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Abstract

This paper examines whether foreign direct investment between countries fosters stock market integration. Empirical tests demonstrate that both the flow and the level of bilateral foreign direct investment between countries explain country pair stock market integration. More specifically, higher bilateral foreign direct investment levels and flows increase Australia's stock market integration with its major trade partners.

Key words: Foreign direct investment; stock market; integration

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FOREIGN DIRECT INVESTMENT AND INTERNATIONAL STOCK MARKET INTEGRATION

1. Introduction

Foreign direct investment, perhaps more than all other international economic activities, has the potential to link economies, thereby integrating world markets. Baker and Wurgler (2009) indicate, for instance, that foreign direct investment allows firms to engage in international cost of capital ("cheap capital") arbitrage, and it can also enable firms to engage directly in labour cost differential arbitrage, thus furthering the integration, respectively, of worldwide capital and labour markets. In addition, foreign direct investment enables firms to conduct goods arbitrage in situations where exporting or licensing might not be possible, and it also brings about direct contact between home and host country individuals, thus helping to integrate worldwide product markets as well as fostering the spread of international technology and best practice. This paper therefore theorizes that foreign direct investment between countries fosters stock market integration, with empirical tests supporting the paper's hypotheses that both the flow and the level of bilateral foreign direct investment between countries can explain country pair stock market integration.

The paper examines stock market integration from an Australian perspective because, all else being equal, Australia's distance from major economies of the world creates the potential for factors which overcome a lack of integration to have a much more noticeable influence. A representative sample of Australia's trade and investment partners from each important economic region of the world is therefore selected to test the hypothesis that higher bilateral foreign direct investment levels

and flows can help to explain Australia's stock market integration with each of these countries.

Stock market comovement between Australia and other countries is measured using Geweke feedback measures that are based on likelihood ratio test statistics of the interrelationship between pairs of stock markets, thus providing an indication of how integration between the country pairs evolves over time (Geweke, 1982, 1984; Bracker, Docking, and Koch, 1999). A measure of interdependence is therefore used to measure integration.

It is important to note the difference between integration and interdependence. Generally, if markets are integrated, assets with identical risk should have the same expected return, regardless of trading location (Ragunathan, 1999; Bekaert, Harvey and Lumsdaine, 2002; Bekaert and Harvey, 1995). The degree of this integration depends on markets' sensitivities to common economic and financial factors (Bracker, Docking, and Koch, 1999). A rise in integration therefore increases the potential that markets will be more interdependent, even though an increase in interdependence does not necessarily imply an increase in integration (Longin and Solnik, 1995; Gilmore and McManus, 2002; Bekaert, Hodrick, and Zhang, 2005). As Bracker, Docking, and Koch (1999) argue, understanding the interdependence of markets provides valuable insights into the underlying processes driving global integration.

In this paper, Geweke (1982) feedback measures are estimated for eleven sample countries, Australia, Canada, Germany, Hong Kong, Japan, Netherlands, New Zealand, Singapore, Switzerland, United Kingdom, and the United States, for a 22 year sample period from 1984 to 2005. The same day (contemporaneous) Geweke feedback measures between all country pairs is found to be statistically significant, thus signalling a high level of market integration between the countries. During

periods of financial turbulence, the level of stock market comovement increases substantially, regardless of the average level of comovement between country pairs. The paper's results indicate an increase in Australian stock market integration with other countries, but the time trend is somewhat insubstantial compared to the overall year by year variability in stock market comovements. As might be expected, markets with overlapping trading hours experience a much greater level of comovement.

As a second stage analysis, the estimated Geweke feedback measures are subsequently used in a panel regression analysis, with the contemporaneous country pair Geweke feedback measures employed as the cross sectional dependent variable. This second stage analysis addresses the question of whether the level as well as the flow of bilateral foreign direct investment between country *i* and country *j* increases the degree of stock market comovement between country *i* and country *j*. As cross-sectional regression analysis controls, economic and financial variables that have previously been found to explain stock market integration, including the size and income of countries as well as the level of trade between countries, are also included in the cross-sectional analysis (see, e.g., Bracker, Docking, and Koch, 1999).

By focusing on the role of foreign direct investment in stock market comovements, a strong link between economic integration and financial integration is identified. The paper's findings suggest that both an increase in bilateral foreign direct investment linkages and bilateral trade linkages positively affect the level of comovement between stock market pairs. The cross-sectional results indicate that, when compared with bilateral foreign direct investment flows, the existing stock of bilateral foreign direct investment has a greater impact on stock market comovement, whereas countries' total (worldwide) foreign direct investment does not affect country pair stock market comovement. Similarly, foreign trade has very strong explanatory

power, thus providing further evidence to support a link between economic and financial market integration, but the overall level of countries' openness (total world trade) does not appear to be important.

The rest of the paper is organized as follows. The foreign direct investment and stock market integration literatures are reviewed in the following section, thus motivating the paper's focus on explaining international stock market comovements using bilateral foreign direct investment. The research method is outlined in the third section, along with the data sample used to examine the influence of foreign direct investment on stock market integration. A fourth section contains the paper's results, and a final section provides conclusions.

2. Foreign Direct Investment and Stock Market Integration Literature Review

Foreign direct investment (hereafter, FDI) can potentially link economies and thus integrate world stock markets. FDI can allow firms to engage in cost of capital ("cheap capital") arbitrage using relatively cheap home country capital, thus potentially bringing the cost of capital closer together worldwide, especially in host countries that would otherwise have a high cost of capital due to market segmentation or other factors (see Baker and Wurgler, 2009). FDI can also be used by firms to arbitrage international labour cost differentials by adjusting international operations to take the best possible advantage of lower cost labour in host countries, thus helping to integrate worldwide operations. FDI could enable firms to conduct goods arbitrage via direct production, when barriers might otherwise prevent trade between countries, thus integrating economies. FDI can also encourage firms to make use of host country physical assets and infrastructure that could otherwise be underutilized, thus potentially helping to integrate investment returns worldwide. Finally, FDI can bring

about a high degree of direct contact between individuals of the home and host countries, relative to exporting, licensing, and portfolio investments, thus facilitating the integration of operating approaches and production technologies worldwide. Although considerable research has been carried out on stock market integration, the influence of FDI on this relationship has received little academic interest. This section therefore reviews the FDI literature, prior to linking it to the financial market integration literature, to motivate subsequent analysis of the connection between FDI and stock market integration.

2.1 FDI Literature

FDI consists of a lasting interest that a direct investor in a source country has over an enterprise in the host country. This lasting interest entails a long term relationship as well as a substantial level of influence over the management of the enterprise. Generally, 10% control of a corporation's voting power is assumed to indicate such a relationship exists (OECD, 2008a). FDI is implemented by either green-field investments or via merger and acquisitions (Hill, 2005).

FDI is the fastest growing component of international capital flows and plays a key role in financing emerging economies (Albuquerque, Loayza, and Serven, 2005). Lipsey (1999) analyses the nature of FDI from 52 source countries, and finds that direct investment is more stable over time than other forms of capital flows. Lipsey (1999) demonstrates that, on average, net flows of FDI are either positive or negative for almost eight years in a row, as compared to four and a half years for portfolio investments. Fixed investments generally involve irreversibility which could contribute to the more permanent nature of FDI flows (Sarno and Taylor, 1999).

Despite the importance of FDI, there has been a surprising lack of empirical analysis of the determinants of FDI and the role FDI plays in international economic

relationships such as world financial market integration. Earlier research on FDI focuses on the theoretical determinants of FDI using the Dunning "ownership, location, internalization", eclectic theory of FDI (see Calvet, 1981 for a review; see also Dunning, 1973, 1979). Internalization theory assumes that firms will engage in foreign activity in order to internalize transfers within the firm to reduce the risks involved when transferring technology internationally, whereas the eclectic theory extends the internalization theory by positing that ownership and location advantages are also required before FDI will occur (examples of technology transfer risk include the risk of technology theft through foreign licensing or partners). Without ownership and location advantages, Calvet (1981) indicates that production by local firms is favoured over FDI because of the informational advantages possessed by local companies. The eclectic theory of FDI, despite being perhaps intuitively compelling, does not easily accommodate testable empirical hypotheses, thus perhaps explaining the dearth of empirical FDI studies.

Recently, however, Baker, Foley, and Wurgler (2009) have examined whether multinational arbitrage of mispricing across markets is a determinant of FDI. They study FDI in relation to stock market valuations in the host and source countries, and test two separate hypotheses. They find strong empirical evidence in favour of a "cheap financial capital" hypothesis, but a lack of evidence to support a "fire-sale" (cheap host country assets) explanation of FDI. To illustrate the former in relation to mergers and acquisitions, managers can issue overvalued shares in the source country to buy less overpriced assets in the host country, thus taking advantage of a lower cost of capital (Baker, Foley, and Wurgler, 2009). Source country valuations are found to be the most statistically significant determinant of FDI, thus providing evidence in favour of a cheap financial capital explanation of FDI.

Another study contributing to a recent revival of FDI empirical research looks at a reverse direction of causality. Albuquerque, Loayza, and Serven (2005) examine the impact of capital market integration on the level of FDI. They argue that market reforms during the 1980s and 1990s increased world capital market integration and therefore the relevance of global factors representing worldwide sources of risk. By evaluating FDI's dependence on a globalization measure constructed from these worldwide risk factors, they conclude that increases in world market integration have led to a growth in FDI flows. This paper focuses on a direction of causality from FDI to market integration.

Aizenman and Noy (2006, 2009) explore two-way feedback between FDI and trade openness using a Geweke (1982) feedback measure to estimate FDI – trade openness interdependence.[1] Aizenman and Noy (2006) find strong feedback from FDI gross flows to trade openness, and slightly weaker feedback in the opposite direction.

2.2 Stock Market Integration Literature

Stock market integration has been extensively researched in relation to the potential benefits of international diversification, since the benefits can diminish if international stock market comovements increase as markets become more integrated. The impact of liberalisation policies on stock market integration has therefore been examined, especially when liberalisation occurs in emerging markets. Other financial and economic factors, such as financial crises (Baharumshah, Sarmidi, and Tan, 2003; Daly, 2003), macroeconomic factors (Bracker, Docking, and Koch, 1999; Karolyi and Stulz, 1996; Johnson and Soenen, 2002, 2003) and market volatility (Longin and

[1] Care has to be taken when interpreting Geweke feedback in relation to causality, but it is safe to interpret Geweke feedback as representing interdependence.

Solnik, 2001), have also been shown to have an important impact on stock market integration.

Factors creating market segmentation have also been explored, since the absence of such factors can provide an environment that will be conducive to financial market integration. Typically, they include exchange controls, investment barriers, inadequate information, and a lack of free trade (Gilmore and McManus, 2002). Market reforms that help to remove such barriers can therefore be expected to lead to an increase in market integration. After lifting foreign ownership restrictions, the level of FDI would be expected to increase as long as other factors such as political climate are also favourable. Thus, the level of FDI can indirectly reflect the performance of market reforms.

Studies exploring the impact of capital market liberalisation on stock market integration separate the data into time periods based on liberalisation dates, and examine the consequent changes in integration pre and post liberalisation. This has proved to be a very difficult task due to the inherent problems of isolating different market reforms as well as determining whether the reforms are credible. Account must also be taken of the reliance of liberalisation on factors such as political climate, the time taken for progress to occur, circumvention of restrictions prior to liberalisation, and the effect of anticipation of liberalisation (Taskin and Muradoglu, 2003; Bekaert and Harvey, 2000; Bekaert, Harvey, and Lumsdaine, 2002). Despite these problems, post liberalisation integration effects have been identified. Ragunathan (1999), for instance, finds that Australian financial deregulation during the 1980s integrated the Australian and world equity markets, whereas pre-deregulation the Australian market was segmented. Similarly, Tai (2007), focusing on Asian emerging market liberalisation, found that the previously segmented

markets of India, Korea, Malaysia, Philippines, and Thailand have become fully integrated with the world capital market. Other studies have found similar results (Taskin and Muradoglu, 2003; Bekaert, Harvey, and Lumsdaine, 2002; Baharumshah, Sarmidi, and Tan, 2003).

In addition to exploring the effects of liberalisation on integration, research has also focused on the influence of macroeconomic factors on stock market integration. King, Sentana, and Wadhwani (1994) explore the influence of ten macroeconomic variables on the integration of 16 stock markets during the period 1970 to 1988, and find that just a small percentage of stock market covariance is accounted for by the macroeconomic variables. Likewise, Karolyi and Stulz (1996) find no influence of selected factors (U.S. macroeconomic announcements, industry effects, Treasury bill returns, and shocks to the Yen/Dollar foreign exchange rate) on the covariance between the Japanese and United States stock markets. To avoid the problem of non-synchronous trading hours, they analyze the relationship between American shares and Japanese shares trading as American Depository Receipts (Karolyi and Stulz, 1996). Wong *et al* (2004) note, however, that an increase in comovement between emerging and developed markets can be partly explained by trade linkages. Phylaktis and Ravazzolo (2002) establish a strong relationship between financial integration and economic integration due to international trade links. Their study of Pacific countries during 1980 to 1998 examines the covariance of excess stock market returns, and their results imply that economic integration can facilitate financial integration.

Bracker, Docking, and Koch (1999) analyze factors that influence the level of comovement between stock market pairs. Their sample includes daily data for nine stock markets over a 22 year period. They first estimate annual Geweke (1982) measures of stock market feedback that are used as the dependent variable in a pooled

regression analysis. The contemporaneous Geweke measures are then regressed against a selection of macroeconomic variables that represent the degree of economic integration between each country pair, including the extent of bilateral trade. Their empirical results suggest a high level of market integration and efficiency. More importantly, several factors in their study are found to be related to the level of stock market integration, including measures of bilateral import dependence.

Johnson and Soenen (2002) include a bilateral FDI measure as an additional independent variable when explaining contemporaneous Geweke measures of integration between twelve Asian equity markets and the Japanese stock market during the period 1988 to 1998. Like Bracker, Docking, and Koch (1999), they conduct a panel regression analysis of a contemporaneous Geweke stock market feedback measure against economic factors, including a variable representing the level of FDI. Johnson and Soenen (2002) find that the Japanese stock market is highly integrated with Asia Pacific stock markets, with FDI being one of the macroeconomic variables that help to explain this comovement. Johnson and Soenen (2002) do not, however, focus their analysis on FDI. This paper's focus on the ability of FDI stocks and flows to explain Geweke measures of integration of the Australian stock market with a representative sample of stock markets from each important region of the world is outlined in the following section.

3. Model Selection and Data Sample

A first stage analysis, introduced immediately below, estimates the degree of integration between country pairs using the Geweke (1982) feedback measure. Section 3.2 outlines a second stage analysis of the influence of FDI on this measure of integration, and the data set used to conduct the study is summarized in a third subsection.

3.1 Geweke (1982) Measure of Stock Market Integration

As a first step, daily stock market returns are used to calculate annual contemporaneous and unidirectional Geweke (1982) feedback measures between each possible pair of countries in the sample. The year by year Geweke measures demonstrate how the comovement of daily returns between countries evolves over time, thus indicating whether integration is increasing or decreasing (see Bracker, Docking, and Koch, 1999).

The likelihood ratio test statistic forms the Geweke feedback measure, and it is calculated for each country pair and for each year from the residual variances and covariances from unrestricted and restricted country pair stock market return regressions. The regression equations used in the analysis are as follows:

$$r_{it} = \alpha_0 + \sum_{k=1}^{M2} a_k r_{jt-k} + \sum_{k=1}^{M1} b_k r_{it-k} + \varepsilon_{it}, \qquad Var(\varepsilon_{it}) = \sigma^2_{\varepsilon i}, , \tag{1}$$

$$r_{jt} = \beta_0 + \sum_{k=1}^{M2} c_k r_{it-k} + \sum_{k=1}^{M1} d_k r_{jt-k} + \varepsilon_{jt}, \qquad Var(\varepsilon_{jt}) = \sigma^2_{\varepsilon j}, \tag{2}$$

with

$$Cov = \begin{pmatrix} \varepsilon_{it} \\ \varepsilon_{jt} \end{pmatrix} = \begin{pmatrix} \sigma^2_{\varepsilon i} & \sigma_{ij} \\ \sigma_{ij} & \sigma^2_{\varepsilon j} \end{pmatrix} = Y ,$$

where $r_{i,t-k}$ ($r_{j,t-k}$) is the return to country i (j) on day t-k (k = 0, 1, …, M), the model's regression coefficients are α, a, b, β, c, and d, ε_{it} and μ_{jt} are random error terms, $\sigma^2_{\varepsilon i}$ and $\sigma^2_{\mu i}$ designate the variance of the error terms, and the matrix Y is the error covariance for equations (1) and (2).

Regression equations (1) and (2) are estimated as seemingly unrelated regressions (SUR) to take account of the error correlation across equations. The error terms of equations (1) and (2) are assumed to be non-persistent, and are also assumed

to be normally distributed as ($N(0,\sigma^2_{\varepsilon l})$, where $l = i$ or j). While equations (1) and (2) examine whether one country's daily market returns are influenced by its own lagged returns as well as the pair country's past market returns, equations (3) and (4) only incorporate a country's own lagged returns to explain the country's current daily returns as below:

$$r_{it} = \alpha'_0 + \sum_{k=1}^{M_1} b'_k r_{it-k} + \mu_{it}, \qquad Var(\mu_{it}) = \sigma^2_{\mu i}, \tag{3}$$

$$r_{jt} = \beta'_0 + \sum_{k=1}^{M_1} d'_k r_{jt-k} + \mu_{jt}, \qquad Var(\mu_{jt}) = \sigma^2_{\mu j}, \tag{4}$$

with

$$Cov(\mu_{it},\mu_{jt}) = 0 .$$

Equations (3) and (4) are estimated using ordinary least squares regression (OLS). Following Bracker, Docking, and Koch (1999), the lag length M_1 is chosen to be 10 trading days and lag length M_2 is chosen to equal 5 trading days.

There are three hypotheses related to this stage of the analysis:

H_1: There is no contemporaneous relationship between country *i* and country *j* on the same day.

H_2: There is no unidirectional relationship from country *j* to country *i*; i.e. country *j* does not lead country *i* across days.

H_3: There is no unidirectional relationship from country *i* to country *j*; i.e. country *i* does not lead country *j* across days.

With respect to Hypothesis One, it is important to note that the same day does not imply the same calendar date, but the responsiveness of each market to the other market's most recent (simultaneous or preceding) trading session.[2] This consideration

[2] The United States and Canadian markets are the last to close each trading day.

therefore also affects the designation of the lags of the other market in equations (1) and (2).[3] To illustrate this point, consider New Zealand and the United States, the furthest west and furthest east countries included in the sample. For the United States, a lag of one calendar day of the New Zealand market incorporates the second most recent trading session of New Zealand (40 hours earlier in real time).[4] For New Zealand, however, a lag of one calendar day of the United States market includes the most recent trading session which is only eight hours earlier in real time, so lags of the United States market begin two calendar days earlier. This makes the model insensitive to the ordering of market openings, so it does not matter where in the world the day is assumed to begin.

Hypothesis Two and Three examine the lead-lag relationship related to trading that occurs beyond the most recent trading session, that is, beyond the 24 hour period. These hypotheses consider the efficiency of the markets by incorporating sources of information in other markets on the same day and also across days.

The following formulas are the Geweke feedback measures *G* to test Hypotheses One, Two and Three:

$$G_{i,j} = (n)\ell n\left[\left(\sigma^2_{\mu i} \times \sigma^2_{\mu j}\right)/|Y|\right] \quad \overset{a}{\sim} \chi^2_1 \text{ under H1;}$$

$$G_{j \to i} = (n)\ell n\left(\sigma^2_{\mu i} / \sigma^2_{\varepsilon i}\right) \quad \overset{a}{\sim} \chi^2_{M2} \text{ under H2;}$$

$$G_{i \to j} = (n)\ell n\left(\sigma^2_{\mu j} / \sigma^2_{\varepsilon j}\right) \quad \overset{a}{\sim} \chi^2_{M2} \text{ under H3,}$$

[3] Since close to close returns are used in the analysis, the period may be slightly less than the 24 hour period defined by the same day.
[4] This is based on the time between the United States market close and the New Zealand market close being calculated in coordinated universal time (UTC).

where n is the sample size, $|Y|$ = determinant of $\hat{Y}$, and χ^2 designates the chi square distribution. The contemporaneous feedback measures ($G_{i,j,t}$) for each country pair (i,j) and each year t are used as the dependent variable in the panel regression analysis outlined in the following subsection.

3.2 Panel Regression Analysis

The second stage analysis utilizes the annual contemporaneous Geweke feedback measure estimates $G_{ij,t}$ for countries i and j and each year t in the panel regression analysis equation

$$G_{ij,t} = \beta_0 + \beta_1 X_{ij,t} + \varepsilon_{ij,t} \tag{5}$$

where β_0 is the regression constant, β_1 is a vector of coefficient estimates, and $X_{ij,t}$ is a vector of explanatory variables, as outlined below. Panel regression equation (5) is first estimated as a univariate OLS regression equation for each alternative explanatory variable $X_{ij,t}$, and it is also estimated using multivariate OLS regression (with and without fixed year effects).[5]

The primary focus of the panel regression analysis is the explanatory power of FDI independent variables, but other economic and financial variables ($X_{ij,t}$) that are empirically important for explaining stock market integration are also included in the regression analysis as control variables. These control variables include bilateral trade, trade openness, wealth, and country size. FDI research focuses on both FDI flows (Johnson and Soenen, 2002; Nourzad, 2005) and FDI stocks (Jansen and Stokman, 2004).

[5] When equation (5) is estimated using fixed year effects, the estimated regression constant β_0 becomes the average coefficient estimate for the yearly dummy variables.

FDI flows refer to the amount of FDI embarked on during a year, while the FDI stock is the accumulated value of FDI at a point in time (Hill, 2005). Bénassy-Quéré, Coupet, and Mayer (2007) suggest that examining FDI stocks is advantageous because they are less volatile than FDI flows, and they also represent a measure of capital ownership. The panel regression analysis is therefore conducted using both bilateral FDI flows ($BIFDIFLOW_{ij,t}$) and bilateral FDI stocks ($BIFDISTOCK_{ij,t}$) explanatory variables. Each bilateral FDI explanatory variable is defined as the sum of the FDI flow (stock) from country *i* to country *j* relative to the GDP of country *j* plus the FDI flow (stock) from country *j* to country *i* relative to the GDP of country *i* (see, e.g., Jansen and Stokman, 2004). In addition, an explanatory variable representing total FDI inflows from all countries of the world to each country pair, defined as the country pair sum of the ratios of total FDI inflows from all countries relative to each country's GDP ($TOTALFDIFLOW_{ij,t}$), is also included in the panel regression analysis.

Bracker, Docking, and Koch (1999) indicate that trade variables are important when explaining the cross-section of Geweke measures of country pair stock market integration. Trade explanatory variables that parallel the FDI explanatory variables are therefore also included as control variables. The first is a bilateral trade variable ($BITRADE_{ij,t}$) which equals the sum of exports from country *i* to country *j* relative to the GDP of country *i* plus exports from country *j* to country *i* relative to the GDP of country *j*. The second trade variable is defined as trade openness ($OPENNESS_{ij,t}$) and equals the country pair sum of the ratios of total exports plus imports of each country to and from all countries of the world, relative to each country's GDP.

Bracker, Docking, and Koch (1999) include a measure for the size of economies when explaining country pair Geweke measures of integration, since

smaller and poorer economies are less likely to be integrated with other countries of the world. Baker, Foley, and Wurgler (2009) indicate that size is best captured by the level of GDP, defined here as the natural logarithm of the country pair sum of GDP ($SIZE_{ij,t}$), whereas income is best captured using the average of the country pair GDP per capita ($AVGGDPCAP_{ij,t}$). Bracker, Docking, and Koch (1999) also note that much greater stock market comovement is likely to be observed if the stock markets in both countries are open at the same time, so a common trade dummy variable that equals one if both markets are open at the same time ($COMTRADE_{ij,t}$) is included as a final panel regression control variable.

Throughout the analysis, all the FDI and control explanatory variables ($X_{ij,t}$) are derived not as separate variables for each country, but as one combined explanatory variable for each country pair. It is also assumed that it is the total amount of FDI (and trade) that is transferred between the country pair that is important, not the net flow. This is based on the premise that inflows and outflows of FDI do not simply offset each other, as each country might be affected by the other country's bilateral FDI inflows as well as outflows (Jansen and Stokman, 2004; Lipsey, 1999).

3.3 Data Sample and Summary Statistics

The eleven countries included in the data sample are Australia, Canada, Germany, Hong Kong, Japan, Netherlands, New Zealand, Singapore, Switzerland, United Kingdom, and the United States, thus implying 55 country pairs are examined in the study. The sample covers a 22 year period from 1984 to 2005. Daily stock returns for the sample countries are measured using Morgan Stanley's Capital International daily local currency stock price data, obtained from Thomson Financial DataStream. Daily stock returns are calculated as the log change in the daily index

closing price. Panel A of Table 1 provides descriptive statistics for the daily stock index returns for the 11 sample countries, and Panel B outlines the share return correlations. The highest correlations are observed for the European countries in the sample.

[Insert Table 1 about here.]

The second stage analysis utilizes panel data consisting of cross sections of country pair observations over a 22 year sample period (1984 through 2005). Not all of the 22 annual observations for the second stage panel regression analysis exist for each country pair explanatory variable for all of the cross sections due to data availability, so in the second stage analysis, technically, the data sample is an unbalanced panel. To illustrate, only 22 country pairs have all 22 annual observations for the bilateral FDI flow explanatory variable ($BIFDIFLOW_{ij,t}$), 10 pairs have 21 annual observations and three have 20, leaving the remaining 20 possible pairs with less than 20 annual observations.

Summary statistics for the panel regression explanatory variables are provided in Panels C and D of Table 1. Bilateral FDI inflows and outflows along with the FDI inward and outward positions for each country pair in the sample are obtained from the Organization for Economic Cooperation and Development (OECD) International Direct Investment Statistics (OECD, 2008b). All data variables in Panels C and D of Table 1 are measure in United States dollars. To deal with potential data inconsistencies (for instance, FDI inflows from one country to the other might not match the FDI outflows from the second country to the first), and to minimize missing data problems, the country in each pair that has the most observations for each bilateral country pair FDI flow or stock variable is used as the primary data source for that variable. Total FDI Inflow data are obtained from the United Nations

Statistics Division (IMF, 2008a). GDP and GDP per capita are based on United Nations estimates (UN, 2008a; 2008b). Bilateral trade data are obtained from the OECD Monthly Statistics of International Trade (OECD, 2008c). The trade openness measure is calculated using total annual exports and imports, as reported by the International Monetary Fund (IMF, 2008b; 2008c).

The Table 1, Panel C descriptive statistics indicate that, on average, the bilateral FDI ties between countries, as represented by total FDI inflows (*BIFDIFLOW*) between the country pairs, are greater than but also relatively more volatile than bilateral trade ties (BITRADE). The correlations amongst the panel regression analysis explanatory variables, reported in Panel D of Table 1, indicate strong correlations amongst some of the trade and FDI variables. This suggests that care must be taken when deciding which explanatory variables are to be included together in multivariate panel regressions using regression equation (5), due to potential multicollinearity, as detailed below in the Results section. The FDI – trade correlation results also imply that it might not be completely possible to separate an FDI explanation of worldwide stock market integration from a trade explanation, since the two sets of explanatory variables are correlated.

4. Results

4.1 Geweke Feedback Measure Results

Annual Geweke feedback measure results for the 55 country pairs during the sample period 1984 through 2005 that are obtained by estimating regression equations (1) to (4) are summarized in Table 2. Germany, New Zealand, Switzerland, and the United Kingdom have the highest average country pairs contemporaneous feedback measures ($G_{i,j,t}$) in Table 2, with each exceeding 70, whereas the

Netherlands average is the lowest at just under 30, and the remainder fall in a tighter range of 37 to 50 (see Panel A). It is therefore apparent that country size is not likely to explain Geweke measures of integration, since two of the smallest but also two of the larger countries have the highest average contemporaneous feedback measures. Figure 1 displays the average and the median Geweke contemporaneous feedback measures ($G_{i,j,t}$) for all 55 country pairs over time, with the influence of financial crises such as the 1987 crash being apparent in upward spikes of the Geweke feedback measure.

[Insert Table 2 and Figure 1 about here.]

The average unidirectional Geweke feedback measures from each country to all others, summarized in Panel B of Table 2, are considerably lower than the contemporaneous feedback levels (compare the means in Panels A and B), with all of them being within the range 8 to 10.1. Surprisingly, however, a fairly high percentage of the year by year unidirectional feedback measures from each country to the others are significant at the 5% level, with the minimum being 15% (for the Netherlands) and all the rest being 20% or higher, thus suggesting that there is sometimes a delay with which these stock markets fully incorporate information from other markets. Also surprisingly, the United States market does not dominate all others in terms of unidirectional feedback, since the 22% of the annual unidirectional feedback measures from the United States to other countries that are significant at the 5% level is very similar to the average for all countries (see the bottom row in Panel B of Table 2).

Table 3 summarizes the percentage of the annual unidirectional feedback measures from each country to each other that are significant at the 5% level, and the results are (again) somewhat surprising. Germany and the Netherlands are the two

countries that are the most affected by the delayed influence of the stock markets of other countries, (see the Germany and Netherlands rows in Table 3), thus suggesting that these two countries can be slow in incorporating information. There also appears to be an interesting pattern of unidirectional feedback between countries within their own geographic regions, with a lower level of unidirectional feedback generally being present within regions. This possibly suggests that the stock market feedback occurs contemporaneously within regions, not with a delay, a possibility that is explored in the panel regression results below where the common trading time (*COMTRADE*) explanatory variable is employed to explain the contemporaneous feedback measures. Australia, for instance, does not receive much unidirectional feedback from Japan, New Zealand, and Singapore (see the Australia column of Table 3), and all three markets are open at the same time.

[Insert Table 3 about here.]

Australia, in addition to having interesting regional feedback patterns, is a potentially informative country to study with respect to stock market integration because of Australia's physical distance from major regional trading blocks, and also because of the considerable liberalisation that has occurred during the study's sample period. Table 4 therefore presents Australia's year by year Geweke feedback measures with all other countries. Prior to 1987, all the Australian Geweke feedback country pair measures are very low, perhaps reflecting the fact that Australia had only recently begun to liberalise its economy by freeing up domestic and international regulatory controls, including controls on foreign exchange and debt markets. The spike upwards in all international market feedbacks caused by the 1987 stock market crash is very noticeable, along with the 1997 financial crisis, but otherwise there is only a mild trend upwards in contemporaneous Geweke feedback measures ($G_{i,j,t}$),

and no time trend is apparent in the unidirectional feedback measures. The following subsection explores whether changes in FDI can help to explain variations in contemporaneous Geweke feedback measures of international stock market integration.

[Insert Table 4 about here.]

4.2 Cotemporaneous Geweke Feedback Measure Panel Regression Analysis

Table 5 presents univariate panel regression results for regression equation (5) that explain country pair contemporaneous Geweke feedback measures $G_{i,j,t}$ using alternative FDI or trade explanatory variables. Table 5 indicates that the bilateral FDI explanatory variables (*BIFDIFLOW* and *BIFDISTOCK*) help to explain stock market integration amongst country pairs ($G_{i,j,t}$), as hypothesized, along with the bilateral trade (*BITRADE*) explanatory variable (see Models 4 to 6 of Table 5). The average per capita income level of country pairs (*AVGGDPCAP*) also appears to significantly increase bilateral stock market integration (see Model 2 of Table 5). As foreshadowed by the Table 2 results, the size of countries (*SIZE*), as measured by GDP, is found to be unrelated to contemporaneous bilateral Geweke feedback measures of stock market integration. Total trade of country pairs with the rest of the world (*OPENNESS*) and total country pair inflow of FDI from all countries (*TOTALFDIFLOW*) are also found to be unrelated to stock market country pair integration (see Models 3 and 7). These results indicate that it is the bilateral economic ties between countries rather than the overall level of trade and FDI openness that are important for country pair stock market integration (compare Models 3 and 7 with Models 4, 5 and 6). These implications of the univariate results are explored further using multivariate panel regression.

[Insert Table 5 about here.]

The univariate explanatory variables used to explain country pair stock market integration in Table 5 tend to be highly correlated, as indicated by Table 1, thus implying that care has to be taken when constructing multivariate regression models to explore further the relationship between bilateral economic ties and stock market integration. Multivariate regression models 1 to 3 in Table 6 therefore include only one bilateral FDI variable (*BIFDIFLOW* or *BIFDISTOCK*) or the bilateral trade variable (*BITRADE*), since all three are correlated, while model 4 includes the bilateral FDI flow and trade variables together (while noting the high correlation between *BIFDIFLOW* and *BITRADE*). Each model also includes the common trade dummy control variable that designates if the stock markets of each country pair are open at the same time (*COMTRADE*), and also the explanatory variable representing the average per capita income level of country pairs (*AVGGDPCAP*), since these explanatory variables are not highly correlated with the bilateral FDI and trade variables. The insignificant univariate explanatory variables, trade openness and total FDI openness (*OPENNESS* and *TOTALFDIFLOW*), are excluded from the multivariate analysis, a decision that is supported by a desire to avoid further multicollinearity complications (see Panel D of Table 1). Models 5 to 8 are identical to models 1 to 4, except each includes controls for fixed year effects.

[Insert Table 6 about here.]

The Table 6 results indicate that, once controls for common stock market opening times and country wealth (*COMTRADE* and *AVGGDPCAP*) are included in the multivariate analysis, bilateral FDI flows (*BIFDIFLOW*) have marginal, at best, ability to explain country pair stock market integration (see models 1, 4, 5, and 8). Rather, it is the existing stock of bilateral FDI (*BIFDISTOCK*), and not the flow, that appears to explain country pair stock market integration (see models 2 and 6 of Table

6). The results are thus consistent with the paper's hypothesis that FDI ties between countries foster the integration of the countries' stock markets. The results of Table 6 also indicate that bilateral trade (*BITRADE)* is very important when explaining contemporaneous stock market feedback between country pairs (see models 3, 4, 7, and 8). [Due to the very strong correlation between bilateral FDI stock and bilateral trade (the *BIFDISTOCK* - *BITRADE* correlation is .517 in Panel D of Table 1), it is not possible to completely distinguish between a bilateral FDI and bilateral trade explanation of country pair stock market integration.] As expected, common stock market opening times (*COMTRADE*) appear to play a very important role in explaining stock market integration, as does the wealth level of the country pairs (*AVGGDPCAP*). The interesting stock market interrelationships created by regional, trade, FDI, and wealth ties amongst country-pairs, as revealed by Table 6, support the paper's economic trade link – integration hypothesis, but are also complex enough that they suggest future research possibilities exploring the causation and potential endogeneity of the links.

5. Conclusion

Researchers have begun to explore the important link between bilateral trade and stock market integration, but the recent growth and growing importance of FDI suggests that it also has great potential to integrate stock markets of the world. FDI ties could increase the comovement of business cycles between countries, for instance, thus indicating FDI can influence stock market comovements that through via market expectations of more synchronized cash flows during common economic cycles. Little research has been done to examine this relationship.

Accordingly this study focuses on the impact of bilateral FDI on the level of integration between international stock markets. As with similar studies, contemporaneous Geweke

feedback measures are used to decipher how the comovement between stock market pairs evolves over time. These are used in a panel regression analysis consisting of the country pairs as the cross section, with the time series covering the period 1984 to 2005. Significant comovement between the cross country stock markets is found on the same trading day, thus indicating that the stock markets in the sample of Australia's economic partners tend to be integrated, especially during periods of financial turbulence like the stock market crash in 1987. The level of stock market comovement with the Australian sample increased substantially regardless of the typical level of comovement with each country, perhaps reflecting the initial liberalization of the Australian economy as well as a trend towards worldwide integration.

The study's findings suggest that, as hypothesized, an increase in bilateral FDI stocks and bilateral trade increase the level of comovement between stock market pairs, even after controlling for other potentially correlated explanations of stock market comovement, including common stock market trading hours. Importantly, a strong link is established between economic integration and financial integration. The results also indicate that the bilateral FDI ties as well as the bilateral trade ties are more important in explaining stock market integration between a pair of countries than their overall openness to FDI or trade.

This paper focuses on the direction of causality from the level of FDI to stock market integration. It is possible that this causality may be bidirectional, with causality also running from stock market integration to FDI; an inspection of this is left to future research. Applying an asset pricing model or adopting a portfolio approach to examine the relationship further could also be beneficial and interesting.

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Table 1: Descriptive Statistics on Variables

This table reports descriptive statistics on the variables used in the paper. Panel A reports summary statistics on daily index return (expressed in percentage) across the eleven markets. Morgan Stanley's Capital International daily stock price data are used and are obtained from Thomson Financial Datastream and are in local currencies. The sample covers 22 year period from 1984 to 2005. Panel B presents correlation matrix on daily index return. Panel C presents summary statistics on economics variables used in the study. The notation is as follows:

SIZE is the nature logarithm of ($GDP_{i,t} + GDP_{j,t}$), where $GDP_{i,t}$ is country *i*'s *GDP* at time t and $GDP_{j,t}$ is country *j*'s *GDP* at time t.

AVGGDPCAP is the average GDP per capita between countries *i* and *j*.

OPENESE equals to $(\exp orts + imports)_{i,t} / GDP_{i,t} + (\exp orts + imports)_{j,t} / GDP_{j,t}$.

BIFDIFLOW is measured as $(bilateral\ FDI\ flows)_{j \to i,t} / GDP_{i,t} + (bilateral\ FDI\ flows)_{i \to j,t} / GDP_{j,t}$, where *FDI* is foreign direct investment and $i \to j$ denotes from country i to country *j*.

BIFDISTOCK equals to $(bilateral\ inward\ FDI\ stocks)_{j \to i,t} / GDP_{i,t} + (bilateral\ inward\ FDI\ stocks)_{i \to j,t} / GDP_{j,t}$.

BITRADE is $(bilateral\ \exp orts)_{j \to i,t} / GDP_{i,t} + (bilateral\ FDI\ flows)_{i \to j,t} / GDP_{j,t}$.

TOTALFDIFLOW is the ratio of total FDI inflow into country *i* to GDP of country *i* plus the ratio of total FDI inflow into country *j* to GDP of country *j,* and is measured as $(Total\ FDI\ \inf low)_{i,t} / GDP_{i,t} + (Total\ FDI\ \inf low)_{j,t} / GDP_{j,t}$

The sample period is from 1984 to 2005. Data are obtained from OECD International Direct Investment Statistics and are reported in United States dollars. Panel D shows the correlations between these economics variables.

(Table 1 continued)

Panel A: Summary Statistics on Daily Index Returns (%)

	Australia	Canada	Germany	Hong Kong	Japan	Netherland	New Zealand	Singapore	Switzerland	UK	USA
Mean	0.0347	0.0295	0.0316	0.0508	0.0128	0.0323	0.0157	0.0177	0.0361	0.0307	0.0349
Median	0.0287	0.0225	0.0459	0.0027	0.0000	0.0410	0.0000	0.0000	0.0448	0.0308	0.0229
Maximum	6.0677	8.5624	7.4500	15.9795	10.6906	10.5740	16.5094	12.6325	7.1204	7.1154	8.6128
Minimum	-25.9229	-9.8481	-13.9732	-38.8417	-16.6673	-11.7595	-17.1742	-26.0038	-12.9594	-12.5361	-22.8270
Std. Dev.	0.9686	0.9071	1.3247	1.6298	1.2173	1.1827	1.2563	1.2847	1.0610	0.9957	1.0241
Observations	6,261	6,261	6,261	6,261	6,261	6,261	6,261	6,261	6,261	6,261	6,261

Panel B: Correlation Coefficients on Daily Index Returns

	Australia	Canada	Germany	Hong Kong	Japan	Netherland	New Zealand	Singapore	Switzerland	UK	USA
Australia	1.0000										
Canada	0.1864	1.0000									
Germany	0.2640	0.3918	1.0000								
Hong Kong	0.3602	0.1922	0.2890	1.0000							
Japan	0.3871	0.1906	0.2468	0.3058	1.0000						
New Zealand	0.2596	0.4097	0.6983	0.2816	0.2506	1.0000					
Netherland	0.3917	0.0708	0.1712	0.1875	0.2117	0.1549	1.0000				
Singapore	0.4321	0.1991	0.2820	0.4744	0.3688	0.2683	0.2413	1.0000			
Switzerland	0.2767	0.3637	0.6966	0.2997	0.2645	0.7161	0.1567	0.3021	1.0000		
UK	0.2573	0.4296	0.5811	0.2686	0.2592	0.7240	0.1375	0.2889	0.6331	1.0000	
USA	0.0520	0.6634	0.3705	0.1435	0.1161	0.3903	-0.0008	0.1329	0.3619	0.4040	1.0000

(Table 1 continued)

Panel C: Summary Statistics on Economics Variables

	AVGGDPCAP	SIZE	OPENESS	BIFDIFLOW	BIFDISTOCK	BITRADE	TOTALFDIFLOW
Mean	24,466.6800	14.7164	1.2820	0.0049	0.0538	0.0032	0.0640
Median	24,081.2500	14.7703	0.8978	0.0021	0.0283	0.0016	0.0396
Maximum	46,109.5000	16.6496	4.7377	0.0652	0.5761	0.0297	0.5303
Minimum	8,340.0000	11.5392	0.3025	-0.0891	0.0008	0.0000	-0.0494
Std. Dev.	7,100.3710	1.0362	0.9456	0.0117	0.0650	0.0048	0.0676
Observations	776	776	776	776	776	776	776

Panel D: Correlation Coefficients on Economics Variables

	AVGGDPCAP	SIZE	OPENESS	BIFDIFLOW	BIFDISTOCK	BITRADE	TOTALFDIFLOW
AVGGDPCAP	1.0000						
SIZE	0.3958	1.0000					
OPENESS	-0.0182	-0.3444	1.0000				
BIFDIFLOW	0.0685	0.1239	0.0291	1.0000			
BIFDISTOCK	0.2148	0.3571	0.1470	0.4144	1.0000		
BITRADE	-0.0290	0.2524	0.2083	0.2857	0.5171	1.0000	
TOTALFDIFLOW	0.0458	-0.2780	0.7267	0.1786	0.1540	0.1015	1.0000

Table 2: Summary Statistics on Geweke Feedback Measures

Panel A reports summary statistics on annual contemporaneous feedback measures from one country to the other ten countries. In Panel B, summary statistics on annual unidirectional feedback measures are presented. The sample period is between 1984 and 2005. *% of Sig* denotes percentage of significant feedback measures at 5% level.

	Australia	Canada	Germany	Hong Kong	Japan	New Zealand	Netherland	Singapore	Switzerland	UK	USA
Panel A: Contemporaneous Feedback Measures											
Mean	46.1103	50.0967	79.2541	49.0953	37.5051	83.2788	29.7787	45.6439	78.6018	72.2677	47.6248
Median	37.8535	24.9695	45.369	33.489	28.7105	47.1195	19.941	34.92	45.8445	43.084	24.382
Stdev	36.1493	60.1429	80.5752	43.9827	26.3644	87.8877	27.1828	38.1611	77.4289	75.6556	57.8244
Maximum	269.799	360.196	477.591	257.878	155.2	477.591	147.243	269.799	378.754	417.553	360.196
Minimum	5.249	7.433	9.082	7.486	7.433	4.968	4.968	5.249	6.009	7.486	6.947
n	220	220	220	220	220	220	220	220	220	220	220
% of Sig	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Panel B: Unidirectional Feedback Measures											
Mean	10.1048	8.521	9.1098	9.7452	8.7899	8.4167	7.9879	8.9072	8.6586	9.301	9.386
Median	7.285	6.455	7.8525	6.747	6.745	6.709	6.0865	7.056	7.5335	6.4895	6.943
Stdev	12.4799	10.7738	5.3878	10.6415	10.2274	7.5162	7.5119	12.1248	7.4183	11.1079	13.4721
Maximum	143.525	146.97	40.776	93.096	127.966	85.853	67.523	160.243	93.913	136.979	148.034
Minimum	1.321	1.452	1.737	1.516	1.182	1.422	1.326	1.305	1.699	1.128	1.529
n	220	220	220	220	220	220	220	220	220	220	220
% of Sig	26%	20%	27%	24%	19%	22%	15%	20%	26%	21%	22%

Table 3: Percentage of Significant Unidirectional Feedbacks from One Country to Other Countries

This table shows the percentage of significant unidirectional feedbacks from each country to each other countries. The sample period is between 1984 and 2005.

Country from\to	Australia	Canada	Germany	Hong Kong	Japan	New Zealand	Netherland	Singapore	Switzerland	UK	USA
Australia	.	23%	36%	18%	32%	27%	45%	14%	32%	18%	14%
Canada	14%	.	32%	36%	14%	23%	14%	14%	18%	14%	23%
Germany	23%	23%	.	18%	27%	36%	32%	27%	23%	32%	32%
Hong Kong	27%	27%	14%	.	18%	27%	36%	23%	23%	32%	14%
Japan	14%	9%	18%	36%	.	9%	23%	14%	27%	27%	9%
New Zealand	14%	18%	41%	23%	23%	.	18%	18%	27%	5%	32%
Netherland	23%	14%	18%	9%	14%	14%	.	18%	36%	9%	0%
Singapore	9%	23%	32%	18%	18%	27%	36%	.	27%	5%	9%
Switzerland	36%	23%	45%	23%	18%	23%	9%	27%	.	32%	23%
UK	18%	9%	45%	18%	9%	32%	23%	23%	18%	.	18%
USA	27%	14%	41%	23%	14%	23%	9%	23%	27%	23%	.

Table 4: Results of Geweke Feedback Measures for Australia

In Panel A, the annual contemporaneous Geweke measures of feedback between Australia and the other eleven counties are reported. While Panel B shows the annual unidirectional Geweke measures of feedback from Australia to each of the other ten countries, the annual unidirectional Geweke measures of feedback from each of other ten countries to Australia are presented in Panel C. The sample period is between 1984 and 2005. * denotes significance at 5% level, ** denotes significance at 1% level.

Year	Canada	Germany	Hong Kong	Japan	Netherlands	New Zealand	Singapore	Switzerland	UK	USA
Panel A: Contemporaneous feedbacks between Australia and the other 10 countries										
1984	18.2118**	30.2973**	27.3954**	43.7945**	42.9747**	15.9612**	15.5368**	64.4287**	29.8259**	9.4900**
1985	14.1965**	21.0947**	13.1780**	21.1760**	7.5034**	7.3879**	5.2491**	12.5243**	8.19458**	11.6313**
1986	15.2634**	16.56858**	13.3506**	19.4077**	15.4342**	22.9351**	15.7480**	15.2092**	12.5927**	17.7289**
1987	136.4537**	55.0120*	257.8782**	135.9465**	78.2929**	147.2431**	269.7985**	83.4160**	92.9872**	29.7598**
1988	22.0611**	77.4725**	76.3446**	35.1574**	41.4546**	55.6654**	84.9703**	103.7080**	23.8968**	13.9348**
1989	13.2501**	116.7973**	11.4414**	23.6762**	68.0879**	133.0747**	89.7042**	98.8966**	22.3950**	15.7777**
1990	14.6719**	43.9293**	66.4069**	74.7776**	52.2141**	96.6080**	58.4116**	59.8674**	30.7189**	9.3116**
1991	12.5736**	62.5832**	62.2726**	74.5367**	67.1758**	53.1207**	79.8329**	73.9923**	53.7084**	36.7740**
1992	14.9940**	26.1664**	29.5936**	32.4633**	27.2468**	62.0310**	36.5745**	34.7918**	39.4361**	26.5815**
1993	11.4613**	32.2102**	32.5329**	26.8366**	29.1259**	65.3926**	16.2942**	19.4938**	17.6809**	16.8719**
1994	17.3687**	69.1824**	79.7331**	41.0971**	57.9740**	135.4573**	58.1379**	34.8566**	23.5108**	12.8033**
1995	24.8821**	48.4820**	34.7010**	26.6825**	32.8893**	61.7848**	36.6426**	32.7311**	21.6640**	23.1671**
1996	24.5288**	96.4375**	80.0112**	34.2772**	57.4787**	54.0827**	52.4352**	46.6276**	37.8674**	18.6724**
1997	30.1245**	126.8654**	120.8128**	52.9790**	83.2326**	128.0381**	83.9566**	72.9666**	51.4594**	11.2650**
1998	21.1111**	44.6530**	93.7014**	95.4128**	38.0200**	80.2976**	68.6246**	42.2037**	59.4143**	15.2113**
1999	25.0573**	17.2590**	57.3992**	65.3746**	13.7615**	46.2741**	38.8826**	24.4481**	17.4771**	22.4945**
2000	16.8443**	20.3177**	63.5802**	71.9870**	46.5472**	52.3691**	42.5046**	12.7304**	28.7910**	10.8379**
2001	13.9688**	15.8402**	83.6834**	69.9021**	20.2385**	55.1879**	76.8115**	18.2522**	24.6441**	26.6892**
2002	37.8397**	35.7821**	77.4796**	65.0311**	60.6963**	45.7663**	55.5516**	43.2388**	58.0033**	24.3874**
2003	10.4942**	30.6822**	53.5610**	42.8793**	28.4695**	33.6181**	66.0672**	39.1684**	28.2331**	18.7520**
2004	29.5717**	36.1992**	45.6209**	73.4282**	38.1033**	18.0154**	51.4866**	40.8588**	39.1186**	14.9245**
2005	11.2973**	45.4958**	49.6575**	71.9850**	44.8996**	43.1757**	39.0417**	56.8236**	50.7348**	11.3544**

(Table 4 continued)

Year	Canada	Germany	Hong Kong	Japan	Netherlands	New Zealand	Singapore	Switzerland	UK	USA
Panel B: Unidirectional feedbacks from Australia to the other 10 countries										
1984	5.2568	4.4049	11.9676*	15.6202**	5.6355	7.9138	1.9299	7.3269	7.5009	4.2884
1985	5.4539	15.2770**	9.2788	14.5906*	3.9939	4.7367	1.4076	4.3488	5.9181	5.3899
1986	5.2358	5.3817	6.6351	11.9539*	6.4962	17.5905**	5.8519	4.3301	2.5250	7.8992
1987	78.8570**	35.6028**	143.5248**	20.3055**	44.3022**	5.8023	54.9098**	42.9590**	44.9900**	18.4098**
1988	14.0250*	20.6088**	7.4003	8.2151	3.7842	14.9902*	6.7183	15.8298**	5.7799	7.2906
1989	7.3297	30.9931**	3.1395	10.3823	14.6975*	11.0247	16.9090**	14.8129*	7.2462	5.7498
1990	8.0099	3.4145	17.8419**	6.1195	5.2302	15.7851**	8.0722	7.9575	9.6474	6.0144
1991	4.5427	12.7358*	7.1016	2.3686	8.9091	11.8078*	6.6652	6.8372	5.7987	14.4620*
1992	6.7758	3.2029	8.7648	6.8666	5.8211	18.6278**	8.2371	6.0895	14.2414*	10.4617
1993	4.0600	13.2574*	5.3728	9.4130	11.3614*	22.0710**	4.9139	8.1381	10.7764	7.5240
1994	7.2787	10.7725	2.5521	11.7849*	8.7674	24.8203**	12.6853*	5.1555	6.6262	4.5031
1995	7.1520	6.0431	6.6422	5.5515	4.0239	9.1427	7.8275	5.7689	3.9972	4.5262
1996	2.6505	4.5075	7.1313	3.1397	5.7751	2.7980	8.8634	5.0122	5.1401	5.4279
1997	10.6365	8.3307	7.1908	3.9053	16.2791**	16.9001**	7.8156	13.3038*	15.4731**	4.2863
1998	8.2546	7.0799	12.4878*	12.8473*	5.2973	19.2949**	8.3381	11.8550*	15.4306**	2.8621
1999	12.1720*	3.3306	4.3094	5.1634	2.6211	10.2882	6.4343	3.6274	2.8618	8.2212
2000	7.3642	3.6336	7.4588	5.8494	8.0250	7.5309	6.2612	1.3208	8.4087	1.6835
2001	6.1275	5.6301	4.8444	16.0009**	5.4586	6.4206	8.6688	8.6662	4.4570	17.6196**
2002	15.0157*	7.1034	5.4351	5.2883	8.8789	4.3658	4.5837	8.4248	10.3987	8.4794
2003	5.4842	15.1428**	5.3754	4.1035	11.1491*	1.8638	9.0251	12.8974*	7.1125	8.8961
2004	16.7137**	4.1855	2.4674	5.2925	8.7642	11.8761*	4.5057	7.5161	6.8443	4.2623
2005	3.8687	16.2534**	7.4039	6.4074	11.7641**	8.4872	8.0714	15.7664**	6.5969	4.5715

(Table 4 continued)

Year	Canada	Germany	Hong Kong	Japan	Netherlands	New Zealand	Singapore	Switzerland	UK	USA
Panel C: Unidirectional feedbacks to Australia from the other 10 countries										
1984	3.8856	10.3916	6.6310	5.4181	4.2586	4.9674	7.6973	5.6087	3.5532	3.3677
1985	7.8693	5.7179	2.5747	1.9731	3.4736	2.6512	3.3588	7.6282	1.8640	6.2342
1986	8.5978	9.7459	6.4080	7.2913	8.7835	5.1405	7.3562	8.8150	9.4554	9.8252
1987	24.4550**	7.2067	93.0963**	14.4829*	9.1364	12.2246*	74.3273**	26.2158**	15.7837**	11.2085*
1988	7.4183	13.5538*	11.5535*	7.3169	8.5583	7.1547	4.0690	11.5416*	8.3211	6.1155
1989	5.5198	13.0250*	1.5159	10.8355	8.8502	15.3411**	9.6816	8.1081	2.8803	8.3648
1990	2.0051	12.7928*	4.9954	4.8308	7.5535	8.4638	7.0903	13.9873*	6.5041	2.7112
1991	6.5999	4.2684	3.5075	5.5708	2.5311	5.8637	5.0080	3.9215	5.4430	18.0482**
1992	8.1658	7.3197	15.5883**	4.3342	7.7356	8.5924	7.4469	8.7889	6.8390	7.7426
1993	5.6585	8.8240	13.4684*	16.0162**	9.1162	4.8051	6.7723	11.0888*	6.2279	9.3468
1994	4.6240	6.4516	5.4180	6.1010	3.1495	16.0244**	7.0110	8.3952	6.0407	4.5080
1995	9.9060	10.7606	4.1724	5.4241	12.3841*	3.5852	7.5460	11.7379*	7.8442	13.6809*
1996	12.1413*	3.6835	7.3232	5.0439	4.6091	10.8247	5.3765	9.9028	2.1156	12.2118*
1997	9.6824	19.2407**	52.3095**	2.2812	8.6213	16.4589**	15.3672**	10.4650	7.5507	6.1306
1998	4.8533	10.4979	5.3019	8.4596	7.8609	6.6460	5.8980	6.8218	11.1519*	5.2861
1999	7.7267	1.9221	6.2135	10.9758	1.7884	6.7765	6.1973	7.6638	4.1076	12.1408*
2000	7.3966	4.1344	8.5254	2.2810	12.1095*	4.0951	9.5415	3.8747	4.8000	7.3159
2001	4.7565	8.6384	13.9185*	11.3186*	8.5871	2.7867	9.6527	8.1942	14.4180*	5.8872
2002	17.1993**	23.4378**	3.5738	4.9444	26.2412**	14.4008*	4.1328	24.3819**	23.9503**	11.8265*
2003	2.9473	8.6544	5.3093	8.1129	7.3229	9.5278	5.5216	6.0493	4.6330	9.1472
2004	6.2240	7.6379	3.6579	3.0892	5.9602	2.1130	3.8438	11.4912*	8.2556	4.8608
2005	4.2950	4.9293	2.9673	4.2035	6.2291	2.6127	3.5469	11.2265*	5.2823	4.0339

Table 5: Results of Univariate OLS Models

This table reports the results of univariate OLS models. The dependent variable is the annual contemporaneous Geweke measure. The notation is as follows:

SIZE is the nature logarithm of ($GDP_{i,t} + GDP_{j,t}$), where $GDP_{i,t}$ is country *i*'s *GDP* at time t and $GDP_{j,t}$ is country *j*'s *GDP* at time t.

AVGGDPCAP is the average GDP per capita between countries *i* and *j*.

OPENESE equals to $(\exp orts + imports)_{i,t} / GDP_{i,t} + (\exp orts + imports)_{j,t} / GDP_{j,t}$.

BIFDIFLOW is measured as $(bilateral\ FDI\ flows)_{j \to i,t} / GDP_{i,t} + (bilateral\ FDI\ flows)_{i \to j,t} / GDP_{j,t}$, where *FDI* is foreign direct investment and $i \to j$ denotes from country i to country *j*.

BIFDISTOCK equals to $(bilateral\ inward\ FDI\ stocks)_{j \to i,t} / GDP_{i,t} + (bilateral\ inward\ FDI\ stocks)_{i \to j,t} / GDP_{j,t}$.

BITRADE is $(bilateral\ \exp orts)_{j \to i,t} / GDP_{i,t} + (bilateral\ FDI\ flows)_{i \to j,t} / GDP_{j,t}$.

TOTALFDIFLOW is the ratio of total FDI inflow into country *i* to GDP of country *i* plus the ratio of total FDI inflow into country *j* to GDP of country *j,* and is measured as $(Total\ FDI\ \text{inf}low)_{i,t} / GDP_{i,t} + (Total\ FDI\ \text{inf}low)_{j,t} / GDP_{j,t}$

The sample period is from 1984 to 2005 and data were obtained from OECD International Direct Investment Statistics. Figures in parentheses are t-statistics which have been adjusted using White correction. . *denotes 5% significance, **denotes 1% significance.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Constant	38.831 (2.253)*	24.646 (4.474)**	59.276 (19.897)**	54.100 (25.735)**	48.181 (19.886**)	43.718 (23.353)**	58.502 (22.280)**
SIZE	1.230 (1.000)						
AVGGDPCAP		0.001 (5.338)**					
OPENNESS			-1.775 (-1.522)				
BIFDIFLOW				854.550 (3.849)**			
BIFDISTOCK					218.011 (4.245)**		
BITRADE						4,645.000 (7.118)**	
TOTALFDIFLOW							-19.299 (-0.975)
# of Obs.	1,210	1,210	1,210	961	958	1,148	1,070
Adjusted R-squared	-0.022%	2.948%	0.032%	2.064%	4.231%	9.898%	-0.043%

Table 6: Results of Multivariate Models

This table reports the results of multivariate models. The dependent variable is the annual contemporaneous Geweke measure. The notation is as follows:

COMTRADE is a dummy variable which is 1 if the two stock markets are open at the same time, otherwise is 0.

AVGGDPCAP is the average GDP per capita between countries *i* and *j*.

BIFDIFLOW is measured as $(bilateral\ FDI\ flows)_{j\to i,t} / GDP_{i,t} + (bilateral\ FDI\ flows)_{i\to j,t} / GDP_{j,t}$, where *FDI* is foreign direct investment and $i \to j$ denotes from country i to country *j*.

BIFDISTOCK equals to $(bilateral\ inward\ FDI\ stocks)_{j\to i,t} / GDP_{i,t} + (bilateral\ inward\ FDI\ stocks)_{i\to j,t} / GDP_{j,t}$.

BITRADE is $(bilateral\ \exp orts)_{j\to i,t} / GDP_{i,t} + (bilateral\ FDI\ flows)_{i\to j,t} / GDP_{j,t}$.

The sample period is from 1984 to 2005 and data were obtained from OECD International Direct Investment Statistics. Figures in parentheses are t-statistics and have been adjusted using White correction. For the constants in Fixed year effect models (5) to (8), the coefficients and t-statistics reported are the average of the year dummy coefficients and t-statistics. *denotes 5% significance, **denotes 1% significance.

	Multivariate Models				Fixed Year Effect Models			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff
CONSTANT	-4.767	0.973	-3.539	-16.926	-26.609	-18.274	-30.227	-33.945
	(-0.702)	(0.136)	(-0.582)	(-2.323)*	(-2.303)*	(-1.604)	(-3.074)*	(-3.001)**
COMTRADE	54.156	54.309	46.690	50.575	53.349	53.718	45.979	50.134
	(14.618)**	(14.950)**	(14.021)**	(14.157)**	(15.700)**	(16.008)**	(15.512)**	(15.378)**
AVGGDPCAP	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002
	(5.136)**	(3.817)**	(5.048)**	(5.537)**	(5.969)**	(4.818)**	(6.825)**	(5.965)**
BIFDIFLOW	475.637			21.863	411.230			-39.079
	(2.578)*			(0.107)	(2.271)*			(-0.1973)
BIFDISTOCK		116.184				94.400		
		(3.255)**				(2.750)**		
BITRADE			3,852.226	4,040.463			3,819.664	3,946.873
			(7.200)**	(7.085)**			(7.792)**	(7.517)**
Year Fixed Effect	No	No	No	No	Yes	Yes	Yes	Yes
# of Obs	961	958	1,148	943	961	958	1,148	943
Adjusted R-Squared	22.092%	22.455%	26.014%	28.758%	32.478%	33.638%	39.609%	39.028%

Figure 1: Geweke contemporaneous feedback measures ($G_{i,j,t}$)