Chapter 3

Consumption Risk Sharing and Its Implications for Financial Integration: The Case of Nine East Asian Countries

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Consumption Risk Sharing and Its Implications for Financial Integration: The Case of Nine East Asian Countries

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Abstract

Using three easily measured variables – growth in aggregate output, change in net factor income and change in national saving – this paper estimates the degree of consumption smoothing by a group, East Asia. Using the Penn World Tables data for nine East Asian countries, we provide evidence that about 22 percent of shocks to GDP are smoothed via a credit market channel while the international capital market is almost insignificant. Furthermore, we find that around 75 percent of shocks to GDP remain unsmoothed. Portfolio investment intensity calculations suggest that, of this already small degree of smoothing achieved by access to international capital markets, a disproportionately small share is coming from within the region for many countries, although some countries are achieving a more balanced geographical spread of their portfolio investments. Given these results, we argue that countries in the region may benefit from having more open financial systems, which they could use as means of increasing the consumption risk sharing.

Keywords: Risk sharing; Financial Integration; East Asia.

JEL Classifications: E32, F33.

1. Introduction

The case for financial integration in East Asia has been made strongly by some policy makers in the region, although, as demonstrated here and elsewhere, progress has been limited. Some argue that financial integration could bolster the region's economic growth and reduce its exposure to global shocks, but such arguments have no firm theoretical basis.[1]. This paper examines one element of the case for gains from financial integration that does have a theoretical basis to see what empirical evidence tells us about the benefits within East Asia. We focus on the connection between the financial system and the element of the real economy most closely connected with welfare, that is, consumption.

Theoretical studies argue that one of the benefits of financial integration is the ability for consumers' or citizens' in a country to achieve consumption smoothing. There may be other welfare improvements from financial integration that come from different channels (such as access to greater capital for investment and embodied technology transfer) but most literature focuses on the welfare gains from consumption smoothing. On the other hand, financial integration also creates some costs for the participating countries. The fear of exposing domestic markets to external shocks, and the higher possibility of financial contagion, are among them but, as shown in other studies in this volume, the evidence is not strong for this effect. We do not consider these costs in this paper but look only for evidence of existing or potential welfare gains.

Consumption smoothing can be achieved when consumers can insure their income against various shocks in the economy or can decouple their consumption from the shocks to their income. In an open economy setting this can be achieved by one country holding other countries' assets and selling these, or using the income stream from them, to buffer the effect when their country experiences a negative shock. The literature identifies this phenomena as "consumption risk sharing". When there is a high degree of consumption risk sharing, countries smooth their consumption by offsetting their

[1] For a discussion on the benefits and costs of financial integration in Asia, see Corbett (2010).

country-specific output shocks via several mechanisms. Two of the most common are capital and credit market channels. In the first channel, each member would offset their individual shocks through cross-ownership of productive assets between countries, which would be facilitated by developed capital markets. In the second channel, countries smooth their consumption via lending and borrowing activities in the international credit market to offset income shocks. Any shocks to GDP that are not dampened by these two channels are classified as "unsmoothed".

There is a considerable literature on consumption risk sharing but we follow the framework in two particular studies. Asdrubali et al. (1996) estimate the consumption risk sharing between states in the US. Kim et al. (2006) adapt Asdrubali et al. to estimate the degree of consumption risk sharing in the East Asian region.

Asdrubali et al. (1996) use regional data from the United States (US), an example of a successful monetary union, to estimate the risk-sharing channels. Using data from 1963 to 1990 they analyze three main channels for risk sharing between states in the US: capital market, credit market and fiscal transfer channels. They find that only 25 percent of shocks to states' output is not smoothed. Contrary to Kim et al., they find that the capital market is the most important channel for consumption risk sharing between states. This channel is used particularly by states that experience persistent shocks to their output. Even though they find that perfect insurance is not achieved, they argue that states in the US have achieved a considerable level of risk sharing.

Kim et al. (2006) use a data series from the Penn World Table between 1971 and 2000 to estimate the degree of consumption risk sharing. They analyze two channels for consumption risk sharing among 10 East Asian countries: Indonesia, Malaysia, the Philippines, Thailand, Singapore, Korea, Taiwan, China, Hong Kong and Japan. In the absence of any federal system, there is no mechanism for fiscal transfers so this does not feature in their study. They find that only 20 percent of the shocks to GDP are smoothed within the region. Within this 20 percent, the credit market is the most important mechanism, dominating the capital market in absorbing the shocks. This means that countries use borrowing and lending in international credit markets more than they use investment strategies to shield their consumption from income shocks. Since most

(though not all) of the countries in the region are high savings countries (with matching external current account surpluses) this implies that they build up a buffer of savings when income shocks are positive (and lend them abroad) and borrow (or draw down savings) when shocks are negative. In addition, the authors calculate the potential welfare gain that each country could attain if it had complete risk sharing. They conclude that the East Asian region has not yet achieved a significant level of consumption risk sharing compared to OECD countries. They draw the implication from this that the region does not yet have the degree of risk sharing necessary for the formation of a common currency area, although this judgment about levels is somewhat arbitrary.

The main objective of this paper is to extend and improve the estimates of the degree of consumption risk sharing in East Asian countries. To this end, we estimate the extent, on average, of each channel of consumption risk sharing in nine East Asian countries. One contribution of this paper is that we are able to use updated data and extend the data to 2003, which enables a clearer view of the period after the Asian financial crisis of 1997. The improved data change the picture of the respective roles of different channels (see Appendix Table 1 for comparison with earlier studies). We also offer an extended interpretation of the estimated low level of consumption risk sharing, and begin to examine the extent to which risk sharing is truly regional, rather than the result of each countries' engagement with international capital markets globally, based on the patterns of mutual asset holding within the region.

The structure of the paper is as follow. Section 2 discusses the conceptual framework that we employ. Section 3 explains the methodology while Section 4 describes the data and gives some summary statistics. Section 5 discusses results and Section 6 presents conclusions and directions for future research.

2. Conceptual Frameworks

The idea of welfare gain from the ability to smooth consumption between time periods is well established in economic theory. If consumers have a preference for constant consumption across time periods (a result that emerges from commonly used consumer

preference functions) while their income is variable across time (i.e. subject to random shocks), they will benefit from the ability to move income through time, via saving and investment strategies, to achieve smoother consumption. In an international context Obstfeld and Rogoff (1996) show how access to international markets can enable countries to achieve this objective. Based on these observations it has been argued that both deeper financial markets and greater "financial integration" among economies would enable those economies to achieve improved welfare by giving them access to capital markets that could achieve consumption smoothing. Corbett (2010) notes that one "approach to the welfare effects of financial integration (see, for example, Backus et al., 1992; Cole and Obstfeld, 1991, Imbs, 2006; Lee and Shin, 2008; Tesar, 1995, van Wincoop, 1994, 1999) derives from the idea that "under complete markets, the social planner equates the marginal utilities of consumption across countries … isoelastic preferences then imply that consumption plans be perfectly correlated" (Imbs: 299). Put more loosely "welfare gains are measured by the degree of consumption risk shared through financial integration" (Lee and Shin, 2008: 2)". This also can be used to imply that "those countries with low levels of consumption risk sharing have most to gain from greater integration" (Corbett, 2010).

As mentioned in the Introduction, there are two mechanisms by which risk sharing can occur among countries. The first is the capital market, through which citizens or the government of a country can own claims to output produced in other countries. This implies that the consumption of a particular country depends on the world income rather than on their own individual income. To illustrate, suppose there is a Malaysian mutual fund that invests all of its wealth by buying other countries' assets. We expect the revenue of the firm will be closely related with the movements of other countries' income. This implies that the Malaysian firm will be insulated from some of the negative shocks that occur to the Malaysian economy through ownership of other countries' assets; that is, they have a form of insurance. This form of risk sharing is also known as income insurance. The extent to which income insurance is used can be captured by the difference between a country's aggregate output, as measured by GDP, and its aggregate income, as measured by GNP.

The second mechanism is the credit markets. Through credit markets, citizens or the government of a country can smooth consumption by borrowing and lending internationally or within their own country. This form of risk sharing is also known as consumption insurance. This form of consumption smoothing is directed by agent's intertemporal decisions. For given international borrowing and lending, the aggregate amount of saving in a country is measured by the difference between aggregate income (GNP) and total consumption (Cons).

3. Methodologies

The focus of this paper is the estimation of the risk-sharing model. To supplement the interpretation of the results we also calculate regional investment intensity indexes. This section of the paper discusses the framework of the risk-sharing model, that is, the modified variance decomposition technique. This technique allows us to quantify the proportion of shocks to GDP that are smoothed through international factor income flows, that is, through savings behavior, and the amount of shocks that are not smoothed. In the second section we discuss the estimation strategy for the risk-sharing model. We then turn to a discussion of an investment intensity index that we use to illustrate how much of the risk sharing actually takes place within East Asian.

3.1. Decomposing Cross-sectional Variance in Aggregate Output

Asdrubali et al. (1996) used modified variance decomposition techniques to break down channels of risk sharing. We (and Kim et al.) use this technique with some modifications. Because Asdrubali et al. use data for individual states within a federal system they avoid any heterogeneity arising at the country level, for example, citizenship and type of government. We therefore have to account for this complication in our estimation strategy. Their framework also assumes that GDP is exogenous and we test this assumption indirectly by testing whether two lags of growth in consumption could be strong instrument variables for growth in GDP. Based on our over-identifying restriction test, we found that these two variables are weak instruments for the growth rate in GDP.

To explain the method we start with the following identity,

$$GDP^i = (GDP^i/GNP^i)\,(GDP^i/Cons^i), \quad (1)$$

where i is an index of countries.

To obtain a simple measure from (1), we take logs and differences on both sides

$$\Delta\log(GDPi) = \Delta\log(GDPi) - \Delta\log(GNPi) + \Delta\log(GNPi) - \Delta\log(Consi) + \Delta\log(Consi). \quad (2)$$

Multiply both sides by $\Delta\log(GDP^i)$ and take expectations. We obtain the following decomposition of cross-sectional variance in GDP:

$$\begin{aligned} Var\{\Delta\log(GDPi)\} &= cov\{\Delta\log(GDPi);\ \Delta\log(GDPi) - \Delta\log(GNPi)\} \quad (3)\\ &+ cov\{\Delta\log(GDPi);\ \Delta\log(GNPi) - \Delta\log(Consi)\}\\ &+ cov\{\Delta\log(GDPi);\ \Delta\log(Consi)\}. \end{aligned}$$

Divide both sides by $var\{\Delta\log(GDPi)\}$ to get

$$\begin{aligned} 1 &= cov\{\Delta\log(GDPi);\ \Delta\log(GDPi) - \Delta\log(GNPi)\}/var\{\Delta\log(GDPi)\} \quad (4)\\ &+ cov\{\Delta\log(GDPi);\ \Delta\log(GNPi) - \Delta\log(Consi)\}/var\{\Delta\log(GDPi)\}\\ &+ cov\{\Delta\log(GDPi);\ \Delta\log(Consi))\}/var\{\Delta\log(GDPi)\}. \end{aligned}$$

Note that the first term in the right-hand side of (4) is the ordinary least square (OLS) formula of the slope in the a bivariate regression of $\Delta\log(GDPi) - \Delta\log(GNPi)$ on $\Delta\log(GDPi)$, the second term is the slope in a bivariate regression of $\Delta\log(GNPi) - \Delta\log(Consi)$ on $\Delta\log(GDPi)$, and the last term is the OLS formula for the slope of a regression of $\Delta\log(Consi)$ on $\Delta\log(GDPi)$. We define βk, βc and βu as the corresponding parameters from the OLS regression and rewrite (4) to get,

$$1 = \beta k + \beta c + \beta u \quad (5)$$

3.2. Estimation of the Risk-sharing model

In the last section we showed how the framework developed by Asdrubali et al. (1996) could be used to quantify the extent of risk sharing via the various channels and how it

corresponds to the slope of several simple OLS regressions. Thus, we can estimate the following system of equations (where all variables are in constant per capita terms).

$$\Delta \log(GDPi,t) - \Delta \log(GNPi,t) = dk,t + \beta k \, \Delta \log(GDPi) + eik,t \quad (6)$$

$$\Delta \log(GNPi,t) - \Delta \log(Consi,t) = dc,t + \beta c \, \Delta \log(GDPi) + eic,t$$

$$\Delta \log(Consi,t) = du,t + \beta u \, \Delta \log(GDPi) + eiu,t$$

where d:;t are time-varying fixed effects. The time-varying fixed effects capture year-specific impacts on the growth rate of aggregate output of the nine East Asian countries. Thus the β coefficients could be interpreted as the weighted average of the year-by-year cross-sectional regressions.[2]

In Equation 6 we have the identical independent variable for all the equations, that is, growth in GDP. Given that the constant represents a time-varying fixed effect, the change in the independent variable captures the change in aggregate output after accounting for any year-specific component affecting all countries' growth of GDP. In other words, a change in the growth rate of GDP in the equation represents country-specific shocks to GDP.

The variable $\Delta \log(GDPi) - \Delta \log(GNPi)$ represents change in net factor income of a country while $\Delta \log(GNPi) - \Delta \log(Consi)$ captures the difference between growth in aggregate income and aggregate consumption and can be used to proxy for national savings. The variable $\Delta \log(Consi)$ measures growth in total consumption.

Using this system of equations, we measure how shocks to GDP affect the other three variables: net factor income payment, total consumption, and national savings. Since we use panel data estimation with time-varying fixed effects, our estimator yields consistent estimates even if there are unobserved shocks that affect all countries (c.f. Wooldridge, 2002; Wooldridge, 2008).

Using the conceptual frameworks that we developed earlier, the interpretation of the

[2]See Asdrubali et al. (1996) for more careful statement of this argument.

sign and magnitude of the parameters in (5) (which is equivalent to (7) as in Sörensen and Yosha (1998)) is as follows. If the region has full risk sharing, then cov{ Δ log(GDPi), Δ log(Consi)} = 0 and hence $\beta u = 0$. However, if risk sharing is not achieved, the consumption level in country i changes positively with individual shocks to country i's output, and we have $\beta u > 0$. Sörensen and Yosha (1998) point out that if we run a regression of consumption on output using cross-sectional data and we also control for fluctuations in regional consumption, we have a test of full risk sharing. Asdrubali et al. (1996), Kim et al. (2006) and Yehoue (2005) use essentially the same approach to quantify the channels of risk sharing.

If full risk sharing is achieved via the international capital market channel, then

cov{ Δ log(GNPi), Δ log(GDPi)} = 0 and hence,

cov{ Δ log(GDPi), Δ log(GDPi) – Δ log(GNPi)} = var{ Δ log(GDPi)} implying that $\beta k = 1$.[3]

The intuition here comes from the fact that the difference between GNP and GDP is the amount of income from abroad. If there is zero covariance between these two, then when the growth rate of one changes the other does not change. Thus, a shock to the growth of domestic income would not cause a similar (or even opposite shock) to national income, including foreign sources of interest and investment income. In this sense, the foreign sources of income must be providing a buffer from the shock to domestic income

On the other hand, suppose that full risk sharing is not achieved via the international capital market channel, but is achieved through the combination of this channel and the credit market channel. This would cause condition (5) to become $1 = \beta k + \beta c$.

By construction (and intuitively) coefficient βu represents the share of shocks to GDP that remains unsmoothed and coefficients βk and βc represent the shares of shocks to GDP that are dampened by changes in net factor income and changes in national

[3] See footnote 19 of Sörensen and Yosha (1998).

savings. If full risk sharing is not achieved, βu, which shows the extent of the unsmoothed part, will be positive. We cannot anticipate any particular sign for βk and βc if we allow the possibility of "dis-smoothing", i.e. increasing the volatility of consumption beyond that of income.[4]

The model in (6) consists of three linear regressions for N countries over T periods.[5] Our objective is to find an appropriate estimator that can cope with this degree of complexity. We treat the system of equations in (6) as a Seemingly Unrelated Regression (SUR) system (Wooldridge, 2002). While we assume that the error terms of each equation have nice properties – zero mean, constant variance and no serial correlation – we do test whether the errors in one equation are correlated with the errors in any other equation within each country. We employ the Breusch–Pagan Test (BP test) for Error Independence to check this.

The conclusion from this test will determine our optimal estimator for (6). If the BP test concludes that the errors are independent, then we use OLS as our estimator for the system. On the other hand, if the errors between equations are not independent then the optimal estimator for the βs is a GLS estimator or Feasible GLS (FGLS) in the operationalized version.[6] Wooldridge (2002) establishes the circumstances in which OLS estimator and FGLS yield identical results for SUR systems. Case one: OLS and FGLS are identical when the errors are independent. Or, in other words, we do not observe any correlation between equations for specific countries. Case two: both estimators are identical when regressors of each equation in the system are identical. Obviously, the specification in (6) falls into the latter case, since we have $\Delta \log(GDPi)$ as the regressor for each equation. Another advantage of using FGLS is the fact that we

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[4] Importantly, βc does not measure which countries smooth consumption optimally via savings. It measures the marginal share of shocks to GDP smoothed via savings (Sörensen and Yosha (1998).). Nor does $\beta u > 0$ indicate that, given the uninsured shocks to income, consumption is not intertemporally smoothed optimally. On the other hand, it measures the amount of deviation of regional consumption patterns from the full risk sharing allocation.

[5] The main references used for the discussion in this section are Greene (2003), Cameron and Trivedi (2008) and Wooldridge (2002).

[6] Cameron and Trivedi (2008) show that there exists a more robust estimator than FGLS to estimate a system such as (7), which is the Iterated FGLS (IFGLS) but it is beyond the scope of this study to proceed using this estimator.

could do joint hypothesis tests of the β's across equations. By using OLS, we can only do hypothesis testing within each equation separately. As shown in the results in Section 5, the results of the BP test require the use of SUR estimation techniques rather than simple OLS.

In addition, OLS assumes that the variance matrix of the vector of error is non-singular. System (6) clearly does not satisfy the singularity condition due to the additive constraint in (5). To overcome the singularity issue in our SUR system, we use the re-parameterization "trick" proposed by Wooldridge (2002). In this "trick" we exploit condition (5), βu =1–βk–βc, and substitute it into one of the equations, which is βu (6). As a result we can estimate all equations jointly.

This is shown as follows:

$$\Delta \log(Consi,t) = du,t + (1-\beta k-\beta c)\,\Delta \log(GDPi,t) + eiu,t \quad (7)$$

Rearranging

$$\Delta \log(Consi,t) - \Delta \log(GDPi,t) = du,t + (\beta k+\beta c)\,\Delta \log(GDPi,t) + eiu,t \quad (8)$$

We then replace the last equation in (7) with (9).

4. Data Descriptions and Summary Statistics

4.1. Data

This paper utilizes Penn World Table version 6.2 (hereafter PWTv62) collected from the Centre for International Comparisons of Production, Income and Prices at the University of Pennsylvania (Heston et al., 2006). This version of PWT used the data in 30 OECD countries as a benchmark and 2002 as the base year. The data were compiled using several different methodologies to ensure all their series can be used in international comparison studies. Our study focuses on nine East Asian countries: Indonesia, Malaysia, Singapore, Thailand, the Philippines, Korea, Japan, China and Hong Kong over the period 1971 to 2003.

The variables we take from the Penn data are, first, Real Gross Domestic Product (GDP).

This variable acts as a proxy for aggregate output. For consistency, PWT produced their GDP series by employing aggregation techniques that take into account price and currency differences between countries.

The second variable is total consumption. PWT does not directly provide this data but does provide estimates for the shares of consumptions by the private and government sector in real GDP. We used this measure to calculate total consumption by multiplying the share of each of these components in real GDP and summing them.

GNP data are not provided directly in PWT, but it does provide the ratio of GNP to GDP. We are, therefore, able to estimate the GNP figure.[7]

4.2. Summary Statistics

Table 1 compares summary statistics for several variables in three different periods. The first variable is the average economic growth, as measured by growth in GDP per capita. On average, the nine East Asian countries had 9.2 percent growth before 1997, the year the Asian Financial Crisis started. Growth remained on average above 7 percent for the years after 1997. The relative small difference in the GDP growth between pre- and post-crisis indicates that the crisis only affected some East Asian countries. On the other hand, the crisis caused an increase in volatility of the economies of the nine East Asian countries, as measured by standard deviations. The volatility of growth of output increased from 4.7 percent in the pre-crisis period to 5.2 percent in periods that include the crisis. The patterns were similar in the other three variables, except for the growth in net factor income, which stayed unchanged.

Table 1. Summary Statistics for Several Variables

	1971–2003		**1971–2000**		**1971–1996**	
Variable	Mean	Std.	Mean	Std. Dev	Mean	Std. Dev

[7] The PWT data extracted the ratio of GNP to GDP from World Bank and UN archives. Since no data are provided for Taiwan we dropped Taiwan from our sample (making the study slightly different in coverage from Kim et al.).

	Dev					
Δ log(GDP)	0.079	0.052	0.083	0.052	0.092	0.047
Δ log(GNP)	0.079	0.053	0.083	0.052	0.091	0.047
Δ log(Cons)	0.078	0.047	0.081	0.048	0.088	0.041
Δ log(GDPi)– Δ log(GNP)	0.000	0.012	0.000	0.012	0.000	0.012
Δ log(GNPi)– Δ log(Cons)	0.002	0.031	0.002	0.03	0.003	0.03

Source: PWTv62.

Table 1 shows that growth of consumption is lower than growth of output and income in all three different periods. This is a rough indicator of saving process in these countries. Table 1 also suggests that credit market is the channel that was dominant in absorbing the shocks to GDP. This last claim needs further justification and in the following section we try to evaluate it using the proposed econometric framework.

5. Results and Discussions

5.1. Risk-Sharing Model

In this section we examine the degree of risk sharing at the aggregate level and for various groupings of East Asian countries (following the groupings used by Kim et al.). This provides us with a simple sensitivity analysis of the consumption risk sharing in East Asian countries. The first group is ASEAN 5, which consists of Indonesia, Malaysia, the Philippines, Singapore and Thailand. The next group is Northeast Asia (NEA), which groups China, Korea and Japan. The last one is developed countries, which consists of Korea, Japan, Hong Kong and Singapore. The last part of this section discusses the effect of including the US in the group for which consumption risk sharing is estimated in several different periods. These groups are as follows.

We present the results of the unit root test for all variables in Table 2. Using the Wooldridge (2008) procedures to check for unit roots we find that some of the series, in some countries, can be identified to have unit roots. This weakly indicates that our study may be subject to spurious regression.

Table 2. Unit Root Test Results

Variables	AUS	CHN	HK	IDN	JPN	KOR	MAL	PHI	SGP	THA	USA
Δlog(GDP)	Yes	No	No	No	No	No	No	Yes	No	No	No
Δlog(GNP)	No	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes
$\Delta\log(GDP^i)$–Δlog(GNP)	No	No	No	No	No	No	No	No	No	No	No
$\Delta\log(GNP^i)$–Δlog(Cons)	No	No	No	No	No	No	No	No	No	No	No

Source: Authors' calculation

We explained above that the choice of an appropriate estimator depends on the independence of the errors between equations. Using procedures suggested by Cameron and Trivedi (2008) to perform the BP test for independence of the errors, we estimate system (6) using the SUR estimator (employing the "trick" from Wooldridge (2002) to impose the summing constraint) to estimate the consumption risk-sharing pattern in nine East Asian countries for the period 1971–2003. Then we calculate the corresponding BP statistic.

We present the estimates in (9) below for the whole East Asian group, where the numbers in the parenthesis below each coefficient are standard errors. We also attach the value of the BP stat for this system.

$$\Delta \log(GDPi,t) - \Delta \log(GNPi,t) = -0.0019 + 0.0235\,\Delta \log(GDPi,t) + eik,t \quad (9)$$

$$(0.00138)\ (0.0138)$$

$$\Delta \log(GNPi,t) - \Delta \log(Consi,t) = -0.0164 + 0.2245\,\Delta \log(GDPi,t) + eic,t$$

$$(0.00322)\ (0.0321)$$

$$\Delta \log(Consi,t) = 0.0184 + 0.7519\,\Delta \log(GDPi,t) + eiu,t$$

$$(0.00293)\ (0.0292$$

$$\text{BP Stat} = 283.557 \text{ p-value } (0.000)$$

Based on the conclusion of the BP statistic, we find sufficient evidence to reject the null hypothesis of no correlation between equations in this SUR system. This result justifies

the decision to use the SUR estimator to estimate system (6).

Our interpretations of the estimation result of (9) are as follows. Only 2.3 percent of shocks to the GDP of nine East Asian countries in the period 1971–2003 is smoothed by the change in net factor income payment. This number, however, is not statistically different from zero, which suggests that the role of the international capital market in consumption risk sharing is virtually nonexistent. From the second equation in (9), we find that 22.45 percent of shocks to GDP is smoothed via savings-related activities and this number is statistically significantly different from zero. Therefore we observe a relatively larger role for the credit market channel in absorbing shocks to the GDP of the nine East Asian countries. From the last equation, we see that the amount of deviation of East Asian regional consumption patterns from full risk-sharing allocation is about 75.19 percent and this number is significantly different from zero. This number can also be interpreted as the amount of shocks to the GDP that remains unsmoothed.

Table (3) reports the results for risk-sharing patterns estimated on several different groups of countries in East Asia and against developed countries as a benchmark. Columns 5 and 6 present the BP and F statistics. The F statistic in Table (3) tests the null hypothesis of the insignificance of both capital and credit market channels in absorbing shocks to the GDP. From the p-value, we have sufficient evidence to reject the hypothesis that capital and credit markets are not significant in absorbing shocks to GDP. Based on the p-value of the BP statistic, we find that within the countries the errors are correlated between equations and this conclusion, again, supports the use of the SUR estimator to estimate (6) for various groupings. The conclusion of these tests is consistent for all sub groups.

For the ASEAN 5 countries, about 26 percent of shocks to GDP are smoothed through lending and borrowing activities (the credit channel). Surprisingly, this figure is not significantly different from the role of the same channel in developed countries. The role of credit markets in ASEAN 5 in 1971–2003 is similar to EC8[8] countries during 1981–1990.

[8] Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, the UK.

Table 3. Risk-sharing Pattern in Various Sub-Groups for 1971–2003

Sub-Groups	Capital Market	Credit Market	Unsmoothed	BP Stat	F Stat
ASEAN 5	2.8	25.50	71.7	157.409	27.16
	(2.0)	(4.2)	(3.8)	(0.00)	(0.00)
NEA	0.10	23.56	74.54	104.614	11.10
	(1.9)	(5.7)	(5.9)	(0.00)	(0.00)
ASEAN 5 + NEA	2.07	24.81	73.12	252.470	39.13
	(1.49)	(3.38)	(3.06)	(0.00)	(0.00)
Developed	2.09	25.97	71.94	146.769	26.60
	(2.07)	(4.94)	(4.2)	(0.00)	(0.00)

Source: PWTv62.

Standard Errors in parenthesis.

The numbers below the BP stat and F Stat are p-value.

Our own calculation for the nine East Asian countries for the period 1981–1990 showed that the marginal amount of shocks to GDP absorbed by saving behavior was approximately 28 percent, while Kim et al. found 23 percent for the same period. From this comparison, we see that East Asian countries' risk-sharing pattern was similar to European countries during the 1980s (Sörensen and Yosha, 1998). For other groups, such as ASEAN 5 plus NEA, and NEA alone, the role of the credit market is about 24 percent on average and is similar to our finding in the preceding paragraph on the aggregate risk-sharing pattern in the nine East Asian countries.

Considering the capital market channel, we can see there is a substantial difference between the role of capital markets in NEA countries and in the other three groups. The capital market channel in NEA accounts for only 0.1 percent and this figure is lower than that for the other groups of countries. As in our earlier findings, we conclude that the percentage of smoothing being carried out by the change in net factor income is statistically not different from zero. Our finding in this regard is consistent with Kim et al. (2006), who also find a very small role for the capital market channel for the same groups of countries. The finding in NEA countries can be explained to some extent by the China factor. Before 2001, the year that China acceded to the WTO, China could arguably be classified as a closed economy (Unit, 2003), which meant that the exchange of productive assets between China and other countries was likely to be insignificant.

Assuming this situation remained until 2000, a year before China's WTO membership, this may have affected the overall pattern of the capital market channel in NEA countries.

One result that remains puzzling is the finding on the fraction of shocks being smoothed in the ASEAN 5 compared with the developed countries group. Our calculation shows that the former outperforms the latter group and is not consistent with the finding in most studies of the consumption risk-sharing pattern. These studies find that the fraction of shocks to GDP that are being smoothed is higher in developed countries (Kim et al., 2006; Yehoue, 2005). It may be that growing economic cooperation between the ASEAN 5 group since early 1970 provides an explanation. This formal cooperation between ASEAN 5 countries is marked by the formation of the ASEAN organization in 1967, whose charter states that one of the goals of this organization is to promote economic cooperation between members. However, later evidence on patterns of mutual portfolio investment does not provide strong support for this argument and the evidence remains puzzling.

We now investigate whether the same pattern is also observed in three different periods: 1971–2003, 1971–2000 and 1971–1996 (for this exercise we also include the US in the group of countries to be estimated, but this does not affect the results as can be seen from the column for 1971–1996, which is not different from the earlier results for the East Asian 9 group).[9] Table 4 shows that the unsmoothed part of GDP shocks seems to have increased after the Asian crisis (i.e. between 1996 and 2000) and had not returned to the earlier levels by 2003. This would be consistent with an inability to access international markets for a period after the crisis and/or an unwillingness to open capital markets during that time. It also reflects the fact that the shocks to GDP were very large at this time. Across the three periods, the contribution of the international capital market to consumption risk sharing is consistently very small.

[9] Introducing the US into the framework (which we did for comparability with Kim et al.) does not alter the overall pattern of consumption risk sharing that we found in the earlier sections. For example, in period 1971–1996, we see that the cross-country factor income flow amounted to only 3 percent. This number is not statistically significantly different from zero.

Table 4. Consumption Smoothing and Risk Sharing (%): East Asian Countries and the US

Periods	Capital Market	Credit Market	Unsmoothed	BP Stat
1971-2003	2.43	22.17	75.40	348.287
	(1.22)	(2.87)	(1.77)	(0.00)
1971-2000	1.74	21.13	77.13	313.728
	(1.22)	(5.7)	(5.9)	(0.00)
1971-1996	3.13	26.79	70.08	275.824
	(1.46)	(3.52)	(3.22)	(0.00)

Source: Authors' calculations; Standard Errors in parenthesis; the numbers below the BP stat and F stat are p-values.

This finding is, however, not unique to the region. It is consistent with Kim et al. (2006) and Sörensen and Yosha (1998) who find the same pattern in European and OECD countries. The insignificance of this channel may be explained by the "home bias puzzle" (French and Poterba, 1991). The "home bias puzzle" is a situation in which citizens in one country prefer to invest their money in their domestic capital market rather than in other countries' capital markets. This is presumed to reflect either some perceived risk or some unobserved barriers to cross-border investment. It is argued that one reason that this happens is the absence of a supranational legal authority (Obstfeld and Rogoff, 1996) which would enforce contracts between countries. In addition to this "home bias puzzle", the absence of common capital markets in East Asia may also contribute in part. However, as noted, since the region is not very different from other groups of countries, this cannot be a major explanation.

We are also interested in country differences in the use of consumption smoothing and the use of different channels. We use a different strategy to estimate the country variation. We introduce country dummy variables, setting one country (Japan) as the benchmark case. We interact the dummy with the growth rate of output and then estimate system (6) by including these two new variables. To illustrate, to estimate China's country variation, we estimate system (6) but include a dummy for China and the interaction of this dummy with the growth rate of output. It can be seen in Table (5) that China was mostly unsmoothed, with around 97 percent of the total shocks to GDP going unsmoothed. While a large share of income shocks go unsmoothed for all

countries in the group, there is heterogeneity of patterns, ranging from a low share of 56.7 percent unsmoothed in Singapore to 97.4 percent in China. The pattern is interesting in that it does not show only high-income countries engaging in income and consumption smoothing. The Philippines, with high levels of overseas earnings being sent home, seems to achieve a relatively higher degree of smoothing than some other countries.

Table 5. Estimate of Country Variations, 1971–2003

Countries	Capital Market	Credit Market	Unsmoothed
Benchmark: All countries excluding Japan			
China	–0.55	22.66	97.43
Hong Kong	4.44	3.04	91.2
Indonesia	1.96	4.36	78.63
Korea	–0.61	19.4	64.73
Malaysia	1.88	35.91	77.03
Philippine	4.01	21.1	62.67
Singapore	4.89	33.33	56.72
Thailand	–0.64	38.2	75.96

These results need further study. An initial attempt to expand the analysis using quarterly data for each country separately (Appendix Table 2) suggests that there may be interesting variations across time and countries.

6. Cross-Border Portfolio Investment

It would be misleading to present results such as those in this paper as revealing the extent of regional consumption smoothing if this is taken to mean the extent to which countries in the region are able to share their income risks with each other and to provide insurance within the region. Other studies using the method we have employed in this paper have sometimes presented their results in these terms (for example, Kim et al) although in fact the estimation that we and they have done simply uses a particular group of countries to estimate the average risk sharing or consumption smoothing behavior for the members of that group. Because we use data on each country's GDP, GNP and Consumption we can only calculate their access to total sources of

international income and to the total amount of savings (whether held domestically or abroad) that they accumulate. The data do not tell us how much of any country's international interest and investment income, or borrowing and lending, come from any geographical area. Therefore, we are not, in fact, saying anything about the intra-regional extent of consumption smoothing and risk sharing. Some of the existing literature has not been careful about this point and has implied that the result could be used to deduce something about the role of regional integration in providing consumption smoothing. This is not correct.

That question remains of interest. It would be useful, for analysis and for policy, to know whether increased access to each other's capital markets within the region (i.e. greater regional financial integration) would allow greater consumption smoothing to take place but, to date, there is no method to do that. The question that is informed by the type of analysis carried out here is only to what extent is access to global capital and credit markets being used to provide consumption smoothing by the countries in the region.

We can, however, use other evidence to see to what extent countries are investing in productive assets of other countries within the region. This may help us infer something about the extent to which consumption smoothing could be, or is already, provided within the region. If most of the region's economies are holding most of their foreign assets and liabilities within the region then it is reasonable to suppose that the consumption and income smoothing functions are mainly being provided within the region. If most of the foreign assets are held outside the region then it would be global (extra-regional) markets that are providing the insurance function.

This section of the paper provides some evidence on this question.

6.1. Data

We exploited the Coordinated Portfolio Investment Survey (CPIS) published by IMF to calculate an Investment Intensity Index. This data is a unique tool in capturing the world totals and the geographical distribution of the holdings of portfolio assets. Hence, by analyzing this data we could infer some pattern in capital flows between countries. By

doing this, we want to give some feel on how risk sharing might actually be taking place between countries within the region. We used the total of portfolio investment asset without further disaggregating into more detailed type of assets and present two years of data, 2001 and 2007, to give a snapshot of changes.

Table 6 shows the geographic breakdown of total portfolio investment assets. In 2001 most East Asian countries held significant amounts of US assets. For example, Indonesian investors invested approximately US$248 million in the US market. The figure was even higher for other countries (Japan, Korea, Hong Kong, the Philippines and Thailand). Only Singapore held portfolio assets in a geographically balanced way, with the amount of money invested in the US market relatively similar to the amount held in East Asian markets.

Table 6 also shows which foreign countries own domestic assets. In Malaysia, for example, almost US$6 million of their assets were held by Singapore in 2001 while Hong Kong and Japanese investors held only about US$4.9 million of Malaysian assets. Similarly, Singaporean investors held a significant amount of Japanese assets. These two examples show that Singapore was actively holding East Asian countries' assets. We could infer from this pattern that Singapore used both intra-regional and extra-regional markets about equally to achieve the risk-sharing result estimated earlier in the paper.

Table 6. Geographic Breakdown of Total Portfolio Investment Assets, 2001 (in million US$)

Recipients	Investor									
	EAST ASIA								NON-EAST ASIA	
	HK	IND	JPN	KOR	MAL	PHI	SGP	THL	AUS	USA
Australia	18,575.00	54.90	19,179.60	52.42	21.67	9.98	7,743.11	9.00	–	55,182.65
China, P.R.	8,416.00	0.03	1,669.24	157.42	7.97	–	1,446.99	4.00	–	3,003.88
Hong Kong SAR of China	–	107.43	6,116.28	406.24	75.14	25.03	4,746.66	125.00	2,185.37	32,047.17
Indonesia	–	–	157.63	75.10	51.34	3.00	867.12	15.00	14.30	1,840.82
Japan	9,248.00	3.17	–	176.33	22.26	5.47	10,550.10	1.00	4,615.31	197,839.43
Korea, Republic of	5,100.00	0.08	5,834.95	–	11.13	6.54	3,215.82	–	429.41	34,474.50
Malaysia	2,421.00	2.11	2,538.18	452.41	–	8.96	6,886.15	–	56.17	4,258.11
Philippines	1,239.00		1,559.87	109.94	101.82	–	1,181.42	1.00	8.17	4,015.21
Singapore	2,685.00	39.82	2,132.59	152.24	471.16	61.64	–	106.00	778.67	22,817.61
Thailand	1,147.00	0.01	1,037.92	179.31	35.98	0.80	2,361.14	–	21.45	2,698.28
United States	39,253.00	248.95	490,200.13	3,763.86	208.33	1,844.21	18,011.01	292.00	44,446.20	–

Source: CIPS, IMF.

Table 7 reveals that in 2007 the pattern of total portfolio investment assets differs significantly. It is still true that most East Asian countries' investors invested their money in developed capital markets such as the USA, Hong Kong and Japan. Philippine investors, for example, invested approximately US$2 billion in the US market. This was higher than the amount they invested in all other East Asian countries' markets. Singaporeans, on the other hand, again invested their money in a geographically balanced way between East Asian countries' markets and the US market.

By 2007, we find that China has attracted more funds than in 2001. Almost all countries in East Asia have started to hold Chinese assets in a significant manner, excluding Indonesia and Malaysia. Hong Kong assets have also attracted many investors from the region. This may in part be explained by the more developed financial system in Hong Kong. Most East Asian investors, however, were still investing a relatively large sum in the USA market so we could infer that these investors were using US assets as a means to smooth their consumption.

Table 7. Geographic Breakdown of Total Portfolio Investment Assets, 2007 (in million US$)

Recipients	Investor									
	EAST ASIA								NON-EAST ASIA	
	HK	IND	JPN	KOR	MAL	PHI	SGP	THL	AUS	USA
Australia	42,436.00	15.97	65,931.22	2,948.54	363.22	359.74	24,119.34	4,157.05	–	222,570.00
China, P.R.	165,710.00	0.05	15,500.71	11,054.59	106.46	53.13	10,554.24	48.61	–	97,240.00
Hong Kong SAR of China	–	62.15	18,351.22	29,723.93	1,902.31	155.12	19,991.40	152.32	6,063.64	121,276.00
Indonesia	761.00	–	1,433.22	742.03	323.30	48.60	9,332.22	20.36	305.92	18,349.00
Japan	20,826.00	20.36	–	4,881.48	219.87	83.24	8,417.08	63.00	25,003.94	582,342.00
Korea, Republic of	20,233.00	5.37	13,762.89	–	961.14	169.71	20,276.93	525.55	3,905.49	139,555.00
Malaysia	5,875.00	4.00	3,228.55	934.11	–	271.91	25,537.63	48.11	523.67	25,209.00
Philippines	1,104.00	2.28	1,952.49	103.02	80.75	–	1,870.97	3.43	–	14,461.00
Singapore	8,774.00	187.99	11,314.22	1,579.39	2,250.72	500.79	–	565.70	2,766.46	64,710.00
Thailand	1,593.00	23.39	1,771.37	429.66	128.84	35.15	4,495.27	–	–	16,842.00
United States	70,387.00	262.21	813,311.39	52,745.76	1,408.14	2,368.53	40,188.80	1,362.28	182,311.35	–

Source: CIPS, IMF.

6.1 Investment Intensity Index

It is helpful to put the size of these intra-regional investments into context. One way to do this is to use intensity indices. Intensity indices can indicate whether bilateral holdings of assets are large or small in terms of the investing country's total holdings of foreign assets and the recipient country's size in the world. The indices parallel the idea of intensity indices used in international trade and indicate whether the asset holding by a particular country in another country is a large share of the investor country's holdings relative to the size of the host country. For example, if country *i* holds 10 percent of its total overseas assets in country *j* and country *j* accounts for 10 percent of the world's foreign-held assets, then the intensity of *i*'s holdings in *j* would be 1. Numbers larger than 1 indicate that holdings by *j* in *i* are disproportionately large relative to *i*'s role as a host to foreign portfolio investment.

The formula for the intensity index[10] that we use is given below

$$\mathrm{I}_{ij} = \frac{A_{ij}}{A_i} \Big/ \frac{L_j}{L_w}$$

where A*ij* is the asset holding by country i in country *j*, A*i* is the total foreign asset holding by country *i*, L*j* is the total of assets held by foreigners in country *j*, and L*w* is the global total of foreign assets.

Intensity Index Results

Here we present investment intensity indices as a means to identify the relative engagement of countries in East Asia with their neighbors. Our goal is again to identify where countries may be doing their risk sharing by showing where they have a disproportionately high share of their foreign portfolios.

Table 8 shows, somewhat surprisingly, that even in 2001 some countries in the region were intensively invested within the region, relative to the small size of those markets in

[10] It is possible to construct intensity indices from both the outgoing and the incoming country side. We have only shown the intensity indexes for the investor country.

the global market. Hong Kong, Singapore and Malaysia were striking in this regard and held disproportionately low investments in the US (below 1). The pattern, however, varies considerably across countries. By contrast, investors in Korea, Japan, Indonesia and the Philippines held more than a proportionate amount of their assets in the US and other developed financial markets such as Hong Kong and Singapore. Indonesia, Japan and the Philippines in particular held proportionately low shares in other economies in the region. Thus the pattern in 2001 would have been consistent with Japan, Indonesia and the Philippines finding their income smoothing from developed-country markets inside and outside the region, while Hong Kong, Singapore, Malaysia and Korea might also have been gaining foreign income from other regional markets.

By 2007 the pattern of exchange of assets was relatively different, as shown in Table 9. Only Japan, Korea and the Philippines remained intensively invested in the US while other countries in the region, even lower-income countries such as Indonesia, for example, had started to reallocate their funds away from the US market to neighboring countries' financial markets. In 2001, Indonesia's intensity index as an investor in the US market was approximately 1.42 whereas in 2007 the figure dropped to 0.65. In general it appears that many countries in the region had moved to a more geographically balanced allocation of their portfolio holdings in proportion to the growth of the size of the countries in global markets. Both Tables 8 and 9 reveal Japan's continued lack of portfolio investment in the developing countries of the region. Again, without wanting to exaggerate the information content of these indexes for the risk-sharing story, it appears that several countries in the region may be able to achieve their income smoothing fairly equally from within and outside the region (remembering that the overall extent of income smoothing from international capital markets remains negligible).

Table 8. Intensity Index of Total Portfolio Investment Assets, 2001 (in million US$)

Recipients	Investor									
	EAST ASIA								NON-EAST ASIA	
	HK	IND	JPN	KOR	MAL	PHI	SGP	THL	AUS	USA
Australia	6.76	5.73	1.11	0.49	0.71	0.35	5.50	0.82	–	1.79
China, P.R.	25.68	0.02	0.81	12.29	2.19	–	8.63	3.04	–	0.82
Hong Kong SAR of China	–	19.69	0.62	6.65	4.33	1.54	5.93	19.92	3.62	1.83
Indonesia	–	–	0.28	21.42	51.61	3.22	18.88	41.66	0.41	1.83
Japan	1.05	0.10	–	0.51	0.23	0.06	2.35	0.03	1.36	2.01
Korea, Republic of	4.11	0.02	0.75	–	0.81	0.51	5.06	–	0.90	2.48
Malaysia	6.63	1.66	1.11	31.69	–	2.36	36.82	–	0.40	1.04
Philippines	6.02	–	1.21	13.67	44.62	–	11.21	1.21	0.10	1.74
Singapore	3.27	13.92	0.41	4.75	51.82	7.24	–	32.21	2.46	2.48
Thailand	5.90	0.01	0.85	23.62	16.70	0.40	23.74	–	0.29	1.24
United States	0.78	1.42	1.56	1.92	0.37	3.54	0.70	1.45	2.30	–

Source: CIPS, IMF.

Table 9. Intensity Index of Total Portfolio Investment Assets, 2007 (in million US$)

Recipients	Investor									
	EAST ASIA								NON-EAST ASIA	
	HK	IND	JPN	KOR	MAL	PHI	SGP	THL	AUS	USA
Australia	2.99	0.41	1.43	1.02	1.54	3.02	4.07	15.50	–	1.70
China, P.R.	20.26	0.00	0.58	6.63	0.78	0.78	3.09	0.31	–	1.29
Hong Kong SAR of China	–	3.28	0.82	21.06	16.53	2.67	6.91	1.17	1.76	1.90
Indonesia	0.66	–	0.39	3.18	16.98	5.06	19.50	0.94	0.54	1.73
Japan	0.72	0.26	–	0.82	0.45	0.34	0.69	0.11	1.73	2.17
Korea, Republic of	2.78	0.27	0.58	–	7.94	2.78	6.67	3.82	1.08	2.07
Malaysia	2.93	0.73	0.50	2.28	–	16.18	30.47	1.27	0.53	1.36
Philippines	1.39	1.05	0.76	0.64	6.14	–	5.66	0.23	–	1.98
Singapore	2.57	20.16	1.02	2.27	39.73	17.54	–	8.79	1.63	2.05
Thailand	1.58	8.46	0.54	2.09	7.67	4.15	10.65	–	–	1.80
United States	0.48	0.65	1.71	1.76	0.58	1.92	0.65	0.49	2.50	–

7. Concluding Remarks and Future Research

This paper employed the variance decomposition technique developed by Asdrubali et al. (1996) to investigate the extent of consumption risk sharing that was achieved by nine East Asian countries between 1971 and 2003. We provided evidence that, for these nine countries, about 22 percent of shocks to GDP are smoothed via the credit market channel while factor income flows (i.e. income received from the international capital markets) have not been used to smooth income shocks. We further found that around 75 percent of shocks to GDP remains unsmoothed (implying that consumption flows were generally not shielded from occasional shocks to income). These findings are consistent across sub-groups of countries although it appears that the ASEAN 5 group smoothed slightly more of their GDP shocks than did Northeast Asia.

The general picture is that the nine East Asian countries are still not well integrated into international capital markets and have a relatively low portion of change in net factor income from abroad and a relatively small ability to adjust national savings to protect consumption. The implication is that there would be significant welfare gains from improvements to mechanisms to achieve consumption smoothing and that these would benefit all countries in the region.

While the analysis cannot directly address the question of whether closer regional financial integration would provide these welfare gains, the analysis of investment intensity indexes is suggestive. Investors in the region have moved more toward a balanced geographic spread of their investments but some countries' investors remain heavily skewed toward the developed global financial markets. Many countries in the region still invest at disproportionately low levels within the region, with 26 of 81 bilateral assets holdings below 1 in 2007. Given the number of bilateral portfolio holdings that are below an intensity index of one, there is the possibility of increases in intra-regional investment flows both from the growth of the financial markets and from further rebalancing toward a more even geographic spread of investments by regional investors. These will not themselves, however, provide more consumption risk sharing as long as the size of international investment income remains low. The policy message is therefore that further opening of financial markets, and development of the capacity

for investors to hold foreign assets as a hedge against local income shocks, both within and outside the region, would improve welfare derived from consumption smoothing.

We should note several limitations of this type of analysis. First, we assumed that GDP was exogenous to the access to external income sources and to the extent of savings. This assumption may not be a realistic (see for example Nelson and Plosser, 1982).

In addition, in discussing the pattern of external investment, our investment intensity indices are derived from the CPIS data. These give an incomplete picture of the cross-country holdings of assets and do not account for foreign direct investment, which is likely to be a much larger element in foreign-derived income. We therefore have only a very indirect measure of the role of regional consumption risk sharing.

There are a number of possible extensions to this research. Finer grained data (quarterly data) over longer time periods would give a better picture of the pattern of consumption risk sharing across countries and over time. The use of VAR techniques would supplement our understanding of how country-specific income shocks are absorbed. Getting behind the pattern of consumption smoothing is essential to understand what drives the results. One way to do this would be to derive the extent to which countries have unsmoothed shocks and then to use panel data regressions on country characteristics (including some policy variables) to explain what helps or hinders the ability to smooth consumption. We might be able to include intensity indexes of regional investment compared with extra-regional investment to see whether closer engagement within the region helps in this regard.

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Appendix

Table 1. Comparison of Alternative Analysis of Risk-sharing Channels

Channel	Periods	Kim et al. (2006)	System (6)	System (6)
Capital Market	1971–2000	0.6	0.4	1.6
		(0.8)	(1.0)	(1.4)
	1971–1996	2.1	2.2	3.4
		(0.9)	(1.2)	(1.7)
	1991–2000	–2.4	–2.7	0.7
		(1.2)	(2.1)	(3.9)
Capital Market	1971–2000	19.4	23.0	21.5
		(3.9)	(3.5)	(3.4)
	1971–1996	18.9	28.0	28.0
		(4.2)	(4.2)	(4.0)
	1991–2000	11.6	18.0	9.9
		(6.0)	(5.9)	(6.5)
Unsmoothed	1971–2000	79.6	76.6	76.9
		(4.0)	(3.5)	(3.2)
	1971–1996	78.7	69.8	68.6
		(4.2)	(4.1)	(3.7)
	1991–2000	92.1	84.7	89.4
		(6.1)	(5.5)	(5.2)
Source		PWT	PWTv61	PWTv62
Estimator		SUR	SUR	SUR
Number of Countries		10	9	9

The numbers below the BP stat and F stat are p-values

Table 2. Estimate of Risk-sharing Channels Using Quarterly Data

Country	Capital Market	Credit Market	Unsmoothed	Period	Conclusion
Japan	–0.00169	–0.0055	1.007*	1969:1–2009:3	Uninsured
Indonesia	–0.011	1.09*	–0.087	1997:1–2009:3	Fully insured
Malay	0.0865	0.0167	0.8967*	2000:1–2008:4	9 % unsmoothed
Thailand	–0.161*	1.001*	0.15*	1993:1–2009:3	Fully insured
Korea	0.011*	1.02*	–0.341	1969:1–2009:2	Fully Insured
Hong Kong	0.109	0.625*	0.264*	1999:1–2009:2	73% insured
Philippines	0.01	0.07	0.91*	1981:1–2006:3	90% unsmoothed

* Statistically significant

Data Source: IFS, IMF.