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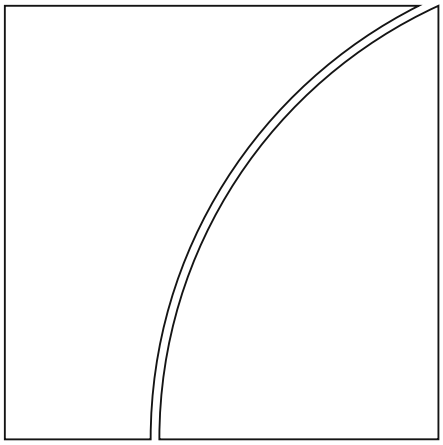

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Asia's decoupling: fact, forecast or fiction?

by Lillie Lam and James Yetman

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JEL classification: F62, E32

Keywords: business cycle co-movement, decoupling

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Asia's decoupling: fact, forecast or fiction?

Lillie Lam and James Yetman[1]

Abstract

Standard measures of real economic co-movement between Asia-Pacific economies and those elsewhere had been observed to follow a downward trend, leading some commentators to suggest that the region was decoupling. However, this process reversed in response to the International Financial Crisis, and co-movement increased to historically high levels for some economies. We examine co-movement patterns and show that these are very sensitive to changes in macroeconomic volatility over time. Controlling for this, however, co-movement is closely linked to underlying trade and financial integration. If international links continue to strengthen in future, co-movement will strengthen in tandem. Decoupling is more a fiction than a fact or a forecast.

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1. Introduction

In the lead-up to the 2008 International Financial Crisis, many commentators discussed Asia's apparent real decoupling from the global economy.[2] Despite growing trade and financial links, the degree of business cycle co-movement between Asian economies and the major advanced economies appeared to be decreasing. This view was supported by empirical analysis based on standard measures of economic co-movement: correlation coefficients and regression analysis.[3]

Strong economic co-movement appeared to re-assert itself with a vengeance once the International Financial Crisis arrived. Using the standard measures that appeared to suggest decoupling in the lead-up to the crisis, co-movement

[1] Bank for International Settlements.

The views expressed here are those of the authors and are not necessarily shared by the Bank for International Settlements. We thank Mark Spiegel and Philip Turner for helpful comments. Any remaining errors are solely our responsibility. Corresponding author: Bank for International Settlements, Representative Office for Asia and the Pacific, 78th Floor, Two International Finance Centre, 8 Finance Street, Central, Hong Kong; email: james.yetman@bis.org; phone: +852 2878 7152; fax +852 2878 7123.

[2] For example, The Economist on May 6, 2008: "The decoupling debate"; and Bloomberg Businessweek on March 20, 2008: "Are Asian Economies Decoupling from U.S.?".

[3] Note that we focus on real economic co-movement. We do not explore financial prices, which have also tended to move more closely together as a result of financial integration. See, for example, Miyajima et al (2012).

increased strongly once the crisis-period was included in the sample, to historically high levels for some economies.

In this paper, we re-examine the recent behaviour of standard measures of business cycle co-movement. First we demonstrate how sensitive the measures are to the business cycle. During tranquil periods, when there is an absence of recessions or crises, there is typically little evidence of any co-movement between Asian economies and the major advanced economies. But during periods of turbulence, such as recessions or global crises, measures of co-movement are observed to spike. In this telling, the "great moderation", a period of low volatility in business cycle fluctuations prior to the International Financial Crisis, helps to explain the apparent "decoupling" that commentators observed in the data.

Second, we look for factors that might explain the degree of real co-movement, focusing on cross-sectional variation across economies. Because co-movement tends to spike during turbulent periods, we consider volatile and (relatively) tranquil periods separately. Focusing on three different recent sub-periods (the recession in 2001, the International Financial Crisis, and the period in between) we identify a number of intuitive factors that explain co-movement. Stronger economic and financial links, measured in terms of trade flows and cross-holdings of financial assets, imply stronger economic co-movement. While the size of the estimated coefficients varies between tranquil and turbulent periods, their signs and statistical significance do not. Thus the same factors appear to explain co-movement across the different phases of recent business cycles.

Third, we investigate the prospects for business cycle co-movement. On one level, the degree of co-movement is dependent on the nature of the global business cycle. If the global economy continues to recover from the International Financial Crisis, standard measures of co-movement are likely to remain near current levels. However, any major deterioration in the global business cycle will likely result in higher measured co-movement.

We also consider the longer-term implications. Conditioning on the degree of volatility in the macroeconomy, our results indicate that measures of co-movement are driven by the strength of underlying economic links. Thus any strengthening of these links implies greater co-movement in future. The factors that best explain the degree of business cycle co-movement cross-sectionally have tended to increase over time. This suggests that, over the longer term, we are likely to see increasing business cycle co-movement between Asia and the advanced economies, all else equal. However, this projection depends critically on the continuing increase in trade and financial links between Asia and the rest of the global economy. In contrast, if there is a move towards greater economic and financial isolationism, we should expect to see weakening evidence of co-movement in future.

2. Measuring economic co-movement

There are a number of different measures of economic co-movement. The most common is the Pearson correlation coefficient, defined as:

$$\rho^{ij} = \frac{\frac{1}{T}\sum_t (y_{it} - \bar{y}_i)(y_{jt} - \bar{y}_j)}{\sqrt{\frac{1}{T-1}\sum_t (y_{it} - \bar{y}_i)^2}\sqrt{\frac{1}{T-1}\sum_t (y_{jt} - \bar{y}_j)^2}},$$

where y_{it} is the year-over-year percentage change in quarterly real GDP for country i in period t, $\bar{y}_i$ is the arithmetic mean of y_{it} and j corresponds to some base economy.[4]

Another common measure is the coefficient from regression of growth in one country on growth in the other (see Yeyati and Williams 2012, for example). In the regression

$$y_{it} = \alpha_i + \beta^{ij} y_{jt} + \varepsilon_{ijt},$$

β^{ij} is intuitively appealing as it measures the degree to which GDP growth in one economy is influenced by that in another.

We also consider equivalent measures of co-movement based on the output gap in countries i and j,defined by

$$\theta^{ij} = \frac{\frac{1}{T}\sum_t z_{it} z_{jt}}{\sqrt{\frac{1}{T-1}\sum_t z_{it}^2}\sqrt{\frac{1}{T-1}\sum_t z_{jt}^2}}$$

and γ^{ij} in

$$z_{it} = \gamma^{ij} z_{jt} + \eta_{ijt}$$

where $z_{it} = \ln[x_{it}] - \ln[HP(x_{it})]$ is defined as the output gap, x_{it} is the seasonally-adjusted level of quarterly real GDP and $HP(.)$ indicates the Hodrick-Prescott filter with a smoothing parameter of 1600.[5,6]

[4] We consider the US and the G3 economies (weighted average of the euro area, Japan and the US, based on 2005 GDP and PPP exchange rates) as country j.

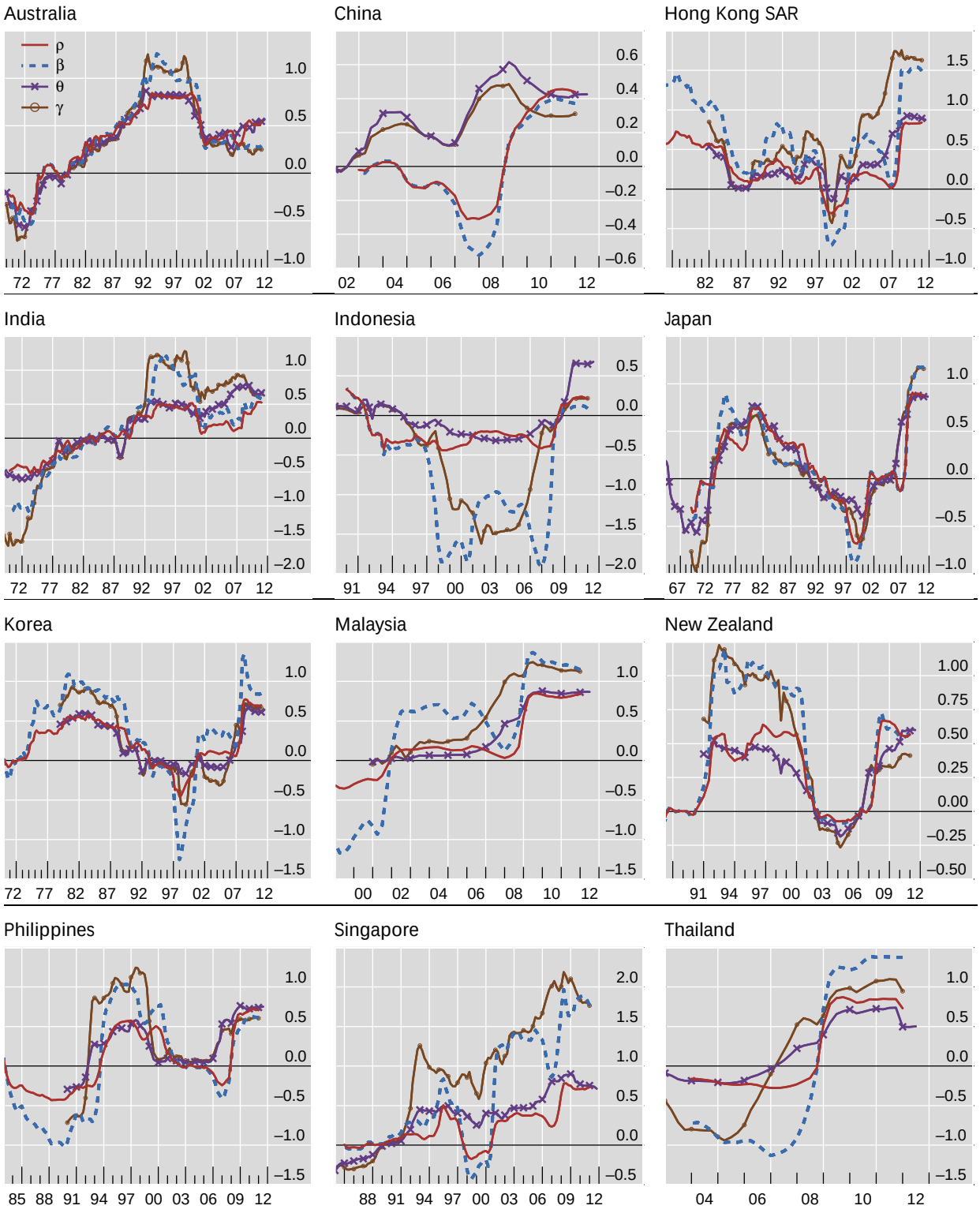
[5] When the Hodrick-Prescott filter is applied across the full sample on which θ^{ij} and γ^{ij} are calculated, the mean of the output gap is very close to zero by construction. Hence we do not include an intercept nor de-trend the output gap when we construct the measures over the full sample. In other circumstances, for example when we consider rolling samples, we include an intercept.

[6] Alternative approaches to measuring co-movement include measures based on the portion of the time that economies are simultaneously in the same phase of the business cycle (Berge (2012) and Harding and Pagan (2002, 2006)) and measures based on the size of spillovers (Diebold and Yilmaz (2009); applied to Asia in Fujiwara and Takahashi (2012)).

Measures of business cycle co-movement with the US

10-year rolling sample

Figure 1



Sources: Datastream; national data; authors' calculations.

Rolling 10-year samples for each of these four standard measures of co-movement are given in Figure 1 for 12 Asia-Pacific economies against the US

economy.[7] This includes ten major Asian economies (China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore and Thailand) as well as Australia and New Zealand.

With some exceptions, these four measures across the different economies tell a similar tale of the last 20 years. First, for 10-year rolling samples ending in the 1990s, the measures tend to trend down over time. Second, for samples ending in the early 2000s, they are generally characterised by low levels of co-movement. A number of authors in the past picked up on these trends, and interpreted them as providing evidence of decoupling of Asia from the global economy.[8] Following that, however, measures of business cycle co-movement start to increase, slowly at first, before jumping to high levels once data for 2008-2009 is included in the rolling samples.

Note that there is some variation across economies. For example, Australia and India never saw any large pick-up in co-movement as a result of the crisis. And in the 1980s Singapore displayed low levels of business cycle co-movement, in contrast to Australia, Hong Kong, Japan and Korea.

Further, there is some variation across the four measures, especially in the cases of China and Indonesia, where growth rate-based measures suggest large negative co-movement during much of the 2000's. Yet the twelve economies deliver a similar message: one of apparent decoupling starting in the 1990s following by increasing co-movement, which a large spike in most measures during the International Financial Crisis. Comparing the different measures, it is not surprising that they tell similar stories. In fact, there is a simple relationship between some of the different measures:

$$\rho^{ij} = \beta^{ij} \frac{\sigma(y_{jt})}{\sigma(y_{it})}; \theta^{ij} = \gamma^{ij} \frac{\sigma(z_{jt})}{\sigma(z_{it})}$$

where $\sigma(.)$ is the standard deviation. Effectively ρ and β are different normalisations of the covariance of growth rates between the two countries, while θ and γ are different normalisations of the covariance of the output gap. For example, the correlation coefficient (ρ) is a measure of the effect of y_{jt} on y_{it} in terms of standard deviations. It answers the question, conditional on there being a simple linear relationship between the two growth rates, how many standard deviations would country i's growth rate increase by if there was a one standard deviation increase in country j's growth rate? The regression coefficient (β) instead focuses on the same question but in terms of units: by how many units (here defined as percentage points) would country i's growth rate increase by if there was a one unit increase in country j's? The ratios of the standard deviations tend to be relatively stable over time; thus the different measures tell a similar story.

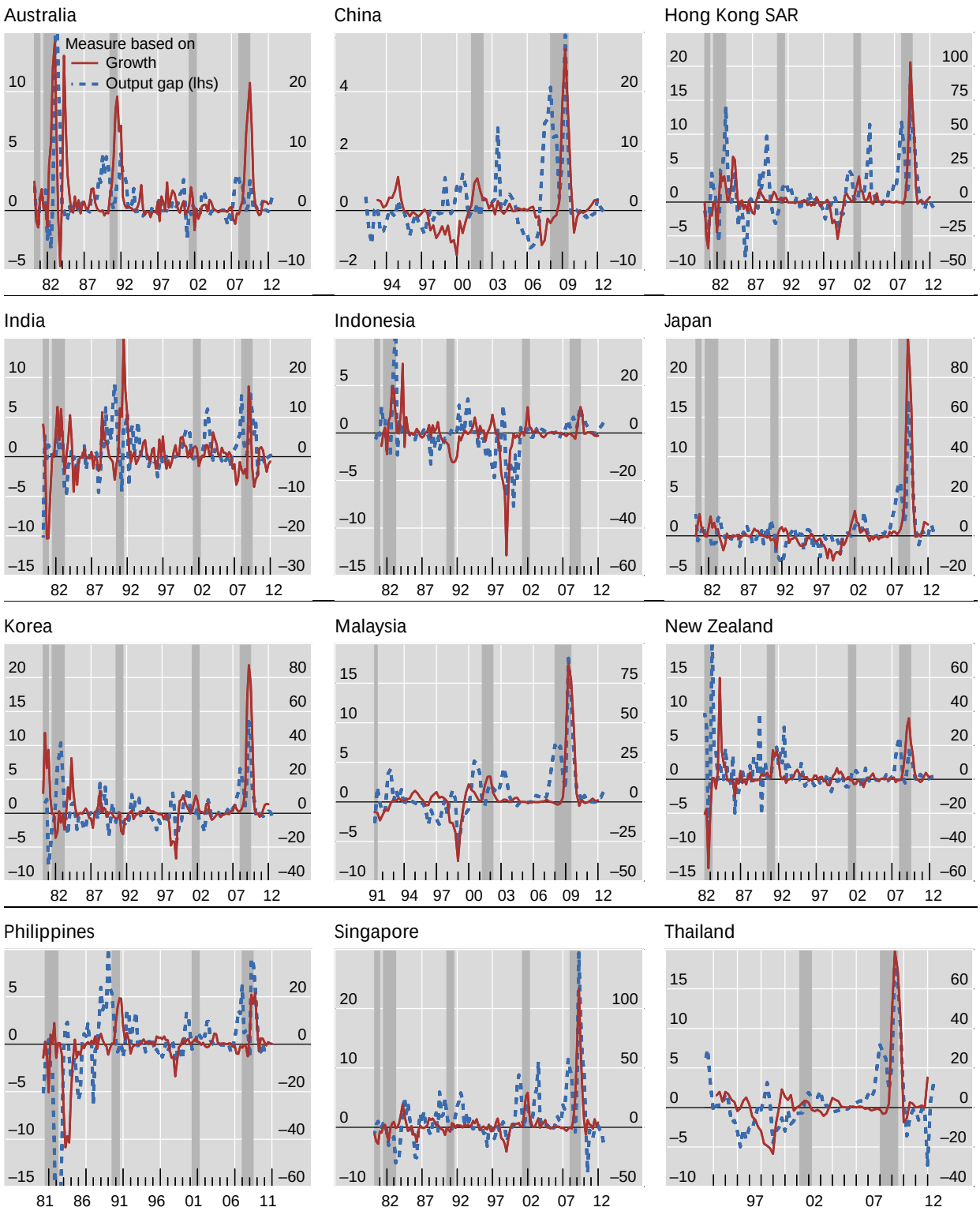
[7] The date on the horizontal axis corresponds to the end of the 10-year rolling sample. For equivalent graphs against a weighted average of the G3 economies (instead of the US), please see Graph A1 in the appendix.

[8] See, for example, Otto et al (2001), Akin and Kose (2008) and Park and Shin (2009).

Measures of business cycle co-movement with the US

Contribution at each quarter

Figure 2



Shaded areas indicate NBER recession period of the US.

Sources: Datastream; national data; authors' calculation.

3. Co-movement: the time dimension

To further investigate changes in measures of business cycle co-movement over time, we focus on the period-by-period contributions to the different measures without any normalisation. Figure 2 plots $(y_{it} - \overline{y}_i)(y_{jt} - \overline{y}_j)$ and $z_{it} z_{jt}$ at each point in time for each of the economies in our sample against the US economy.[9]

These graphs help to explain what we see in the rolling samples. Most of the time, measures of co-movement are low or close to zero. However, there are exceptions. During the Asian Financial crisis, the more heavily-affected Asian economies (Indonesia, Korea, Malaysia and Thailand) grew at a rate below trend while the US grew at above trend. Hence the contribution to co-movement was negative. More recently, during the International Financial Crisis, many economies co-moved very strongly with the US, with the size of the contribution to co-movement reaching historically high levels in many cases (China, Hong Kong, Japan, Korea, Malaysia, Singapore and Thailand).[10] Given that the standard measures of co-movement are often based on rolling samples of these variables, as illustrated in Figure 1, it is not surprising that the presence of the Asian Financial Crisis period in rolling samples would tend to give the impression of decoupling, while the presence of the International Financial Crisis in the sample would support the opposite conclusion.[11]

Figure 2 also includes shaded bars for periods in which the US economy was in recession, as defined by the NBER. Here we see a more general pattern. When the US economy enters a recession, standard measures of co-movement tend to increase, and the size of the increase appears to be positively related to the severity of the recession.[12] So, many economies saw small increases in co-movement during the 2001, relatively mild, recession. But in 1990-91 (for Australia, India, Malaysia, the Philippines and Singapore), and especially in 1981–82 (for Australia, Hong Kong, Indonesia, Korea and New Zealand), co-movement spiked.

Table 1 supports this interpretation. It displays the median of the average co-movement measure across the economies in our sample for different sub-samples. Strikingly, the 2002-2007 period was one of very low co-movement relative to the recessions that preceded and followed.

[9] The sample mean $\overline{y}$ is based on the full sample of data for country i or j which varies across economies due to data availability. One difference between the growth rate- and output gap-based measures is that the former tend to result in a single spike in co-movement at the height of a period of turbulence while, with the latter measure, this is preceded by another spike. This difference is partly because the Hodrick-Prescott filter is a two-sided filter: the underlying observation at time t influences the measure both before and after time t. An equivalent graph against the G3 economies is given in Graph A2 in the appendix.

[10] Antonakakis (2012) also notes that the 2007-2009 US recession was a period of unprecedented business cycle co-movement.

[11] Siklos (2012) argues that the whole notion of decoupling is unhelpful. Instead, it is more informative to think of variations in the degree of mutual dependence over time.

[12] See also Yetman (2010) for related arguments. Similarly Kose et al (2013) report that national business cycles are more sensitive to developments in the global economy during global recessions than during global expansions.

Co-movement and the business cycle

Table 1

NBER recessions[1] *(expansions)*	Percentage change in real GDP of the US[2]	Growth-based measure[3]	Output gap-based measure[3]
1980 Q1–1980 Q3	–2.83	–1.49	0.50
(1980 Q4–1981 Q2)		*(–2.50)*	
1981 Q3–1982 Q4	–2.01	4.66	1.13
(1983 Q1–1990 Q2)		*(1.52)*	*(0.27)*
1990 Q3–1991 Q1	–1.02	0.35	0.51
(1991 Q2–2001 Q1)		*(–1.37)*	*(–0.18)*
2001 Q2–2001 Q4	0.73	4.47	0.46
(2002 Q1–2007 Q4)		*(0.09)*	*(0.24)*
2008 Q1–2009 Q2	–4.69	25.22	3.59

[1] Recession is defined as a period from the month following the NBER peak to the month of NBER trough. [2] Percentage change of the US real GDP between NBER trough and the preceding NBER peak. [3] For growth-based measure, average of quarter-by-quarter contribution of the measures within the corresponding recession or expansion; for output gap-based measure, average within one year before to one year after the corresponding recession or expansion. Median of Australia, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand. Due to missing data, China and Thailand are excluded in business cycles before 2001; Indonesia before 1982; Malaysia before 1991.

Source: authors' calculations.

Outside of turbulent periods, Asian economies appear to be largely "decoupled" and insulated from the advanced economies, based on low levels of co-movement using standard measures. This is despite the fact that the period we are examining was one in which Asian economies were becoming increasingly integrated with the global economy, with trade and financial flows growing, as we later discuss.

There are a number of possible explanations for the apparent disconnect between stronger economic links and time-varying co-movement. First, changes in the degree of co-movement could reflect changes in the strength of underlying economic links (Kose et al 2003; Furceri and Karras 2008). For example, strengthening economic links that lead to increases in international risk sharing would tend to promote greater co-movement. In contrast, stronger trade links may allow greater specialisation and, depending on the nature of that specialisation (promoting either intra- or inter- industry trade), may either increase or decrease co-movement.[13] However, it is unlikely that the nature of underlying economic links can change so quickly as to produce the amount of time-variation in co-movement that we see in the data.

An alternative explanation is that standard measures of co-movement are inherently sensitive to the global business cycle. Perhaps the effects of economic links on co-movement depend critically on the phase of the business cycle or underlying economic volatility. The so-called "great moderation", for example, was a period of relative economic calm by historical standards when Asian economies found themselves in a relatively benign global economic environment. During such

[13] For example, Park (2011) argued that increased intra-regional trade would lead to a self-contained East Asian region that was relatively sheltered from external shocks. In this sense, continued growth in intra-regional trade may lead to decoupling.

periods, economies may grow at rates that are relatively close to trend, so that measures of deviations from trend, such as de-meaned growth rates and output gaps, tend to be close to zero. In contrast, during periods of turbulence, growth rates are likely to deviate further from trend, and in the negative direction.[14] Additionally, the sign of these deviations is likely to be correlated across countries due to trade and financial links, so that standard measures of co-movement are much larger during volatile periods than during other times. We examine these mechanisms further in the following section.[15]

4. Co-movement: the cross-section dimension

We next focus on the cross-sectional dimension, and examine what might explain the relative degree of co-movement for the economies in Asia-Pacific. Given the foregoing analysis, outlining how much co-movement varies between turbulent periods and relatively tranquil periods, we divide recent years into three different periods: the 2001 recession, the International Financial Crisis and the period in between. We take these recent periods as being the most informative for the prospects of co-movement in future, given that economic links between economies tend to evolve slowly over time. Each period is examined separately, using ordinary least squares. As a robustness check, we also estimate across the three periods together using seemingly unrelated regression methods, and obtain very similar results to those reported below.[16]

4.1 International Financial Crisis of 2008–2009

Starting with the most recent sub-period, for the International Financial Crisis episode we compute the average of the quarter-by-quarter contribution to our four measures of business cycle co-movement outlined in section 2. For ρ and β we focus on the period 2008 Q1–2009 Q2, while for θ and γ we focus on the longer period of 2007 Q1–2010 Q2. For the first two measures, our period corresponds to the recession as defined by NBER business cycle dates.[17] For the latter two measures, the longer examination period reflects the fact that measures based on a two-sided filter, like the Hodrick-Prescott filter used here, imply that the underlying

[14] For example, Leduc and Liu (2013) argue that increased uncertainty may manifest itself as a downward demand shock. Their estimates suggest that uncertainty shocks during the international financial crisis accounted for at least a one percentage point increase in unemployment in the US,

[15] Yetman (2011) suggests a measure of business cycle co-movement that is relatively insensitive to the amount of macroeconomic volatility given by $\xi_t^{ij} = -\left|(y_{it} - \overline{y}_i) - (y_{jt} - \overline{y}_j)\right|$. See, also, Wälti (2009) for a similar approach.

[16] The results from the seemingly unrelated regression are contained in Table A2 in the appendix. Seemingly unrelated regression allows estimates of coefficients to vary across equations but offers efficiency gains from modelling the correlation in errors across the three samples.

[17] In accordance with NBER business cycle reference dates, the recession period in this paper is defined as starting with the quarter in which the month following the NBER peak falls, and ending with the quarter in which the NBER trough falls. For example, December 2007 is the month of the latest peak and June 2009 is the latest trough. So the recession period is defined as the period of January 2008–June 2009 (i.e. 2008 Q1–2009 Q2).

observation at time t influences the measure both before and after time t. Our approach yields four measures across 12 economies, for a total of 48 observations.

We examine 24 possible variables that might explain the degree to which Asian economies co-move with the US, listed in table 2. Except where otherwise specified, we measure these variables as of the end of 2007, before the greatest effects of the crisis were felt in the Asian region.

Variables to explain co-movement during the International Financial Crisis — Table 2

	Units	Observations	Mean	Standard deviation
1. Trade openness (end-2007)				
Trade openness = exports + imports	% of GDP	10	114.18	114.39
Manufacturing exports	% of exports	12	57.16	23.02
2. Financial openness (end-2007)				
Current account	% of GDP	12	5.82	9.63
Net foreign assets	% of GDP	12	13.85	96.48
Gross foreign assets	% of GDP	12	216.56	379.17
Gross foreign liabilities	% of GDP	12	202.71	295.21
Foreign holdings of US assets	% of GDP	12	25.34	30.46
Foreign holdings of US LT debt	% of GDP	12	15.44	14.98
Foreign holdings of US ST debt	% of GDP	12	1.32	0.98
Foreign holdings of US equity	% of GDP	12	8.58	18.27
US holdings of foreign assets	% of foreign GDP	12	16.80	16.48
US holdings of foreign LT debt	% of foreign GDP	12	2.31	2.44
US holdings of foreign ST debt	% of foreign GDP	12	0.30	0.54
US holdings of foreign equity	% of foreign GDP	12	14.19	16.01
Foreign banks' share of US credit	% of total claims	5	2.78	5.16
US banks' share of foreign credit	% of total claims	12	13.08	6.62
Private sector credit	% of GDP	12	90.31	39.35
3. Monetary and fiscal policy framework (end-2007)				
Exchange rate peg = 1	dummy variable	12	0.25	0.45
Foreign exchange reserves	% of GDP	12	35.12	28.14
Exchange rate volatility (2001–07)	%	12	6.15	3.99
Inflation target = 1	dummy variable	12	0.50	0.52
Average inflation (2001–07)	%	12	2.91	2.66
Inflation volatility (2001–07)	%	12	5.08	3.39
Government revenue	% of GDP	12	24.56	6.09
Government spending	% of GDP	12	23.25	6.94
Government debt	% of GDP	12	49.17	50.01

Sources: Lane and Milesi-Ferretti (2007); IMF *IFS*; IMF *WEO*; US Treasury International Capital data; national data; BIS consolidated banking statistics.

Included in the set of explanatory variables are two that focus on trade openness: total trade as a percentage of GDP, and manufacturing exports as a share of total exports. Next are fifteen measures associated with financial openness. We consider the current account, which is a measure of net financing needs of the economy. Next is net foreign assets, gross foreign assets and gross foreign liabilities

as measures of foreign exposures. Given that the US was a focal point of the crisis, we measure exposures with the US economy based on Treasury International Capital System (TIC) data: total foreign holdings of US assets and total US holdings of foreign assets, each as a share of GDP, as well as break-downs of these variables into long-term debt, short-term debt and equity. We also consider cross-border banking exposures based on BIS consolidated banking statistics[18] and private sector credit as a percentage of GDP to measure of the size of domestic financial markets.

Finally, we include measures that are symptomatic of the policy framework. In terms of monetary policy, dummy variables are used to capture whether the economy had a pegged exchange rate, or a formal inflation target. We also examine the size of foreign exchange reserves, daily exchange rate volatility against the US dollar over 2001-2007 and the level and volatility of inflation over 2001-2007. For fiscal policy, we examine government revenue, spending and debt, each as a percentage of GDP.

These measures are intended to include a number of domestic, as well as international, factors that have been used elsewhere to try to explain the degree to which different economies were affected by the crisis, for example in Cechetti, King and Yetman (2011).[19]

In order to assess the importance of each of these variables in explaining the degree of co-movement, we consider each in turn in a regression with an intercept in our panel of 12 economies and 4 different measures of co-movement during the crisis. Fixed effects are included for each of the different measures. All explanatory variables are normalised by their standard deviation so that the magnitude of the coefficient may be compared across variables: it is a measure of the effect of a one-standard deviation increase in the explanatory variable on the measures of business cycle co-movement. Results are given in Table 3.

The results reveal a remarkable number of highly statistically significant variables. In terms of trade openness, both variables are highly significant. Stronger trade links implied stronger co-movement during the crisis. For financial openness, all variables except US holdings of foreign debt and US banks' share of foreign credit are positive and highly significant. Domestic holdings of US assets of any kind appear to have been a powerful source of contagion during the crisis. In contrast, only US holdings of domestic equity had a large effect. Additionally, high levels of domestic credit appear to have been correlated with higher levels of contagion, perhaps reflecting heightened vulnerability of the domestic economy to foreign shocks.

[18] Foreign banks' share of US credit is defined as the share of a given country's consolidated foreign claims vis-à-vis the US (on immediate borrow basis by nationality) to all reporting countries claims vis-à-vis the US. This variable is available for Australia, Hong Kong, India, Japan and Singapore, all of whom are BIS reporting economies. The US banks' share of foreign credit is defined as the share of consolidated foreign claims on immediate borrower basis in a given country by US headquartered banks of all reporting banks. Since US is one of the BIS reporting economies, this variable is available for all economies in our sample.

[19] Cecchetti et al (2011) ask a different, albeit related, question to the one examined here. First they construct a measure of how well different economies performed during the crisis, conditional on the historical dependence between those countries and the US. As a second step, they then consider similar variables to the ones we use here to see which factors might explain the relative performance of different economies, conditional on their historical dependence. Here we are not so concerned about whether economies did better or worse than might be expected but rather, in absolute terms, how well they performed.

Explaining co-movement during the International Financial Crisis

Table 3

	Coefficient	P-value	Observations	R^2
1. Trade openness (end-2007)				
Trade openness = exports + imports	0.67	0.007	40	0.45
Manufacturing exports	0.75	0.002	48	0.46
2. Financial openness (end-2007)				
Current account	0.85	0.000	48	0.49
Net foreign assets	0.98	0.000	48	0.54
Gross foreign assets	0.75	0.002	48	0.46
Gross foreign liabilities	0.65	0.005	48	0.44
Foreign holdings of US assets	0.96	0.000	48	0.53
Foreign holdings of US LT debt	0.99	0.000	48	0.54
Foreign holdings of US ST debt	0.77	0.001	48	0.47
Foreign holdings of US equity	0.76	0.002	48	0.46
US holdings of foreign assets	0.80	0.001	48	0.48
US holdings of foreign LT debt	0.05	0.859	48	0.36
US holdings of foreign ST debt	-0.24	0.200	48	0.37
US holdings of foreign equity	0.83	0.001	48	0.48
Foreign banks' share of US credit	0.82	0.043	20	0.46
US banks' share of foreign credit	-0.13	0.645	48	0.36
Private sector credit	0.78	0.002	48	0.47
3. Monetary and fiscal policy framework (end-2007)				
Exchange rate peg = 1	0.53	0.062	48	0.41
Foreign exchange reserves	0.96	0.000	48	0.53
Exchange rate volatility (2001-07)	-0.43	0.082	48	0.39
Inflation target = 1	-0.61	0.030	48	0.43
Average inflation (2001–07)	-1.17	0.000	48	0.61
Inflation volatility (2001–07)	-0.70	0.005	48	0.45
Government revenue	0.41	0.153	48	0.39
Government spending	-0.15	0.600	48	0.36
Government debt	0.57	0.017	48	0.42

Source: authors' calculations.

Regarding the policy framework, the general picture is that measures associated with exchange rate flexibility (not having a currency peg, having a low level of foreign exchange reserves, allowing high exchange rate volatility) appeared to lower the level of co-movement during the crisis, implying that the ability of the exchange rate to adjust and to act as a shock absorber was important in sheltering domestic economies from external shocks and lowering co-movement during the crisis. In contrast, having an inflation target was associated with weaker co-movement. Our results suggest that not all nominal anchors are equal, at least in the context of crisis periods. However, we find that lower average inflation or inflation volatility are associated with higher co-movement. This may be because the economies with the lowest and most stable inflation (Australia, Hong Kong, Japan, New Zealand and Singapore) are also those with the strongest international financial links. For fiscal policy, the size of the government (in terms of revenue or

spending as a percentage of GDP) offers little explanatory power. In contrast, the size of government debt matters. Perhaps an economy saddled with high debt levels encounters more difficulties in implementing counter-cyclical fiscal policy to dampen the business cycle during turbulent periods.

Overall, measures of openness had very predictable effects on business cycle co-movement during the crisis: higher levels of openness resulted in higher levels of co-movement. Additionally, exchange rate rigidity and high levels of fiscal debt limited the policy options to absorb shocks, increasing measured co-movement.[20]

We also considered some robustness checks. Given that the four sets of estimates of $\{\rho, \beta, \theta, \gamma\}$ that are used to construct our dependent variable are likely to be correlated, we split our sample in six different ways, by taking every possible pair of the four measures. The results (available on request) are surprisingly robust. First, in no single case did a variable that was reported as being statistically significant in Table 3 change sign. In just one case of each of US holdings of foreign long term debt, US banks' share of foreign credit and government spending (all insignificant in Table 3) the sign of the estimated coefficient changed, and each of these is highly insignificant (p-values exceeding 0.80). Second, in only a few cases are statistically significant results in Table 3 no longer significant in one or more of the split samples. For example, if we define significance at the 10% level, we lack significance in the split samples for foreign banks' share of US credit, the exchange rate peg dummy and inflation targeting dummy (for each variable insignificant in three of six cases), exchange rate volatility (insignificant in five cases), inflation volatility and government debt (each insignificant in one case). Third, overall, of the statistically significant variables at the 10% level in Table 3, 87% of all the results on split samples have the same sign and are also statistically significant at the 10% level.[21] The remaining 13% have the same sign but are statistically insignificant.[22]

[20] We also considered combinations of these factors, to see if we could find a small number of variables that together give a parsimonious explanation of co-movement. However, there are no robust set of regressors: testing up or testing down, first eliminating relatively weak regressors from the sample or jointly choosing sets two or three regressors based on goodness-of-fit criteria all offer different combinations from among the significant variables identified above as to which smaller set of regressors is a good predictor of business cycle co-movement during the crisis.

[21] At the 5% level, this percentage is also 87%; of the remaining cases, 9% are statistically significant at the 10% level while 4% are insignificant.

[22] We also considered various pairs and triplets of variables that are likely to be closely related, although these results were more mixed. If we include both trade variables together, for example, trade openness becomes insignificant (p-value of 0.16) while manufacturing exports remain highly significant (p-value of 0.01). In terms of financial openness, both gross foreign assets and gross foreign liabilities are highly significant when examined together. However, gross foreign liabilities ceases to be statistically significant when paired with private sector credit. Likewise, while both US holdings of foreign assets and foreign holdings of US assets are significant when considered on their own, only foreign holdings of US assets are significant when considered together. Considering the policy framework variables, when examined jointly, both foreign exchange reserves and having an exchange rate peg are statistically significant. However, conditioning on the level of foreign exchange reserves, a pegged exchange rate decreases the degree of co-movement.

Variables to explain co-movement during the 2001 recession

Table 4

	Units	Observations	Mean	Standard deviation
1. Trade openness (end-2000)				
Trade openness = exports + imports	% of GDP	9	112.75	85.63
Manufacturing exports	% of exports	11	63.46	22.93
2. Financial openness (end-2000)				
Current account	% of GDP	12	2.61	5.01
Net foreign assets	% of GDP	12	-5.12	72.80
Gross foreign assets	% of GDP	12	133.98	210.58
Gross foreign liabilities	% of GDP	12	139.10	151.01
Foreign holdings of US assets	% of GDP	12	16.50	24.98
Foreign holdings of US LT debt	% of GDP	12	11.10	14.41
Foreign holdings of US equity	% of GDP	12	5.40	11.22
Foreign banks' share of US credit	% of total claims	3	7.08	11.54
US banks' share of foreign credit	% of total claims	12	13.65	6.39
Private sector credit	% of GDP	10	104.97	51.43
3. Monetary and fiscal policy framework (end-2000)				
Exchange rate peg = 1	dummy variable	12	0.33	0.49
Foreign exchange reserves	% of GDP	12	25.07	25.03
Exchange rate volatility (1991-2000)	%	12	12.35	7.61
Inflation target = 1	dummy variable	12	0.42	0.51
Average inflation (1991–2000)	%	12	5.27	3.84
Inflation volatility (1991–2000)	%	12	14.39	17.43
Government revenue	% of GDP	12	22.33	7.34
Government spending	% of GDP	12	23.63	7.15
Government debt	% of GDP	11	56.99	38.57

Sources: Lane and Milesi-Ferretti (2007); IMF *IFS*; IMF *WEO*; US Treasury International Capital data; national data; BIS consolidated banking statistics.

4.2 2001 recession

We now consider the previous recessionary period. Similar to the analysis for the International Financial Crisis, we compute the average quarter-by-quarter contribution over the period of 2001 Q2–2001 Q4 to ρ and β and over the period of 2000 Q2–2002 Q4 to θ and γ. The set of explanatory variables, listed in Table 4, is as of the end of 2000 and includes the same variables as those in Table 2 except where data are unavailable.

The results are given in Table 5. Remarkably, even though the 2001 period was much less volatile than the more recent crisis, the same variables are in general statistically significant – even if the coefficients are smaller, by a factor of about 2. That is, more open economies – measured in terms of trade flows or dependence

on manufacturing exports – tended to co-move more strongly. Greater financial openness, in terms of gross or net positions, or holdings of US assets, was also correlated with greater co-movement.[23] And factors associated with policy regimes that allow for exchange rate flexibility – such as inflation targeting and volatile exchange rates – are associated with lower levels of co-movement. Further, variable values consistent with economies having the scope to easily respond to external shocks via policy were correlated with less co-movement.

Explaining co-movement during the 2001 recession

Table 5

	Coefficient	P-value	Observations	R^2
1. Trade openness (end-2000)				
Trade openness = exports + imports	0.36	0.001	36	0.54
Manufacturing exports	0.28	0.000	44	0.44
2. Financial openness (end-2000)				
Current account	0.48	0.000	48	0.53
Net foreign assets	0.52	0.000	48	0.58
Gross foreign assets	0.45	0.001	48	0.49
Gross foreign liabilities	0.37	0.002	48	0.40
Foreign holdings of US assets	0.51	0.000	48	0.57
Foreign holdings of US LT debt	0.51	0.000	48	0.56
Foreign holdings of US equity	0.49	0.001	48	0.54
Foreign banks' share of US credit	-0.52	0.023	12	0.82
US banks' share of foreign credit	-0.05	0.545	48	0.23
Private sector credit	0.26	0.000	40	0.45
3. Monetary and fiscal policy framework (end-2000)				
Exchange rate peg = 1	0.49	0.000	48	0.54
Foreign exchange reserves	0.55	0.000	48	0.62
Exchange rate volatility (1991-2000)	-0.18	0.059	48	0.27
Inflation target = 1	-0.37	0.000	48	0.40
Average inflation (1991–2000)	-0.20	0.045	48	0.28
Inflation volatility (1991–2000)	-0.13	0.073	48	0.25
Government revenue	0.03	0.829	48	0.23
Government spending	-0.14	0.133	48	0.26
Government debt	0.14	0.107	44	0.23

Source: authors' calculations.

One common argument about the international financial crisis is that a collapse in trade volumes played a critical role in the propagation of the crisis.[24] Comparing our results over these two sub-samples suggests that, while trade flows were a vector of contagion, their role during the recent crisis was nothing extraordinary.

[23] The only exception to this is that foreign banks' share of US credit was significantly negatively correlated with co-movement during this period. Note, however, that this result is based on data for only 3 countries due to data availability.

[24] See, for example, Chor and Manova (2012).

Most factors that help to explain co-movement have larger coefficients in the recent crisis relative to the earlier recession but, proportionately, there is no outsized increase in the role of trade openness.

Overall, the results across the two episodes suggest that variables reflecting strong economic links provide information that is highly predictive of the nature of co-movement during volatile periods.

4.3 Great Moderation of 2002–2007

Finally, we repeat the analysis focusing on a relatively tranquil period. We again construct the average quarter-by-quarter contribution over the period of 2002 Q1–2007 Q4 to ρ and β and over the period of 2003 Q1–2006 Q4 to θ and γ.[25] The set of explanatory variables is the same as those used for the 2001 recessions, i.e. as of the end of 2000, listed in Table 4.[26]

The results are shown in Table 6. Curiously, the same variables that were statistically significant during the more volatile periods are also significant during this relatively tranquil period, have the same sign and have very similar p-values. One important difference, however, is that the size of the coefficients is much smaller during this less volatile period, by a factor of around 5.[27]

By dividing up the 2001-2009 period into three sub-periods, and focusing on each of these individually, we have shown that measures of co-movement that are associated with economic links in terms of trade integration, financial openness and monetary and fiscal policy flexibility work well to explain co-movement during all three sub-periods. However, the magnitude of the coefficients varies widely between the different episodes, with more volatile periods being associated with larger coefficients. If instead we were just to focus on all the periods together, we would be combining episodes during which the relationships between economic links and co-movement vary widely, even as their economic and statistical significance remains strong.

[25] In contrast to the previous two sub-samples, in this case our output gap-based measures are examined over a shorter period than the growth-based measures, to exclude the effects of volatile data at either end.

[26] The same set of explanatory variables, but as of end-2002, was also considered, yielding very similar results; see Table A1 in the appendix.

[27] Pula and Peltonen (2011) argued that trade data overstate trade openness and analysed decoupling using an international input-output table which focused on bilateral trade and production linkages. Their results, based on data up to 2006, argued against decoupling but suggested that emerging Asia is less "coupled" with the advanced economies than trade data would imply.

Explaining co-movement during the Great Moderation of 2002–07 Table 6

	Coefficient	P-value	Observations	R^2
1. Trade openness (end-2000)				
Trade openness = exports + imports	0.09	0.004	36	0.48
Manufacturing exports	0.05	0.003	44	0.24
2. Financial openness (end-2000)				
Current account	0.07	0.000	48	0.32
Net foreign assets	0.12	0.000	48	0.66
Gross foreign assets	0.12	0.000	48	0.65
Gross foreign liabilities	0.11	0.000	48	0.56
Foreign holdings of US assets	0.11	0.000	48	0.54
Foreign holdings of US LT debt	0.11	0.000	48	0.58
Foreign holdings of US equity	0.09	0.000	48	0.45
Foreign banks' share of US credit	-0.11	0.046	12	0.81
US banks' share of foreign credit	0.00	0.914	48	0.14
Private sector credit	0.07	0.001	40	0.30
3. Monetary and fiscal policy framework (end-2000)				
Exchange rate peg = 1	0.08	0.007	48	0.34
Foreign exchange reserves	0.11	0.000	48	0.60
Exchange rate volatility (1991–2000)	-0.08	0.002	48	0.22
Inflation target = 1	-0.15	0.000	48	0.34
Average inflation (1991–2000)	-0.04	0.014	48	0.19
Inflation volatility (1991–2000)	-0.03	0.023	48	0.17
Government revenue	0.01	0.762	48	0.14
Government spending	-0.01	0.503	48	0.14
Government debt	0.06	0.000	44	0.30

Source: authors' calculations.

5. The future of co-movement

The foregoing analysis has illustrated how macroeconomic co-movement, as commonly measured, varies with the degree of macroeconomic volatility. During turbulent periods, co-movement is strong compared with relatively tranquil periods. However, regardless of the degree of volatility, underlying economic links help to explain the degree of co-movement across our panel of economies.

Looking forward, evidence of either decoupling or higher levels of co-movement is likely to reflect the global business cycle. If global growth is relatively stable, and major macroeconomic crises are avoided, then standard measures are

likely to indicate low levels of co-movement. In contrast, periods of turbulence are likely to result in higher levels of co-movement.[28]

Cross-sectionally, however, the strength of underlying economic links is highly correlated with the degree of co-movement, during both volatile and tranquil periods. Conditioning on the level of macroeconomic volatility, then, the direction of future co-movement is therefore likely to reflect the strength of underlying economic links between economies.

The message from data on economic links is generally consistent with continued strong co-movement. Focusing on trade openness, exports as a percentage of GDP (Figure 3, top row) have tended to strengthen or remain flat for most economies in the region. In contrast, the importance of manufacturing for exports appears to be declining in most countries, although it remained above 60% of exports for China, Hong Kong, Japan, Korea, the Philippines and Thailand as of 2010. However, current accounts generally remain positive and large for many regional economies, although these may be expected to fall over the long run.

In terms of other measures of financial openness, gross international exposures have tended to trend up over time. While these shrank somewhat during the International Financial Crisis, this has since been reversed. Gross international exposures are at or are close to all-time highs as a percentage of GDP in the latest available data for all economies in our sample except Indonesia and the Philippines, two countries whose exposures never fully recovered from the Asian Financial Crisis in the 1990s (Figure 3, middle row). Gross and net positions based on TIC data tell a more nuanced story; some categories have seen strong growth, and others are declining. But overall, financial links between Asian economies and the US remain strong.[29] Further, many measures of domestic credit are currently at high levels by historical standards, exceeding 100% of GDP in Australia, China, Hong Kong, Japan, Korea, Malaysia, New Zealand and Singapore, suggesting that regional economies remain vulnerable to external shocks.

In terms of the scope for domestic policy responses in the face of external shocks, there is greater room for optimism. While foreign exchange reserves have trended up in recent years (Figure 3, bottom row), as policymakers in the region tended to dampen exchange rate appreciation pressures, this trend is unlikely to continue indefinitely.[30] Any change away from foreign exchange intervention is likely to be one towards greater exchange rate volatility, which would be associated with less co-movement. Finally, net government debt remains small and manageable for most economies in the Asia-Pacific region. With the notable exception of Japan, net debt exceeds 50% of GDP only in India (where it is trending down) and Malaysia (52% in 2011). Thus there might be scope for a strong fiscal

[28] Leduc and Spiegel (2013) argue that the decline in co-movement in the aftermath of the recent crisis has been large by historical standards and suggest that this can be explained by monetary policy in some economies being constrained by the zero lower bound. This effect might be expected to reverse when monetary policy normalises.

[29] See, also, Elekdag et al (2012) for a discussion of growing financial linkages between Asia and the advanced economies. Financial integration leads to stronger co-movement of asset prices, as Miyajima et al (2012) discuss. This may be one of the channels by which stronger financial links lead to stronger business co-movement, although evaluation of the precise channels driving co-movement is beyond the scope of the current study.

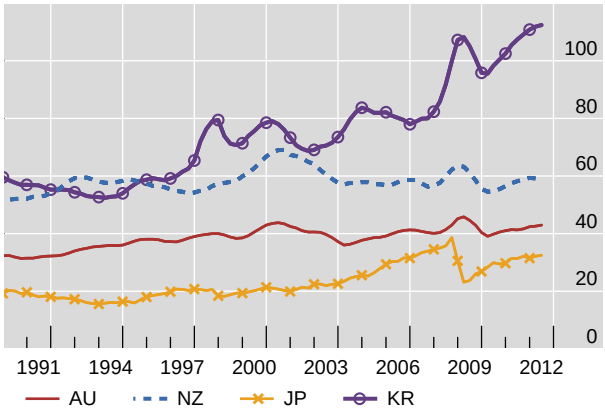
[30] See Filardo and Yetman (2012) for a discussion of the challenges associated with the continued accumulation of foreign exchange reserves in Asia.

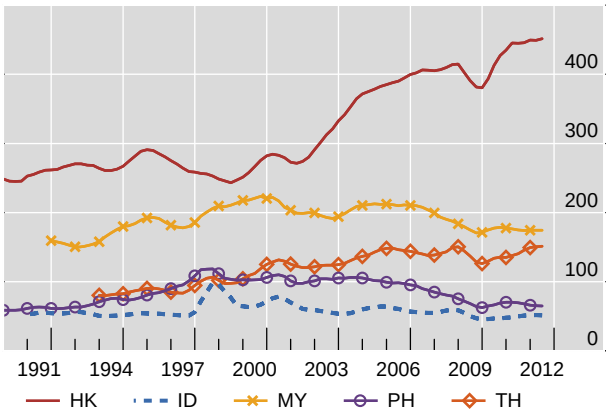
response to external shocks to the business cycle, as was seen during the International Finance Crisis, in contrast to many other regions of the world.

Trade and financial exposures of Asia-Pacific economies

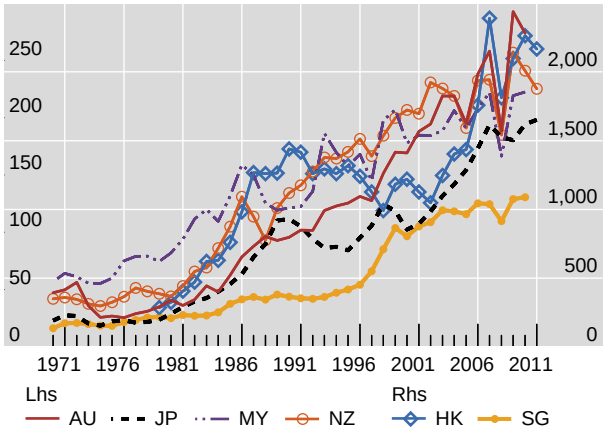
As a percentage of GDP — Figure 3

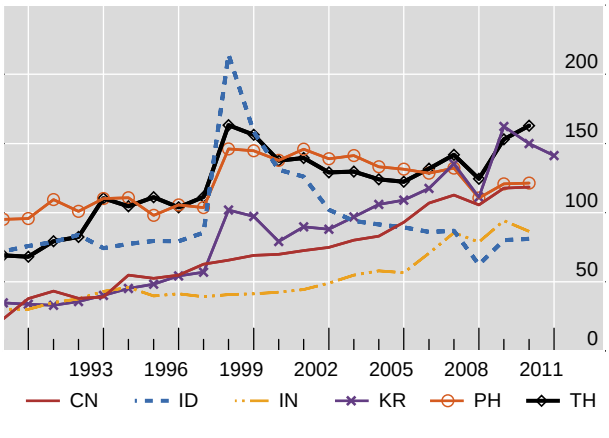
Total trade[1]



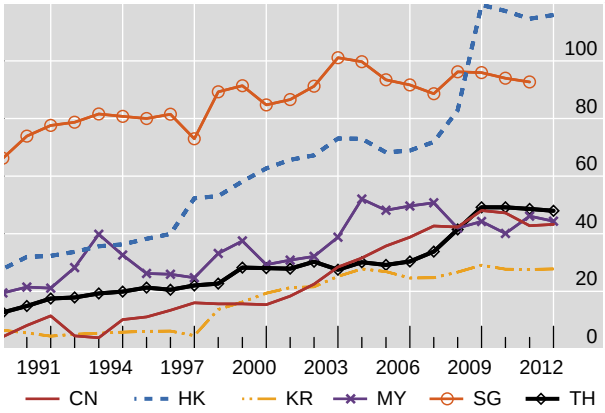


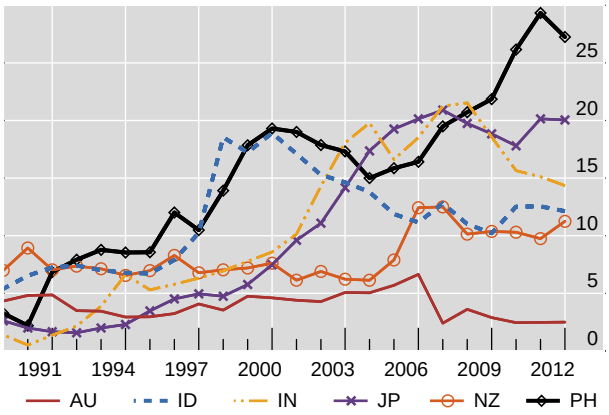
Gross foreign exposure[2]





Foreign exchange reserves[3]





AU = Australia; CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; SG = Singapore; TH = Thailand.

[1] Sum of imports and exports. [2] Sum of foreign assets and liabilities. [3] As of 2011 Q4 for Singapore; 2012 Q1 for China and India; 2012 Q3 for Indonesia and Japan; and 2012 Q2 for others.

Sources: Lane and Milesi-Ferretti (2007); IMF *IFS*; World Bank; national data.

Overall, the evidence points to continued strong links between the economies of Asia-Pacific and the advanced economies. Thus it is highly unlikely that we will see the Asia-Pacific region decoupling from developments elsewhere in the foreseeable future. Conditional on underlying macroeconomic volatility, advanced economies outside the region are likely to continue to have large effects on the economies in Asia-Pacific.

6. Conclusions

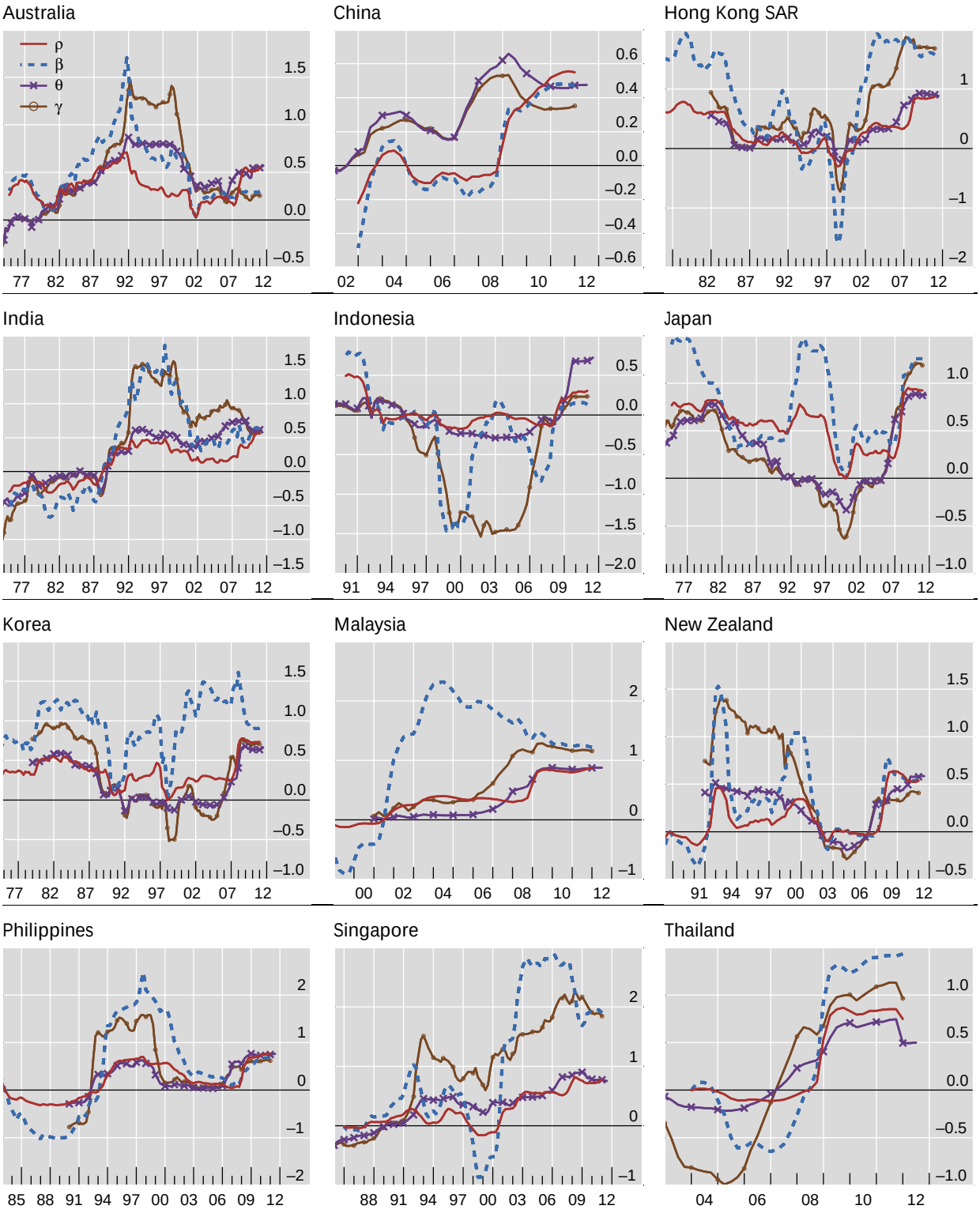
Is Asia's decoupling a fact, a forecast or a fiction? The evidence that we have presented here suggests that it is closest to being a fiction. First, evidence in the past of decoupling was heavily skewed by macroeconomic volatility. We have shown that standard measures imply that co-movement is strongest during turbulent periods, and indicate little co-movement during relatively tranquil periods. This dynamic explains most of the past evidence of apparent decoupling. Second, we show that cross-sectional variation in the degree of co-movement can be explained by underlying economic links among economies in terms of trade and financial flows, as well as the scope for domestic policymakers to respond to external shocks. These relationships are statistically significant, both in turbulent times and tranquil times, and imply that any long-term forecast of decoupling requires matching forecasts of decreasing trade and financial links, and/or increased policy independence in future. While such outcomes, consistent with a change from internationalisation to isolationism, are possible, they imply a reversal of current trends that seems unlikely. Thus Asian economies are liable to continue to co-move closely with the world's major economies in future.

However, standard measures of co-movement may continue to mislead, indicating decoupling where none is present. For example, these measures are often reported based on rolling samples. Our results suggest that, if the global economy continues to recover from the International Financial Crisis, standard measures of co-movement are likely to remain near current levels in the near term. But there will be a discrete drop in measured co-movement in future, when the exceptionally turbulent period of the International Financial Crisis drops out of the sample period. Past experience suggests that this will be mis-interpreted as evidence of decoupling, even if underlying economic links between Asia and the rest of the global economy continue to strengthen.

Appendix

Measures of business cycle co-movement with G3[1]

10-year rolling sample — Figure A1



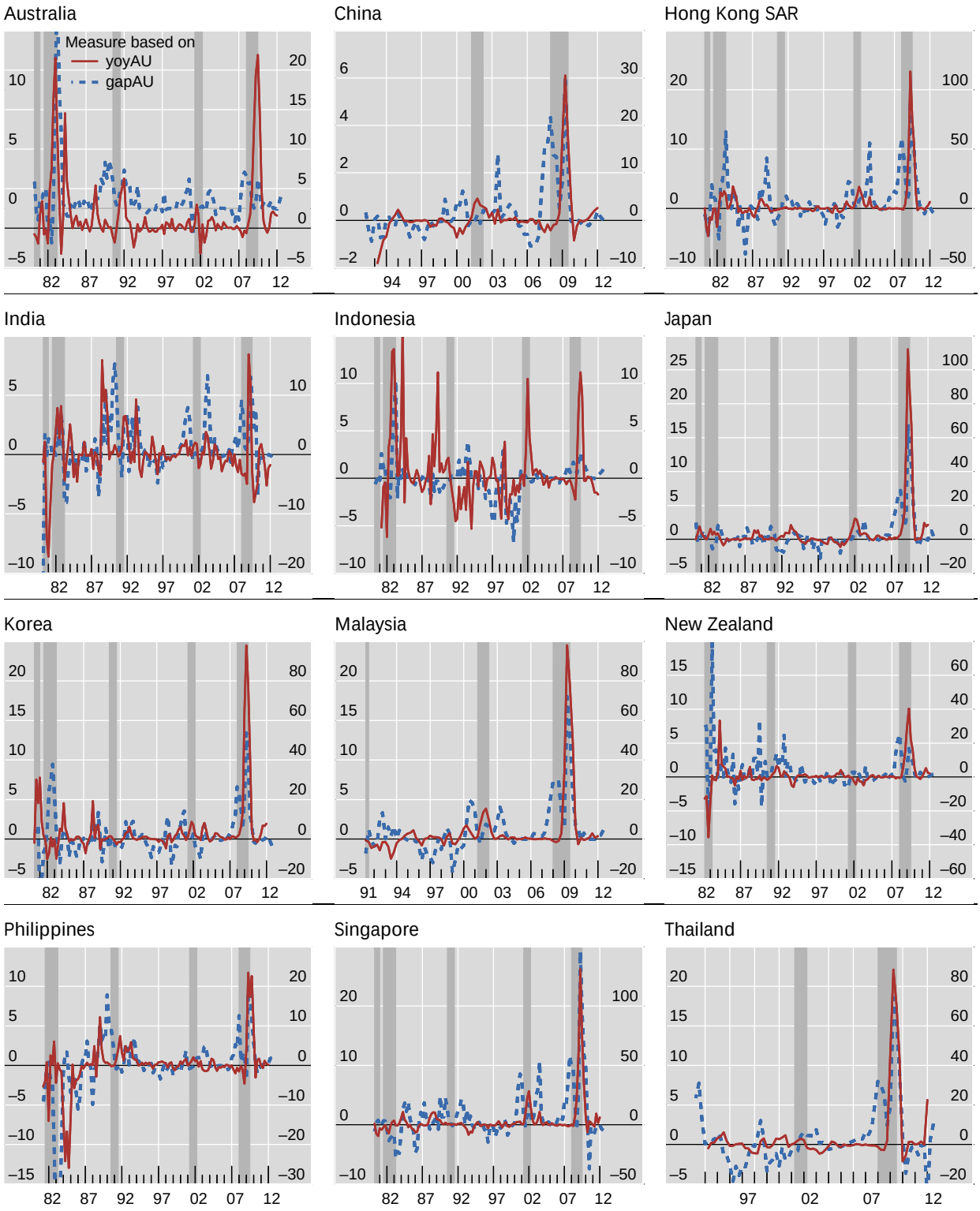
[1] Weighted average of Euro area, Japan and the United States based on 2005 GDP and PPP exchange rate.

Sources: Datastream; national data; authors' calculations.

Measures of business cycle co-movement with G3[1]

Contribution at each quarter

Figure A2



Shaded areas indicate NBER recession period of the US.

[1] Weighted average of Euro area, Japan and the United States based on 2005 GDP and PPP exchange rate.

Sources: Datastream; national data; authors' calculations.

Explaining co-movement during the Great Moderation of 2002–07 Table A1

	Coefficient	P-value	Observations	R^2
1. Trade openness (end-2002)				
Trade openness = exports + imports	0.10	0.003	36	0.52
Manufacturing exports	0.05	0.006	48	0.21
2. Financial openness (end-2002)				
Current account	0.10	0.000	48	0.53
Net foreign assets	0.12	0.000	48	0.68
Gross foreign assets	0.12	0.000	48	0.66
Gross foreign liabilities	0.11	0.000	48	0.56
Foreign holdings of US assets	0.11	0.000	48	0.55
Foreign holdings of US LT debt	0.12	0.000	48	0.62
Foreign holdings of US equity	0.08	0.000	48	0.39
Foreign banks' share of US credit	-0.05	0.183	16	0.55
US banks' share of foreign credit	0.01	0.565	48	0.14
Private sector credit	0.06	0.036	40	0.23
3. Monetary and fiscal policy framework (end-2002)				
Exchange rate peg = 1	0.08	0.007	48	0.34
Foreign exchange reserves	0.11	0.000	48	0.61
Exchange rate volatility (2001-07)	-0.06	0.009	48	0.29
Inflation target = 1	-0.09	0.000	48	0.40
Average inflation (2001–07)	-0.07	0.001	48	0.33
Inflation volatility (2001–07)	-0.01	0.614	48	0.14
Government revenue	-0.03	0.154	48	0.17
Government spending	-0.03	0.264	48	0.16
Government debt	0.05	0.018	48	0.21

Source: authors' calculations.

Explaining co-movement during the International Financial Crisis: Seemingly unrelated regression estimates

Table A2

	Coefficient	P-value	Obs	R^2
1. Trade openness (end-2007)				
Trade openness = exports + imports	0.70	0.009	40	0.45
Manufacturing exports	0.83	0.001	48	0.46
2. Financial openness (end-2007)				
Current account	0.52	0.027	48	0.47
Net foreign assets	0.91	0.000	48	0.53
Gross foreign assets	0.85	0.001	48	0.46
Gross foreign liabilities	0.73	0.004	48	0.43
Foreign holdings of US assets	0.88	0.000	48	0.53
Foreign holdings of US LT debt	0.81	0.000	48	0.53
Foreign holdings of US ST debt	0.78	0.002	48	0.46
Foreign holdings of US equity	0.82	0.093	20	0.46
US holdings of foreign assets	-0.24	0.270	48	0.36
US holdings of foreign LT debt	0.82	0.001	48	0.47
US holdings of foreign ST debt	0.91	0.000	48	0.53
US holdings of foreign equity	0.85	0.001	48	0.46
Foreign banks' share of US credit	0.73	0.004	48	0.43
US banks' share of foreign credit	0.88	0.000	48	0.53
Private sector credit	0.81	0.000	48	0.53
3. Monetary and fiscal policy framework (end-2007)				
Exchange rate peg = 1	0.40	0.076	48	0.41
Foreign exchange reserves	0.79	0.001	48	0.52
Exchange rate volatility (2001-07)	0.07	0.748	48	0.35
Inflation target = 1	-0.36	0.110	48	0.42
Average inflation (2001–07)	-0.93	0.000	48	0.60
Inflation volatility (2001–07)	-0.82	0.000	48	0.45
Government revenue	0.63	0.008	48	0.38
Government spending	0.16	0.529	48	0.35
Government debt	0.43	0.074	48	0.41

Source: authors' calculations.

Explaining co-movement during the 2001 recession: Seemingly unrelated regression estimates

Table A2 (continued)

	Coefficient	P-value	Observations	R^2
1. Trade openness (end-2000)				
Trade openness = exports + imports	0.40	0.000	36	0.53
Manufacturing exports	0.32	0.000	44	0.43
2. Financial openness (end-2000)				
Current account	0.40	0.000	48	0.52
Net foreign assets	0.49	0.000	48	0.58
Gross foreign assets	0.45	0.000	48	0.49
Gross foreign liabilities	0.39	0.000	48	0.40
Foreign holdings of US assets	0.51	0.000	48	0.57
Foreign holdings of US LT debt	0.46	0.000	48	0.56
Foreign holdings of US equity	0.49	0.000	48	0.54
Foreign banks' share of US credit	-0.50	0.005	12	0.82
US banks' share of foreign credit	-0.07	0.437	48	0.23
Private sector credit	0.21	0.010	40	0.44
3. Monetary and fiscal policy framework (end-2000)				
Exchange rate peg = 1	0.42	0.000	48	0.53
Foreign exchange reserves	0.52	0.000	48	0.62
Exchange rate volatility (1991-2000)	-0.03	0.761	48	0.24
Inflation target = 1	-0.35	0.000	48	0.40
Average inflation (1991–2000)	-0.13	0.192	48	0.27
Inflation volatility (1991–2000)	-0.13	0.188	48	0.25
Government revenue	0.08	0.445	48	0.23
Government spending	-0.12	0.225	48	0.26
Government debt	0.15	0.154	44	0.22

Source: authors' calculations.

Explaining co-movement during the Great Moderation of 2002–07:
Seemingly unrelated regression estimates

Table A2
(continued)

	Coefficient	P-value	Observations	R^2
1. Trade openness (end-2000)				
Trade openness = exports + imports	0.10	0.000	40	0.48
Manufacturing exports	0.06	0.004	48	0.23
2. Financial openness (end-2000)				
Current account	0.06	0.002	48	0.32
Net foreign assets	0.12	0.000	48	0.66
Gross foreign assets	0.12	0.000	48	0.65
Gross foreign liabilities	0.11	0.000	48	0.56
Foreign holdings of US assets	0.11	0.000	48	0.54
Foreign holdings of US LT debt	0.11	0.000	48	0.58
Foreign holdings of US equity	0.09	0.000	48	0.45
Foreign banks' share of US credit	-0.11	0.001	12	0.81
US banks' share of foreign credit	0.00	0.998	48	0.14
Private sector credit	0.06	0.002	48	0.30
3. Monetary and fiscal policy framework (end-2000)				
Exchange rate peg = 1	0.07	0.001	48	0.34
Foreign exchange reserves	0.11	0.000	48	0.60
Exchange rate volatility (1991–2000)	-0.06	0.001	48	0.34
Inflation target = 1	-0.07	0.000	48	0.34
Average inflation (1991–2000)	-0.04	0.102	48	0.19
Inflation volatility (1991–2000)	-0.03	0.124	48	0.17
Government revenue	0.01	0.524	48	0.14
Government spending	-0.01	0.579	48	0.14
Government debt	0.06	0.001	48	0.30

Source: authors' calculations.

References

Akin, Cigdem and M. Ayhan Kose (2008) "Changing nature of north-south linkages: stylized facts and explanations," Journal of Asian Economics 19(1), 1-28.

Antonakakis, Nikolaos (2012) "Business cycle synchronization during US recessions since the beginning of the 1870s," Economics Letters 117(2), 467-472.

Berge, Travis J. (2012) "Has globalization increased the synchronicity of international business cycles?" Federal Reserve Bank of Kansas City Economic Review, Third Quarter, 5-39.

Cecchetti, Stephen G, Michael R King and James Yetman (2011) "Weathering the financial crisis: good policy or good luck?" BIS Working Paper no 351.

Chor, Davin and Kalina Manova (2012) "Off the cliff and back? Credit conditions and international trade during the global financial crisis," Journal of International Economics 87(1), 117-133.

Diebold, Frank X and Kamil Yilmaz (2009) "Measuring financial asset return and volatility spillovers, with application to global equity markets," Economic Journal 119(534), 158–171.

Elekdag, Selim, Phurichai Rungcharoenkitkul and Yiqun We (2012) "The evolution of Asian financial linkages: key determinants and the role of policy," IMF Working Paper no 12/262.

Filardo, Andrew and James Yetman (2012) "The Expansion of Central Bank Balance Sheets in Emerging Asia: What are the Risks?" BIS Quarterly Review, June, 47-63.

Fujiwara, Ippei and Koji Takahashi (2012) "Asian financial linkage: macro-finance dissonance," Pacific Economic Review 17(1), 136-159.

Furceri, Davide and Georgios Karras (2008) "Business-cycle synchronization in the EMU," Applied Economics 40(12), 1491-1501.

Harding, Don and Adrian Pagan (2006) "Synchronization of cycles," Journal of Econometrics 132(1), 59-79.

Harding, Don and Adrian Pagan (2002) "Dissecting the cycle: a methodological investigation," Journal of Monetary Economics 49(2), 365-381.

Kose, M. Ayhan, Prakash Loungani and Marco E. Terrones (2013) "From the global to the national cycle: in intricate liaison," Pacific Economic Review 18(3), 370-402.

Kose, M. Ayhan, Eswar S. Prasad and Marco E. Terrones (2003) "How does globalization affect the synchronization of business cycles?" American Economic Review 93(2), 57-62.

Leduc, Sylvain and Zheng Liu (2013) "Uncertainty shocks are aggregate demand shocks," Federal Reserve Bank of San Francisco Working Paper 2012-10.

Leduc, Sylvain and Mark M. Spiegel (2013) "Is Asia decoupling from the United States (again)?" Pacific Economic Review 18(3), 345-369..

Miyajima, Ken, M. S. Mohanty and Tracy Chan (2012) "Emerging market local currency bonds: diversification and stability," BIS Working Paper no 391.

Otto, Glenn, Graham Voss and Luke Willard (2001) "Understanding OECD output correlations," Reserve Bank of Australia Discussion Paper 2001-05.

Park, Yung Chul and Kwanho Shin (2009) “Economic integration and changes in the business cycle in East Asia: is the region decoupling from the rest of the world?” Asian Economic Papers 8(1), 107-140.

Park, Yung Chul (2011) “The global financial crisis: decoupling of East Asia–myth or reality?” ADBI Working Paper Series no 289.

Pula, Gabor and Tuomas A. Peltonen (2011) “Has emerging Asia decoupled? An analysis of production and trade linkages using the Asian international input-output table,” in: The Evolving Role of Asia in Global Finance, Yin-Wong Cheung, Vikas Kakkar and Guonan Ma (eds), Emerald, 255-286.

Philip R. Lane and Gian Maria Milesi-Ferretti (2007) "The external wealth of nations mark II: revised and extended estimates of foreign assets and liabilities, 1970–2004,” Journal of International Economics 73(2), 223-250.

Siklos, Pierre L. (2012) “No coupling, no decoupling, only mutual inter-dependence: business cycles in emerging vs mature economies,” BOFIT Discussion Papers no 17/2012.

Wälti, Sébastien (2009) “The myth of decoupling,” Applied Economics 44(26), 3407-3419.

Yetman, James (2011) “The decoupling of Asia-Pacific?” in: The Evolving Role of Asia in Global Finance, Yin-Wong Cheung, Vikas Kakkar and Guonan Ma (eds), Emerald, 235-253.

Yetman, James (2010) “Exporting recessions: international links and the business cycle,” Economics Letters 110(1), 12-14.

Yeyati, Eduardo Levy and Tomas Williams (2012) “Emerging economics in the 2000s: real decoupling and financial recoupling,” Journal of International Money and Finance 31(8), 2102-2126.