assistance. The views expressed in this paper are those of the author and do not necessarily reflect the views and policies of the Asian Development Bank, or its Board of Governors or the governments they represent.

I. Introduction

East Asian trade volume has increased faster than anywhere else in the world in recent decades; mainly due to the lowering of tariffs begun in the 1980s. Trade integration among these economies has also reached a high level, leading many to call for deeper monetary integration in the region; as trade integration could lead to greater synchronization of business cycles. Business cycle synchronization is important because if trade intensity in East Asia has indeed led to an increase in co-movement of output, then the cost of forming an optimum currency area (OCA) in the region will have been reduced through lower incidence of asymmetric shocks.

This paper aims to examine whether rising East Asian trade intensity has led to such synchronization. Theoretically the impact is ambiguous, and dependent on the nature of trade (Section II), therefore requiring an empirical approach. Frankel and Rose (1998) provide the seminal work on this topic, while several other authors[1] have improved on its specification. The latest is Shin and Wang (2004).

This paper extends Shin and Wang (2004) in two ways: as suggested by Frankel and Rose (1998), it introduces instrumental variables for the trade intensity term in order to remove the estimation bias. And it updates their results by including data since the 1997/98 Asian financial crisis.

II. Trade Intensity and Business Cycle Synchronization

According to the theoretical literature, the impact of trade integration on a business cycle is ambiguous. If the demand channel dominates, we expect trade integration to increase cycle correlation. Positive output shocks in an economy may increase demand for goods from a neighbor. On the other hand, if industry-specific shocks are the dominant force explaining cyclical output, the relationship would be negative if increasing specialization in production leads to inter-industry trade (as in Heckscher-Ohlin or Ricardo). In this case, trade integration leads to specialization in different industries, which in turn leads to asymmetric effects of industry-specific shocks. In contrast, if intra-industry trade or vertical trade prevails, as in the global production and supply chains that are now developing in East Asia, specialization does not necessarily lead to those asymmetric effects because the pattern of specialization occurs mainly within industries. As Calderon, Chong, and Stein (2003) argue, "the total effect of trade intensity on cycle correlation is theoretically ambiguous and poses a question that could only be solved empirically."

In a seminal paper, Frankel and Rose (1998) have specified an equation in which cyclical output correlation depends on trade intensity. They point out, however, that using the ordinary least squares OLS method to estimate this equation would generate biased and inconsistent estimates as a result of an endogeneity problem. First, cycle correlation could lead to currency unions, which in turn could lead to increased trade intensity. Second, by joining a currency union, countries reduce transaction costs and increase trade links which might lead to higher output correlation. Therefore, a positive relationship between trade intensity and cycle correlation could potentially result because a third factor—the formation of a currency union—explains both variables. As a result, they use instruments for the bilateral trade intensity variable based on the gravity

[1] For example, Calderon, Chong, and Stein (2003).

model. Using data from 21 industrial countries, they find that the higher the level of bilateral trade, the more highly correlated are business cycles.

Using a broader set of instrumental variables suggested by Wei (1996) and Deardorff (1998), Calderon, Chong, and Stein (2003) find that the impact of trade integration on business cycle synchronization in North-North country pairs is higher than in North-South and South-South country pairs.

An important step, however, is missing from Frankel and Rose (1998) and Calderon, Chong, and Stein (2003). Both conjecture that the positive correlation between trade intensity and business cycle co-movement is a result of intra-industry trade, but they do not introduce this variable directly in their equations.

Shin and Wang (2004) extend the analysis of trade intensity and cycle correlation significantly by identifying four channels through which increased trade integration might affect business cycle co-movements: (i) inter-industry trade, (ii) intra-industry trade, (iii) demand spillovers, and (iv) policy coordination channels. Only the first channel implies that increased trade leads to less synchronization of business cycles. Their business cycle co-movement equation has four regressors—trade intensity, intra-industry trade, fiscal policy coordination, and monetary policy coordination. Although aware of the endogeneity problem highlighted by Frankel and Rose (1998), they note the difficulty of finding appropriate instrumental variables for the intra-industry trade term. Following Imbs (1998), they argue that the real problem is not one of endogeneity, but of an omitted variable which they believe can be handled by the introduction of macroeconomic policy coordination variables.

Shin and Wang (2004) estimate the equation using 1976–1997 data from 10 East Asian economies and two South Asian countries and the OLS method. They find that intra-industry trade is the major variable explaining business cycle co-movement. Unlike Frankel and Rose (1998) and Calderon, Chong, and Stein (2003), Shin and Wang's (2004) results suggest that increasing trade itself does not induce synchronization of business cycles. In particular, if increasing trade occurs mainly across different industries, it does not foster co-movement of output with trading partners.

We improve on Shin and Wang (2004) in two ways. First, we estimate an equation similar to that of Shin and Wang (2004) but, as suggested by Frankel and Rose (1998), we introduce instrumental variables for the trade intensity term. Because Shin and Wang (2004) do not use instrumental variables, the estimated coefficient could be biased and inconsistent. Second, Shin and Wang's (2004) sample ends in 1997 and does not capture structural changes that might have occurred in the business cycle co-movement equation since the Asian financial crisis. Therefore, we expect the relation between business cycle co-movement and trade intensity to have strengthened in the post-crisis period for several reasons. First, the sharp withdrawal of capital from the region and the consequent slump in domestic demand increased the relative importance of external demand in explaining business cycle co-movements. Second, cooperation and integration (including policy dialogue on trade issues) picked up after the crisis. Rana (2007) and Lee, Park, and Shin (2004) have found that co-movements of output in East Asian economies have been more pronounced in the period. Our sample covers 1993–2004.

III. Data and Statistical Trends

To measure business cycle synchronization, we collected monthly industrial production index (IPI) data for the period January 1989 to December 2004, from national sources. Our sample includes People's Republic of China (PRC), Indonesia, Japan, Republic of Korea, Malaysia, Philippines, Singapore, and Thailand. Following Frankel and Rose (1998), we used the Hodrick-Prescott filter to de-trend the data and determine the cyclical components of IPI. Bilateral correlations were calculated using 5-year windows and moving average figures. For example, the 1993 annual data used in our regressions refers to bilateral correlation between monthly observations from January 1989 to December 1993.

Bilateral trade intensity between country *i* and country *j* over time period *t* was measured using the following formula:

$$TI_t = \left(\frac{f_{ijt}}{F_{it}}\right) \bigg/ \left(\frac{F_{jt}}{W_t}\right)$$

where f_{ijt} is the total trade (exports plus imports) between countries *i* and *j*; F_{it} is the total trade of country *i*; F_{jt} is the total trade of country *j*; W_t is the total world trade. Following Shin and Wang (2004), trade intensity indexes using export and import data were annual and obtained from the International Monetary Fund's (IMF) *Direction of Trade Statistics*.

The intra-industry trade data was based on the Grubel and Lloyd index,

$$IIT_t = 1 - \frac{\sum_i \left| x_{ijt}^k - m_{ijt}^k \right|}{\sum_i (x_{ijt}^k + m_{ijt}^k)}$$

where x_{ijt}^k is total nominal exports of product k from country *i* to country *j* and m_{ijt}^k is total nominal imports of product *k* from country *j* to country *i*. These were calculated at the Standard International Trade Classification (SITC) two-digit level based on data from the United Nations Commodity Trade Statistics Database, or UN Comtrade (SITC Revision 3).

The monetary policy coordination (MPC) variable was defined as correlation between of bilateral real interest rates between pairs of countries. They were calculated using the 5-year window moving average and monthly data, just like the IPI correlation variable. We used IMF *International Financial Statistics*.

The fiscal policy coordination (FPC) variable was defined as the bilateral correlation between pairs of fiscal balances expressed as a percentage of gross domestic product (GDP). We used 5-year windows of annual data to calculate bilateral correlations—for example, the 1993 observation refers to correlation using 1989–1993 annual data.

In Table 1, we report the average measures of IPI correlation, trade intensity, intra-industry trade, and the monetary and fiscal policy coordination variables for each country. The average correlation is based on a simple arithmetic mean for the correlation measures of each country with the other East Asian countries in the sample. For example, we calculate the correlation measures for Indonesia with each of the other seven East Asian countries and use the mean as the measure for Indonesia.

Interestingly, the corr IPI variable for all the countries increased until the early 2000s, and has since fallen somewhat. Both the TI and IIT variables show a steady upward trend during the period under analysis, suggesting that among these countries total bilateral trade as well as intra-industry trade has been increasing. Data in the last two columns suggest better macroeconomic policy coordination in the late 1990s and early 2000s, which may reflect improved regional policy dialogue in the post-crisis period under the ASEAN Surveillance Process and the ASEAN+3 Finance Ministers Process.

IV. The Regressions and Estimation Results

Following Shin and Wang (2004), we estimate the following equation:

$$corr\ IPI\ (i.j)_\tau = \alpha_0 + \alpha_1 \cdot TI\ (i.j)\tau + \alpha_2 \cdot IIT\ (i.j)\tau + \alpha_3 \cdot FPC(i.j)\tau + \alpha_4 \cdot MPC(i.j)\tau + \epsilon_{ij\tau} \qquad (1)$$

where $corr\ IPI\ (i.j)_\tau$ refers to the correlation of industrial production index between country *i* and country *j* during period τ.[2] As described in Section III, for trade intensity *(TI)*, we use the total trade measure and calculate intra-industry trade *(IIT)* at the two-digit level.[3] For fiscal policy coordination *(FPC)*, we calculate the correlation of the ratio of budget deficit to GDP between country *i* and country *j*. For monetary policy coordination *(MPC)*, we consider the correlation coefficient of real short-term interest rates between each pair of countries.

As Shin and Wang (2004) highlight, each term on the right-hand side of equation *(1)* represents a channel through which increased trade influences co-movements of IPI across countries. The first term, trade intensity, indicates how demand spillovers influence business cycle correlation. Because demand spillovers increase as trade intensity increases, it should be valid to use trade intensity as a proxy for demand spillovers. The second term, intra-industry trade, indicates how co-movements of output are influenced by intra-industry trade. The third and fourth terms indicate how coordination of fiscal and monetary policy, respectively, affect co-movements. Finally, if trade increases mainly through inter-industry trade, and if this channel dominates the other channels, then the coefficient of the first term should be negative. In this way we can identify the most important channel of trade influencing co-movement of outputs across countries.

We estimated equation *(1)* using OLS and the instrumental variable (IV) approach in which, as suggested by Frankel and Rose (1998), we use instruments for TI in order to estimate α_1 consistently.

---

[2] The variables are defined and sources identified in Section III.

[3] Shin and Wang (2004) used several different measures of *TI* and *IIT*, but the results were similar.

Following Calderon, Chang and Stein (2003), the regression for trade intensity is

$$TI = \beta_o + \beta_1 y_i + \beta_2 y_j + \beta_3 d_{ij} + \beta_4 B_{ij} + \beta_5 REM_i + \beta_6 REM_j + \varepsilon_{ij} \qquad (2)$$

where y_i and y_j represent income per capita in countries i and j, d_{ij} is the distance between country i and j, and B_{ij} is a dummy variable equal to one for countries that share a common border. It is expected that bilateral trade between countries i and j will increase if their outputs per capita increase, if they are closer in distance, and if they share a common border. Furthermore, an indicator of geographical remoteness *(REM)* for countries i and j that measures how far each country lies from alternative markets is also included. It is expected that the farther the alternative markets, the higher the trade intensity between pairs of countries. REM_i and REM_j are remoteness variables.[4]

The estimated regression results are presented in Table 2. Panel A of the table presents the OLS results, while Panel B presents the IV estimates.

Our findings strongly support those of Shin and Wang (2004). In fact, the statistical significance of the regressors is much higher than those they report. The OLS regression results indicate that, as expected, the estimated coefficient of the TI variable is positive and statistically significant at the 1% level. Similarly, the coefficient for the IIT variable is also positive and statistically significant, indicating a positive relationship between intra-industry trade and business cycle synchronization.[5] When we use both the TI and IIT variables, however, the former variable, although positive, becomes statistically insignificant, while the IIT variable remains highly significant. Both the fiscal and monetary coordination variables are also of the correct sign and statistically significant at the 1% level. When we introduce a crisis dummy variable, however, they become statistically insignificant. The post-crisis dummy is also positive and statistically significant at the 1% level, suggesting that, as expected, the relationship between trade intensity, intra-industry trade and business cycle synchronization has strengthened since the crisis.

Panel B of Table 2 presents the results of IV regressions. The results are broadly similar to the OLS estimates, suggesting strong statistical significance of the IIT, FPC, and MPC variables. The crisis dummy is also significant.

The fixed effect OLS and IV regressions in Table 3 are also broadly similar to the results using pooled data. The only difference appears to be that when both IT and IIT variables are used in the IV model, both are statistically significant, although the statistical significance of the IT variable is lower than that of the IIT variable.

We also performed various robustness checks for our specifications and generally arrived at the same conclusions. We did this by excluding various countries from our full sample. Tables 4 and 5 present the results excluding Japan, the largest economy and the largest trading partner of many economies in the region. Tables 6 and 7 present the results excluding the PRC which is now emerging as an important center in global production chains. Tables 8 and 9 present the results excluding both.

Our results suggest that intra-industry trade (together with macroeconomic coordination variables when the crisis dummy is not included) is a major factor explaining business cycle co-movements in East Asia. Interestingly, this means that increasing trade itself does not lead to synchronization of business cycles. In particular, if increasing trade

[4] See Appendix 1 for definitions of variables and data sources.
[5] The statistical significance of the IIT variable, however, is higher than that of TI.

occurs mainly across different industries, it does not foster co-movements of production with trading partners.

V. Implications

The above findings have important policy implications for monetary cooperation in East Asia. Bayoumi and Mauro (1999) have calculated an Optimal Currency Area (OCA) index for ASEAN based on historical data of debt patterns and the nature of disturbances and concluded that "on economic criteria, ASEAN appears less suited for a regional currency arrangement than Europe before the Maastricht Treaty was signed, although the difference was not large."[6] The findings of this paper—that an increase in intra-industry trade leads to synchronization of business cycles together with the findings of Frankel and Rose (1998) that the level of trade integration increases significantly after the formation of a currency union— suggest that although ex ante East Asia may not be a good candidate for a currency union, ex post based on endogenous factors it could be. The latter factors are important because trade expansion due to the formation of a currency union could lead to greater synchronization of business cycles, which in turn would reduce the cost of union by increasing the incidence of symmetric shocks. Proponents of deeper monetary cooperation in East Asia, including those making a case for a single currency, may have a point.

As Frankel and Rose (1998) have cautioned, a cursory review of historical data may give a misleading picture of a country's eligibility for entry into monetary union because its economic structure may change as a result of joining. Formation of a currency union leads to an increase in trade, which in turn leads to greater synchronization of business cycles. Our findings suggest, however, that caution should be exercised in searching for appropriate partners for currency union: trade may increase, but if increased trade is mainly inter-industry then business cycle movements could be weakened. It is only when the level of intra-industry trade increases that business cycles become more synchronized and the cost of a currency union is reduced.

[6] See Bayoumi and Mauro (1999), page 1.

Appendix 1
Instrumental Variables and Sources

GDP per capita (y_i *and* y_j): This variable is expressed in US dollars and data is from ADB *Key Indicators of Developing Asia and Pacific Countries* and Econstat (for Japan).

Distance (d_{ij}): This variable is the physical distance in kilometres between the capitals of two countries. The data source is http://geobytes.com.

Remoteness (REM_i *and* REM_j): Following Wei (1996) and Deardorff (1998), we constructed a variable on remoteness for country *i* using the weighted average of that country's distances to all of its partners (except for the country *j* involved in a determined country pair). The distances were all weighted by the share of the partner's output in world GDP, that is, for a determined (*i,j*)-country-pair, the remoteness of country *i* is defined as

$$REM_i = \sum_{m \neq j} \left(\frac{y_m}{y^W} \right) d_{im}$$

where *m* is defined over all trading partners of country *i*, except for country *j*. Data sources are Datastream and http://geobytes.com.

Border dummy variable (B_{ij}): This is defined as follows:

B_{ij} =1 if a country pair has a common geographic border
B_{ij} =0 if a country pair has no common geographic border

References

Bayoumi, T., and P. Mauro. 1999. The Suitability of ASEAN for a Regional Currency Arrangement. *IMF Working Paper* No. 99/162. International Monetary Fund, Washington, D.C.

Calderon, C., A. Chong, and E. Stein. 2003. Trade Intensity and Business Cycle Synchronization: Are Development Countries Any Different? *Working Paper no. 478*. Inter-American Development Bank.

Deardorff, A.V., 1998. Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World? In *The Regionalization of the World Economy,* Edited by Frankel, J.A. Chicago: University of Chicago Press: 7–22.

Frankel, J., and A. Rose. 1998. The Endogeneity of the Optimum Currency Area Criteria. *The Economic Journal* 108, 1009–1025.

Imbs, J. 1998. Fluctuations, Bilateral Trade and the Exchange Rate Regime. London: London Business School.

Lee, J.W., Y.C. Park, and K. Shin. 2004. A Currency Union for East Asia, in Monetary and Financial Integration in East Asia: The Way Ahead Vol. II. ADB.

Rana, P. 2007. Economic Integration in East Asia: Trends, Prospects, and a Possible Roadmap, *Economic Growth Center Working Paper Series No. 2007/01*, Nanyang Technological University.

Shin, K. and Y. Wang. 2004. Trade Integration and Business Cycle Synchronization in East Asia. *Asian Economic Papers, 2:3*.

Wei, S.-J., 1996. Intra-National versus International Trade: How Stubborn are Nations in Global Integration? *NBER Working Paper 5531*, April.

Table 1: Averages of Country Variables

Country and period	Corr IPI	TI	IIT	MPC	FPC
People's Republic of China (PRC)					
1993	0.163	1.022	0.309	0.232	0.245
1994	0.200	1.090	0.295	0.399	0.271
1995	0.224	1.154	0.329	0.329	0.252
1996	0.202	1.201	0.379	0.130	0.229
1997	0.225	1.224	0.384	-0.019	0.348
1998	0.193	1.303	0.404	-0.071	0.702
1999	0.265	1.321	0.475	0.387	0.733
2000	0.294	1.265	0.481	0.629	0.709
2001	0.254	1.345	0.502	0.771	0.612
2002	0.275	1.450	0.483	0.873	0.213
2003	0.333	1.518	0.495	0.651	0.119
2004	0.277	1.586	0.471	0.632	0.387
Indonesia					
1993	-0.057	2.192	0.200	0.411	0.076
1994	-0.010	2.187	0.254	0.527	0.291
1995	0.021	2.321	0.244	0.418	0.282
1996	0.072	2.202	0.271	0.117	0.157
1997	0.235	2.336	0.270	0.038	0.064
1998	0.362	2.764	0.236	0.102	0.776
1999	0.436	2.702	0.264	0.332	0.873
2000	0.476	2.664	0.325	0.568	0.762
2001	0.444	2.762	0.337	0.708	0.641
2002	0.399	2.883	0.335	0.878	0.033
2003	0.342	3.082	0.332	0.570	-0.150
2004	0.257	3.137	0.360	0.567	0.120
Japan					
1993	0.233	2.574	0.281	0.480	-0.524
1994	0.267	2.630	0.300	0.669	-0.636
1995	0.243	2.690	0.342	0.640	-0.648
1996	0.262	2.720	0.357	0.398	-0.334
1997	0.308	2.609	0.390	0.083	-0.071
1998	0.347	2.549	0.439	-0.022	0.580
1999	0.398	2.606	0.432	0.294	0.661
2000	0.463	2.590	0.425	0.713	0.586
2001	0.489	2.715	0.445	0.783	0.570
2002	0.501	2.687	0.448	0.836	0.144
2003	0.497	2.755	0.451	0.453	-0.016
2004	0.434	2.722	0.443	0.525	0.103

Table 1 cont'd					
Country and period	Corr IPI	TI	IIT	MPC	FPC
Republic of Korea					
1993	0.217	1.854	0.307	0.416	0.075
1994	0.241	1.802	0.340	0.553	0.282
1995	0.258	1.786	0.355	0.553	0.306
1996	0.284	1.797	0.351	0.369	0.122
1997	0.363	1.851	0.362	0.128	0.203
1998	0.462	2.024	0.409	0.268	0.795
1999	0.501	2.052	0.427	0.581	0.743
2000	0.523	1.936	0.497	0.732	0.221
2001	0.534	2.009	0.520	0.795	-0.140
2002	0.506	2.019	0.540	0.859	-0.348
2003	0.471	1.978	0.527	0.668	-0.236
2004	0.402	1.944	0.521	0.693	-0.503
Malaysia					
1993	0.089	2.932	0.353	-0.306	0.244
1994	0.106	2.735	0.387	0.266	0.354
1995	0.112	2.806	0.417	0.387	0.372
1996	0.187	2.817	0.433	0.223	0.272
1997	0.267	2.925	0.456	-0.039	-0.115
1998	0.375	3.327	0.459	0.020	0.714
1999	0.437	3.233	0.483	0.509	0.752
2000	0.521	3.256	0.527	0.742	0.604
2001	0.522	3.346	0.534	0.800	0.531
2002	0.496	3.459	0.517	0.888	0.049
2003	0.463	3.605	0.483	0.518	-0.203
2004	0.389	3.615	0.502	0.515	0.360
Philippines					
1993	0.064	1.586	0.326	0.194	0.110
1994	0.139	1.642	0.277	0.304	0.314
1995	0.218	1.815	0.288	0.346	0.355
1996	0.109	1.899	0.366	0.237	0.155
1997	0.145	2.031	0.428	0.118	0.051
1998	0.281	2.455	0.432	0.077	0.856
1999	0.283	2.356	0.468	0.365	0.831
2000	0.357	2.335	0.463	0.543	0.696
2001	0.426	2.554	0.476	0.623	0.592
2002	0.489	2.600	0.503	0.754	0.189
2003	0.452	2.838	0.504	0.689	0.050
2004	0.438	2.850	0.422	0.705	0.114

Table 1 cont'd					
Country and period	Corr IPI	TI	IIT	MPC	FPC
Singapore					
1993	0.298	3.606	0.468	0.451	0.237
1994	0.301	3.574	0.471	0.507	0.337
1995	0.314	3.321	0.504	0.430	0.332
1996	0.309	3.424	0.504	-0.042	0.369
1997	0.302	3.599	0.518	0.073	0.364
1998	0.381	4.106	0.513	0.226	0.867
1999	0.440	4.040	0.530	0.402	0.775
2000	0.513	4.031	0.549	0.587	0.487
2001	0.526	4.027	0.564	0.716	0.423
2002	0.546	4.137	0.566	0.832	-0.074
2003	0.519	4.153	0.577	0.465	0.125
2004	0.469	3.932	0.556	0.653	0.078
Thailand					
1993	-0.110	2.085	0.331	0.430	-0.472
1994	-0.098	1.989	0.355	0.525	-0.504
1995	-0.100	2.290	0.336	0.273	-0.423
1996	-0.006	2.419	0.383	-0.113	0.270
1997	0.009	2.441	0.465	-0.010	0.363
1998	0.213	2.657	0.483	0.248	0.753
1999	0.292	2.650	0.496	0.602	0.788
2000	0.356	2.555	0.524	0.746	0.666
2001	0.395	2.745	0.507	0.811	0.612
2002	0.451	2.821	0.547	0.858	-0.209
2003	0.433	2.995	0.537	0.456	-0.080
2004	0.353	3.044	0.546	0.526	0.152

Table 2: Trade Intensity and Business Cycle Synchronization: Regressions with Pooled Data (All Countries)				
	1	**2**	**3**	**4**
A. Ordinary least squares				
Constant	0.141	0.003	-0.009	0.006
	(5.24)***	(0.08)	(0.25)	(0.18)
TI	0.026		0.011	0.009
	(3.68)***		(1.60)	(1.39)
IIT		0.533	0.491	0.341
		(6.75)***	(5.89)***	(4.24)***
FPC	0.063	0.052	0.053	0.012
	(3.10)***	(2.69)***	(2.75)***	(0.66)
MPC	0.192	0.146	0.149	0.054
	(5.66)***	(4.38)***	(4.47)***	(1.59)
Crisis Dummy				0.185
				(7.19)***
Observations	336	332	332	332
R-squared	0.14	0.22	0.22	0.33
B. Instrumental variables				
Constant	0.154	0.003	0.002	0.007
	(5.01)***	(0.08)	(0.07)	(0.20)
TI	0.021		0	0.008
	(2.24)**		(0.05)	(0.96)
IIT		0.533	0.532	0.343
		(6.75)***	(6.11)***	(4.14)***
FPC	0.063	0.052	0.052	0.012
	(3.10)***	(2.69)***	(2.69)***	(0.65)
MPC	0.193	0.146	0.146	0.053
	(5.67)***	(4.38)***	(4.37)***	(1.58)
Crisis Dummy				0.185
				(7.19)***
Observations	336	332	332	332
R-squared	0.13	0.22	0.22	0.33

Table 3: Trade Intensity and Business Cycle Synchronization: Panel Regressions with Fixed Effects (All Countries)				
	1	**2**	**3**	**4**
A. Ordinary least squares				
Constant	0.368	0.17	0.059	0.227
	(5.74)***	(3.22)***	(0.77)	(3.15)***
TI	0.012		0	-0.005
	(1.51)		(0.06)	(0.69)
IIT		0.623	0.625	0.321
		(6.64)***	(6.45)***	(3.42)***
FPC	0.078	0.066	0.066	0.024
	(4.17)***	(3.74)***	(3.73)***	(1.43)
MPC	0.165	0.102	0.102	0.016
	(5.39)***	(3.36)***	(3.35)***	(0.54)
Crisis Dummy				0.198
				(8.74)***
Observations	336	332	332	332
R-squared	0.34	0.43	0.43	0.54
B. Instrumental variables				
Constant	0.044	0.17	0.13	0.263
	(0.93)	(3.22)***	(1.63)	(3.54)***
TI	-0.005		-0.02	-0.014
	(0.58)		(2.17)**	(1.74)*
IIT		0.623	0.682	0.345
		(6.64)***	(6.91)***	(3.64)***
FPC	0.078	0.066	0.065	0.023
	(4.12)***	(3.74)***	(3.61)***	(1.35)
MPC	0.169	0.102	0.101	0.014
	(5.49)***	(3.36)***	(3.28)***	(0.49)
Crisis Dummy				0.2
				(8.80)***
Observations	336	332	332	332
R-squared	0.33	0.43	0.41	0.53

Table 4: Trade Intensity and Business Cycle Synchronization: Regressions with Pooled Data (without Japan)

	1	2	3	4
A. Ordinary least squares				
Constant	0.089	-0.063	-0.066	-0.043
	(2.90)***	(1.44)	(1.51)	(1.06)
TI	0.028		0.012	0.01
	(3.81)***		(1.57)	(1.41)
IIT		0.561	0.495	0.338
		(5.95)***	(4.80)***	(3.41)***
FPC	0.087	0.092	0.091	0.061
	(3.33)***	(3.65)***	(3.63)***	(2.56)**
MPC	0.232	0.184	0.189	0.06
	(5.72)***	(4.55)***	(4.67)***	(1.39)
Crisis Dummy				0.198
				(6.23)***
Observations	252	250	250	250
R-squared	0.18	0.25	0.25	0.36
B. Instrumental variables				
Constant	0.094	-0.063	-0.065	-0.044
	(2.93)***	(1.44)	(1.47)	(1.08)
TI	0.025		0.005	0.014
	(3.06)***		(0.52)	(1.65)*
IIT		0.561	0.535	0.318
		(5.95)***	(5.02)***	(3.13)***
FPC	0.087	0.092	0.091	0.061
	(3.34)***	(3.65)***	(3.64)***	(2.55)**
MPC	0.233	0.184	0.186	0.062
	(5.73)***	(4.55)***	(4.58)***	(1.43)
Crisis Dummy				0.197
				(6.20)***
Observations	252	250	250	250
R-squared	0.18	0.25	0.25	0.36

Table 5: Trade Intensity and Business Cycle Synchronization: Panel Regressions with Fixed Effects (without Japan)				
	1	**2**	**3**	**4**
A. Ordinary least squares				
Constant	0.279	0.015	-0.087	0.161
	(3.44)***	(0.29)	(0.88)	(1.73)*
TI	0.019		0.008	-0.004
	(2.09)**		(0.85)	(0.43)
IIT		0.728	0.705	0.37
		(6.19)***	(5.84)***	(3.20)***
FPC	0.067	0.065	0.066	0.034
	(2.81)***	(2.90)***	(2.93)***	(1.67)*
MPC	0.214	0.132	0.134	0.004
	(5.87)***	(3.55)***	(3.60)***	(0.10)
Crisis Dummy				0.222
				(7.96)***
Observations	252	250	250	250
R-squared	0.39	0.46	0.46	0.57
B. Instrumental variables				
Constant	0.413	-0.501	0.028	-0.136
	(4.65)***	(6.88)***	(0.27)	(2.19)**
TI	-0.001		-0.017	-0.016
	(0.10)		(1.63)	(1.71)*
IIT		0.728	0.78	0.395
		(6.19)***	(6.31)***	(3.40)***
FPC	0.065	0.065	0.063	0.032
	(2.70)***	(2.90)***	(2.77)***	(1.55)
MPC	0.216	0.132	0.127	-0.004
	(5.86)***	(3.55)***	(3.36)***	(0.11)
Crisis Dummy				0.23
				(8.15)***
Observations	252	250	250	250
R-squared	0.37	0.46	0.44	0.57

Table 6: Trade Intensity and Business Cycle Synchronization: Regressions with Pooled Data (without PRC)				
	1	**2**	**3**	**4**
A. Ordinary least squares				
Constant	0.145	0.004	0.002	0.025
	(4.22)***	(0.09)	(0.06)	(0.68)
TI	0.017		0.001	-0.003
	(2.12)**		(0.10)	(0.47)
IIT		0.494	0.490	0.316
		(5.71)***	(5.26)***	(3.79)***
FPC	0.073	0.072	0.071	0.015
	(3.14)***	(3.27)***	(3.25)***	(0.73)
MPC	0.260	0.215	0.216	0.066
	(6.15)***	(5.29)***	(5.26)***	(1.68)*
Crisis Dummy				0.248
				(8.89)***
Observations	252	250	250	250
R-squared	0.16	0.25	0.25	0.43
B. Instrumental variables				
Constant	0.167	0.004	0.019	0.028
	(4.04)***	(0.09)	(0.44)	(0.73)
TI	0.010		-0.011	-0.005
	(0.87)		(0.99)	(0.54)
IIT		0.494	0.542	0.324
		(5.71)***	(5.43)***	(3.68)***
FPC	0.075	0.072	0.074	0.015
	(3.20)***	(3.27)***	(3.32)***	(0.74)
MPC	0.258	0.215	0.208	0.065
	(6.09)***	(5.29)***	(5.01)***	(1.63)
Crisis Dummy				0.249
				(8.88)***
Observations	252	250	250	250
R-squared	0.16	0.25	0.24	0.43

Table 7: Trade Intensity and Business Cycle Synchronization: Panel Regressions with Fixed Effects (without PRC)				
	1	**2**	**3**	**4**
A. Ordinary least squares				
Constant	0.275	-0.057	0.083	0.166
	(3.55)***	(0.89)	(1.30)	(3.10)***
TI	0.013		0.002	-0.009
	(1.40)		(0.20)	(1.19)
IIT		0.577	0.572	0.220
		(5.20)***	(5.02)***	(2.18)**
FPC	0.095	0.087	0.087	0.026
	(4.36)***	(4.22)***	(4.22)***	(1.43)
MPC	0.258	0.197	0.197	0.062
	(6.68)***	(5.12)***	(5.11)***	(1.79)*
Crisis Dummy				0.258
				(10.37)***
Observations	252	250	250	250
R-squared	0.35	0.42	0.42	0.6
B. Instrumental variables				
Constant	0.382	0.195	0.089	0.165
	(4.46)***	(3.25)***	(0.92)	(3.09)***
TI	-0.004		-0.017	-0.011
	(0.41)		(1.59)	(1.25)
IIT		0.577	0.624	0.223
		(5.20)***	(5.37)***	(2.21)**
FPC	0.094	0.087	0.085	0.025
	(4.29)***	(4.22)***	(4.10)***	(1.40)
MPC	0.259	0.197	0.192	0.061
	(6.66)***	(5.12)***	(4.95)***	(1.76)*
Crisis Dummy				0.259
				(10.37)***
Observations	252	250	250	250
R-squared	0.34	0.42	0.41	0.6

Table 8: Trade Intensity and Business Cycle Synchronization: Regressions with Pooled Data (without PRC and Japan)

	1	2	3	4
A. Ordinary least squares				
Constant	0.044	-0.1	-0.103	-0.045
	(1.07)	(1.88)*	(1.93)*	(0.96)
TI	0.024		0.006	-0.001
	(2.96)***		(0.71)	(0.17)
IIT		0.54	0.498	0.332
		(5.06)***	(4.06)***	(3.07)***
FPC	0.087	0.11	0.107	0.067
	(2.89)***	(3.81)***	(3.65)***	(2.60)**
MPC	0.348	0.296	0.302	0.052
	(6.45)***	(5.67)***	(5.70)***	(0.92)
Crisis Dummy				0.282
				(7.71)***
Observations	180	180	180	180
R-squared	0.24	0.3	0.3	0.48
B. Instrumental variables				
Constant	0.054	-0.1	-0.1	-0.048
	(1.26)	(1.88)*	(1.86)*	(1.01)
TI	0.021		-0.001	0.002
	(2.33)**		(0.05)	(0.25)
IIT		0.54	0.544	0.31
		(5.06)***	(4.29)***	(2.79)***
FPC	0.088	0.11	0.11	0.066
	(2.92)***	(3.81)***	(3.75)***	(2.54)**
MPC	0.347	0.296	0.295	0.057
	(6.42)***	(5.67)***	(5.54)***	(1.01)
Crisis Dummy				0.279
				(7.63)***
Observations	180	180	180	180
R-squared	0.23	0.3	0.3	0.48

Table 9: Trade Intensity and Business Cycle Synchronization: Panel Regressions with Fixed Effects (without PRC and Japan)				
	1	**2**	**3**	**4**
A. Ordinary least squares				
Constant	0.198	-0.532	0.01	0.144
	(3.10)***	(5.80)***	(0.14)	(2.35)**
TI	0.016		0.009	-0.018
	(1.43)		(0.83)	(1.95)*
IIT		0.717	0.698	0.279
		(4.70)***	(4.53)***	(2.10)**
FPC	0.072	0.08	0.081	0.034
	(2.53)**	(3.00)***	(3.00)***	(1.51)
MPC	0.368	0.281	0.284	0.022
	(7.34)***	(5.53)***	(5.57)***	(0.44)
Crisis Dummy				0.312
				(9.44)***
Observations	180	180	180	180
R-squared	0.4	0.47	0.47	0.65
B. Instrumental variables				
Constant	0.198	-0.105	-0.006	0.321
	(3.05)***	(1.69)*	(0.08)	(2.67)***
TI	-0.01		-0.02	-0.029
	(0.77)		(1.56)	(2.80)***
IIT		0.717	0.758	0.283
		(4.70)***	(4.80)***	(2.12)**
FPC	0.07	0.08	0.08	0.032
	(2.45)**	(3.00)***	(2.92)***	(1.41)
MPC	0.366	0.281	0.274	0.008
	(7.18)***	(5.53)***	(5.26)***	(0.16)
Crisis Dummy				0.324
				(9.65)***
Observations	180	180	180	180
R-squared	0.39	0.47	0.45	0.65