Emerging Markets and International Risk Sharing

By Tsung-wu Ho[*] and Wei-ting Wang[†]

Dept. of Finance, Shih Hsin University

No. 111, Sect. 1, Mu-cha Road

Taipei, 11604, Taiwan

R.O.C.

Abstract

The objective of this paper is to examine the factors that affect international risk sharing, and investigate whether emerging markets plays an important part on the mechanism of international risk sharing. We investigate three factors that affect it: Country size, government scale, and trade openness. We have three conclusions: First, extremely high trade openness is less effective to smooth volatility, but it is necessary for Asian emerging markets to pursue trade openness moderately. Second, the role of emerging markets for international risk sharing is substantial. Finally, the big government of China is conductive to income and consumption smoothing.

Keywords: International risk sharing, Country size, Government size, Trade openness, Threshold effects

[*] Correspondence author (tsungwu@cc.shu.edu.tw), Professor of Finance an Economics in the Department of Finance, Shih Hsin University, Taiwan, ROC.

[†] Author (cici7556@yahoo.com.tw), Department of Finance, Shih Hsin University, Taiwan, ROC.

Contents

Table Contents

1   Introduction

Financial globalization does not completely benefit emerging markets.   Their amount of international risk sharing is not improved (Kose, *et al.*, 2007b), and their market return is impacted by local shocks (Beakert, *et al.*, 2007) during the period of financial labialization. Some benefits from financial globalization are conditional on the level of financial development.   Even financial globalization is as if an accelerator for some benefits, these benefits are not so easy to be captured empirically by the standard models of financial development (Kose, *et al.*, 2006 and 2007a; Mishkin, 2006; and Tobin and Sun, 2009). Therefore, we conjecture that if international risk sharing is associated with economic fundamentals, its performance would be more stable.

What categories of country can obtain the profit from international risk sharing, and what kinds of one cannot?   How is the structure of international risk sharing to be in the world?   This paper will investigate several country-specific factors that affect the performance of international risk sharing in a context of globalization: Country size, government scale, and trade openness.   One of our conclusions indicates that government size plays crucial role in international risk sharing, and the one of China is an obvious example in this finding.   And we judge that emerging markets plays an important part on the mechanism of international risk sharing.

Some literature indicated that international risk sharing in developed countries has increased during financial integration (Kose *et al.*, 2007b; Sorensen *et al.*, 2007).   However, Kose *et al.* (2007b) did not successfully prove the effect of trade openness on the correlation between financial openness and international risk sharing.   Sorensen *et al.* (2007), only considered financial elements, found that the declining home bias was associated with the increasing amount of international risk sharing in OECD countries.   However, there are two clearly explanations imply that the measure of home bias is not always reasonable: (1)

complex cross-holding is common to the world economies; (2) some domestic investments are based on sound principle not on local preferences. Consequently, we follow their methodological framework, and investigate the amount of international risk sharing associated with country-specific factors rather than home bias.

The objective of this paper is to examine the following questions: (1) whether larger countries absorb income and consumption risk relatively easily; (2) whether bigger governments effectively stabilize the impact of shocks by the big amount of public spending in consumption; (3) whether the countries with higher trade openness depend more heavily on international markets and international risk sharing, since they are exposed more to shocks. In addition, it is worth of noticing that the largest countries and the ones with the largest government and the highest trade openness are not necessarily share more risk, because the extreme magnitude of size and openness may generate other uncertainties.

According to Kose *et al.* (2007b), most previous empirical evidence has investigated risk sharing by data of Europe, America, or OECD, this paper include additional data, emerging markets. The diversity of performance within emerging economies might be difficult to isolate and quantify in the terms of international risk sharing, if they were directly compared with the advanced OECD members. Therefore, we divide our sample into four country groups: emerging markets, OECD, and Asia, separately, and all countries.

In this way, we find the structure of international risk sharing. In the era of globalization, the most of shared risk hardly vanishes but be transferred to emerging countries. The time and distance of communication from country to country are shortened, the swift infections of various shocks result in the weakened cross-border boundaries, such as financial panics, war, and disease. Even if emerging markets do not receive the most of advantages from financial globalization, they still play an important part on the structure of international risk sharing.

There is no widely-used method to measure the amount of risk sharing; hence many studies attempt to quantify it in various ways. Diverse patterns of risk sharing were considered (Becker and Hoffmann, 2006), and different horizons were estimated (Sorensen and Yosha, 1998; Becker and Hoffmann, 2006; Leibrecht and Scharler, 2008) in existing literature.   They thought the amount of international risk sharing is limited.

Becker and Hoffmann (2006) discussed *ex ante* and *ex post* risk sharing; the former smoothes income volatility by equity markets, and the latter smoothes consumption volatility by the transaction of foreign assets and foreign capital. They concluded that even if the 30%-50% of volatility was absorbed in the short run, no more than 10% was achieved in the long run. The statement was similar to Sorensen and Yosha (1998) and Leibrecht and Scharler (2008).   Athanasoulis and Wincoop (2001) supposed that limited international risk sharing was the result of barriers, which were specific to international borders.

On the other hand, Kose *et al.* (2007b) and Sorensen *et al.* (2007) thought that more international risk sharing among developed countries accompanied with financial integration. Giannetti and Koskinen (2003) and Scharler (2004) mentioned that the more protection for investors a country has, the better performance of consumption risk sharing it procures. Implying the development of international economy in the recent decade is characterized by financial globalization. Leibrecht and Scharler (2008) also suggested that financial globalization is favorable to smooth consumption volatility, because the time lag between the occurrence of shocks and the impact on consumption would be longer in those countries holding an above average amount of foreign assets and liabilities.

Different from current studies, we focus on macroeconomic aspects instead of financial aspects. In theory, larger scale advantages reduce average cost. A country with a large population bears less average public spending, has enough productivity to afford closed economy, and is subject to lower economic volatility (Alesina and Wacziarg, 1998; Karras, 2006; and Furceri and Karras, 2007). Larger government is better at eliminating the effects

of unexpected shocks, so large government is necessary for open economies, which face more external shock (Rodrik, 1998; and Fatas and Mihov, 2001).

A lot of studies agree that trade openness is crucial for the economy. Terra (1993) suggested that it is necessary for a country, bearing foreign debts heavily to repay the interest and capital, using their trade surplus and the inflation tax. For countries, trade promotes growth and reduces volatility (Yanikkaya, 2003; and Karras, 2006). For industrial sectors, it leads to confront volatility successfully (Giovanni and Levchenko, 2006).

Besides, even if international risk sharing is improved, does welfare increase? Wagner (2007) suggested there was a trade-off between perfect risk sharing and the efficient governments. Financial integration and innovation have certainly encouraged households ahead to sharing risk by financial transaction. Unfortunately, they also have raised the moral hazard of governments and have debased the performance of risk sharing. In other words, the level of international risk sharing should be within an optimal level, and overly large and insufficiently small risk sharing may be detrimental for economy.

This paper is organized as follows. Section 2 presents the methodology used to measure international risk sharing. Section 3 reports the data of this investigation. Section 4 discusses the results of empirical evidence by four country groups, and analyzes the impact of China on the absorbable shock in rest countries. Section 5 summarizes the conclusions.

2   Econometric Methodology

2.1   Measuring International Risk Sharing

In theory, the aggregate uncertainties cannot be shared, only the deviation from cross-sectional average, which is regarded as individual risk, can be fully shared by diversified portfolios.   The deviation from aggregate economy stands for the idiosyncratic risk of each country.   Less international risk sharing is expressed by larger deviation (Scharler, 2004; Becker and Hoffmann, 2006; Kose *et al.*, 2007b; Sorensen *et al.*, 2007; Leibrecht and Scharler, 2008).

To this end, unshared income risk is measured by the co-movement of gross national income (GNI) and gross domestic product (GDP); and unshared consumption risk is similarly measured by the co-movement of final consumption and GDP (Sorensen *et al.*, 2007).   That is to say, given shock, the correspondence of the volatility between GNI and GDP expresses the uncertain component of income that cannot be supported by the gain derived from foreign investment, and in consequence, national income is not smoothed; consumption risk sharing is explained in similar way, since consumption is affected by the present and expected income. High co-movements imply these countries fail in sharing income or consumption risk *among them*.

Following Sorensen *et al.* (2007), we estimate the regression below:

$$\Delta log\, GNI_{it} - \Delta log\, GNI_t = constant + \beta_{nt}\left(\Delta log\, GDP_{it} - \Delta log\, GDP_t\right) + \varepsilon_{it} \qquad (1)$$

where GNI_{it} and GDP_{it} are country i's quarter t GNI and GDP, and GNI_t and GDP_t are the quarter t average of GNI and GDP in all countries[3]. ε_{it} is the error term.   The coefficient

---

[3]   GNI and GDP in this paper are *per capita* GNI and GDP.

β_{nt} measures the average co-movement of idiosyncratic GNI and GDP growth. If individual income risk is completely shared, only aggregate risk would be present, β_{nt} would be naturally zero. Therefore, the larger the β_{nt} stands for the higher degree of the co-movement between national and domestic income; which shows that the mechanism of international risk sharing is not enough to smooth domestic income. In other words, the average of income risk sharing is $1-\beta_{nt}$, which takes the value 1; if income risk sharing is complete; the value is zero, if the idiosyncratic GNI moves one-to-one with GDP, and the percentage of income risk sharing is $100(1-\beta_{nt})$.

For sure, one can also observe the level of consumption risk sharing in each quarter by the similar regression:

$$\Delta log\,C_{it} - \Delta log\,C_t = constant + \beta_{ct}\left(\Delta log\,GDP_{it} - \Delta log\,GDP_t\right) + \varepsilon_{it} \qquad (2)$$

where C_{it} is country i's final consumption at quarter t, and C_t is the cross-sectional average final consumption of all countries at quarter t^4. The coefficient β_{ct} measures the average co-movement of consumption and GDP growth. While consumption is completely smoothed, the deviation of aggregate consumption growth and β_{ct} are zero, implying that the uncertain component of consumption is removed from domestic shocks by efficient international risk sharing; on the contrary, if international risk sharing is completely unsuccessful, β_{ct} will achieve 1.

In this paper, the sense of deviation in the four country groups is different, because the aggregate growth is regarded as the average of a country group; for example, for all countries, GDP_t, GNI_t, and C_t are the average growth rate of all sample countries, but for emerging markets, they are the average growth rate of these emerging countries at quarter t. Although the latter computation is not correspond with the fact that countries cannot select which economic system to participate in the era of globalization, the effects of country-specific

---

[4] Final Consumption in this paper is *per capita* consumption.

characteristics on international risk sharing may be observed easier by this way. Especially for emerging markets, which are usually proved their data are not applied to some financial models.

According to Equation (1) and (2), the measure of international risk sharing is a constant regression coefficient, some studies considered the variation of risk sharing. For instance, Sorensen *et al.* (2007) let the regression coefficients separately change by four factors: time, home bias, and foreign assets and liabilities holdings. Kose *et al.* (2007b), used the same methodological framework, and allowed for the effect of time-varying and financial openness.

However, two points were ignored in these papers. In the first place, their linear functions might be subjected to bias stem from the nonlinear relationship of these added variables, such as home bias, foreign assets and liabilities holding, and financial openness. Even if the relationship between risk sharing and home bias or the relationship between risk sharing and financial development exist indeed, there is little evidence for linearity. If nonlinear relationship is explained by linear models, the estimation and inference of the results might be misleading.

In the second place, the level of risk sharing only changes by the time and some financial variables in Sorensen *et al.* (2007) and Kose *et al.* (2007b), but they did not consider the fiscal role that government plays in risk sharing.

2.2 The Threshold Regression in Panel Data

In order to avoid the error from ignoring nonlinearity, we used threshold model, which was suggested by Hansen (1999), and considered the effects of macroeconomic elements,

such as country size, government size, and trade openness, on international risk sharing in four country groups: emerging markets, OECD, and Asia separately, and all countries. Kose et al. (2007a) already have suggested that there are some thresholds, which determine how the level of financial globalization ends up its potential benefits of growth and volatility. Likewise, we attempt to find the thresholds, which decide where on the country-specific characteristics start and close its advantages of international risk sharing.

The threshold values in this paper, as suggested by Hansen (1999), are endogenously determined by threshold model instead of researcher's intuition as done by traditional method. In order to confirm whether these threshold effects are significantly present, Hansen (1999) suggested the likelihood ratio statistic and critical values, which are obtained by bootstrapping to simulate distribution. In spite of these improvements, there is still a drawback in our regressions, they just estimate under stationary rather dynamic conditions. Nevertheless, it is so complex to treat dynamic and panel model simultaneously, a large part of studies use stationary model with panel data, so does this paper.

Based on the Equation (1) and (2), we add threshold variables for observing the effects of country size, government size, and trade openness on international risk sharing. We expound the threshold effect of country size on income risk sharing in this section, and measure the threshold effects of government size and trade openness on income and consumption risk sharing by the similar framework.

Country size is judged by the conception of the relative value in this paper, the one of country i at time t is measured as the share of GDP in the aggregate GDP of cross-sectional countries, defined below[5]:

---

[5] For fear larger GDP of some countries are just because more population, then induce the country sizes may be overvalued, we remove the effect of scale of population on country size, so we measure by the level of *per capita*. Both the numerator and denominator contain population, so we can simplify calculate by GDP. And it is similar to the measure of government scale.

$$Country\ Size_{it} = \frac{GDP_{it}}{\sum\limits_{j=1}^{N} GDP_{jt}}$$

GDP, measures the output of an economy, is a very important economic fundamental. The relatively larger the GDP is, the relatively larger the country is, and it also indicates that the economic scale of this country is larger.

Government size for country i at time t is measured as:

$$Government\ Size_{it} = \frac{GC_{it}}{GDP_{it}}$$

where GC_{it} expresses government consumption of country i at time t. Government consumption is an important fiscal stabilizer, because the more government consumes, the more final aggregate consumption and economic impacts are resulted.

Trade openness is measured as the sum of imports and exports as share of GDP; formally, trade openness of country i at time t is judged by the following:

$$Trade\ Openness_{it} = \frac{M_{it} + X_{it}}{GDP_{it}}$$

where M_{it} and X_{it} express imports and exports of country i at time t, respectively. More imports and exports of countries mean the contact with the world is so frequent that showing the countries are more open. However, it may be easier for them to suffer from international risk.

We estimated single, double, and triple threshold models to capture the effects of these country-specific characteristics on international risk sharing.

Single threshold model for examining the effect of country size on income smoothing is below:

$$\Delta log\ GNI_{it} - \Delta log\ GNI_t = constant + \beta_{1n}(\Delta log\ GDP_{it} - \Delta log\ GDP_t) + \varepsilon_{it},\ Size_{it} < \gamma_1\ (3)$$

$$\Delta log\ GNI_{it} - \Delta log\ GNI_t = constant + \beta_{2n}(\Delta log\ GDP_{it} - \Delta log\ GDP_t) + \varepsilon_{it},\ Size_{it} \geq \gamma_1\ (4)$$

In these regressions, γ_1 is the threshold value, $Size_{it}$ is the size of i country at quarter t. Country sizes of the observations which are smaller than γ_1 are employed in Eq. (3), and the others are imported in Eq. (4). β_{1n} and β_{2n} stand for the co-movement of GNI and GDP growth, likewise $100(1-\beta_{1n})$ and $100(1-\beta_{2n})$ mean the amount of absorbed income volatility of corresponding regimes. We examined whether the difference of the influence on income risk sharing between smaller and larger countries is substantially apparent.

Threshold model can be combined as a single function by using indicator function. Taking single threshold model of Eqs.(3) and (4) as an example, we had Eq.(5) below:

$$\Delta log\,GNI_{it} - \Delta log\,GNI_t = constant + \beta_{1n}\left(\Delta log\,GDP_{it} - \Delta log\,GDP_t\right)\cdot I(\,Size_{it} < \gamma_1\,)$$

$$+ \beta_{2n}\left(\Delta log\,GDP_{it} - \Delta log\,GDP_t\right)\cdot I(\,Size_{it} \geq \gamma_1\,) + \varepsilon_{it} \qquad (5)$$

where $I(\cdot)$ is an indicator function, which takes the value 1, if the single threshold condition in the bracket is satisfied and zero otherwise.

In order to clearly identify the threshold effects of country size, government size, and trade openness on risk sharing, the statistical significance of the threshold number must be tested. To this end, we tested the null hypothesis below:

$$H_0 : \beta_{1n} = \beta_{2n} \qquad\qquad (6)$$

Under the null, there is no threshold effect. Following Hansen (1999), we simulate the asymptotic distribution by bootstrapping to get the likelihood ratio statistic and critical values, and the presence models with more thresholds are tested sequentially.

We found that the threshold effect is different from emerging markets to OECD. For example, larger countries and governments of emerging markets have apparently superior in international risk sharing, but not for OECD countries. Therefore, it is surely essential to divide our samples into several groups. We separated them into 30 OECD member countries and 12 emerging markets, and there are 2 and 9 Asian economies respectively included in them.

3 Data and Preliminary Analysis

The empirical study presented in this paper samples 42 countries, and quarterly time series data covers the periods of 1993Q1-2008Q1. We compiled the data that is derived from Datastream, collecting three threshold variables: country size, government size and trade openness.   The descriptive statistics are displayed in Table 1.   According to Table 1, we have several findings:

First, most of larger countries belong to OECD.   For example, the US is the largest country, and the Slovak Republic is next to it.   However, the smallest country, Denmark, is not an emerging market, as it is a Northern Europe.

Second, China is not only the largest country out of 12 emerging economies, but also has the largest government out of 42 sampled countries.   Nevertheless, those small Northern European countries have relatively larger governments, for example, Denmark and Sweden, which is in line with the finds from Alesina and Wacziarg (1998).   Besides, the government size of Luxembourg and New Zealand are especially big, though these were omitted as outliers.

Third, conforming to Alesina and Wacziarg (1998), the relationship between trade openness and country size is reversed in both emerging markets and OECD countries.   The countries with higher trade openness, such as Malaysia, Singapore and Luxembourg, are smaller.   On the contrary, in terms of lower trade openness countries, Japan and the US are larger countries.

Finally, trade openness is negatively correlated with government size of some emerging economies, such as Malaysia, Singapore and Thailand.   The data of OECD somewhat supports the conclusions of Garen and Trask (2005), which demonstrated that government

expenditure is positively correlated with trade openness, and this correlation is slightly positive.

We measure the income and consumption risk sharing of each country group without considering any country-specific variables (see Table 2). During the period of 1993Q1-2008Q1, the average amount of income risk sharing achieves to 42.14%, but the one of the countries has consumption risk sharing of 13.89%. This finding confirms Kose *et al.* (2007b), who demonstrated that financial globalization profited industrial countries but rarely improved the mechanism of consumption risk sharing of emerging economies. According to preliminary analysis, we suspect the shared risk may be transferred from OECD countries to Asian emerging markets. For example, if the former are absent, the latter would share 58.53% income risk and 49.36% consumption risk. On the other hand, if the latter stay away from markets, the former could just sustain 35.15% income risk and 14.82% consumption risk. The translation of risk has become more obvious over time, and emerging economies and Asian countries have played an increasingly important role for international risk sharing.

The smoothed income volatility decreased over time, but consumption has increased. The difference between these changes can be explained by the fact that financial development enables one to smooth consumption easily by intertemporal or international asset allocation, but diversified investments generate more income uncertainties. This finding is in line with Becker and Hoffmann (2006), who suggested that income volatility is hardly smoothed by complex asset transaction, and asserted consumption volatility is sustained by purchasing or selling foreign assets and borrowing or lending foreign capital.

By the way, the GNI of some countries is only reported by annual level in Datastream, which is summarized in Appendix 1. We converted annual data to quarterly frequency by the tool of quadratic-match average, and similarly converted monthly data to quarterly frequency by averaging observations on a period-by-period basis. In addition, as the

government consumption of Luxembourg and New Zealand are highly large, in order to obtain reliable results we considered them as outliners and omitted them from our dataset.

4 Discussion

The constant regression coefficients are insufficient to explain the level of international risk sharing since the ability of risk sharing depends to some extent on country-specific characteristics. Our findings offer the coefficients of the regimes of country size, government size, and trade openness to show the threshold effects on income and consumption risk sharing.

Before analyzing the amount of risk sharing for each regime, we examined how many threshold effects should be considered and checked whether the threshold effects are significantly present using likelihood ratio statistics (see the top panels of Tables 3~8). The results of income and consumption risk sharing appear in Tables 3~5 and Tables 6~8 respectively. The bottom portions of Tables 3~8 display the β and the amount of risk sharing in those country groups which significantly show the threshold effects.

4.1 The Results of Income Risk Sharing

Table 3 presents the results for the threshold effect of country size on income risk sharing among emerging markets when OECD members are excluded. We see from the coefficients of each regime, the one of the largest regime can be regarded as zero by statistical test. The largest countries perfectly share the whole income risk, while the smallest ones only share 24.82% income risk.

Besides, only the scale of China has continuously increased, and belonged to the largest regime during the period of 2007Q1-2008Q1. The proportion of middle regime has

decreased over time, and the proportion of the smallest one started to increase since 1997. For example, the country size of Argentina had decreased from a peak of 1.61% in 1993, it has been classified in the smallest regime since 2002Q3, and its country size was only about 0.23% in 2008Q1.

Table 4 presents the results of threshold effects of government size on income risk in the 42 countries and 12 emerging economies. For both country groups, countries with larger government absorb more income risk. In particularly, if OECD countries are removed, the insignificant coefficient of lager regime shows that their income risk is completely absorbed.

In fact, only the government of China belongs to larger regime over the sample period, and none of OECD members has such huge government like China. Namely, the government of China stands out in income risk sharing. These results indicate that the fiscal stabilizer of China is so huge that it easily affects final aggregate consumption and generates economic impacts. But we must look more carefully into whether relatively larger governments of other countries also can stabilize their national income.

Table 5 displays the results of the threshold effect of trade openness on income risk sharing in Asia when other sample countries are driven out. The shared income risk of the lowest regime is more than the largest one. High trade openness, as a result, increases economic exposure to the world, but the power to mitigate risk is not necessarily improved.

The smallest trade openness regime comprises China, India, Indonesia, Russia, Japan, and Korea in the average of the period of 1993Q1-2008Q1. The proportion of both higher and lower regimes was the same from 1995 to 2002, but the weight of the higher regime increased.

In line with the above statements, we presume that China, as the largest country out of 12 emerging economies, has the largest government out of the full sample, and its relatively lower trade openness is good at absorbing income risk. There is little support for threshold effects of country-specific characteristics to explain the amount of income risk sharing among

OECD.　Implying their country-specific characteristics do not clearly sort out the distinction of income smoothing within their own country group.

4.2　The Results of Consumption Risk Sharing

The statistically significant threshold effects on consumption risk sharing exist in every country group.　However, the gap of shared risk by each regime is not apparent in two country groups, all countries and OECD countries.　Therefore, we have to compare the relative performance among each regime.

Table 6 presents the results of threshold effect of country size on consumption risk sharing in each country group.　For all countries, the larger regime excels at consumption risk sharing, but not for the extreme one.　But if OECD members are excluded, the largest country regime, which always includes China, sustains the most consumption risk.

While emerging economies are excluded, the largest regime supports comparatively more consumption risk.　Twenty-seven countries belong to this regime, except Denmark and Iceland, which are classified in the smallest one, and Luxemburg, which is in the middle one. Surprisingly, the coefficient of middle regime is significantly more than one might imagine because the idiosyncratic consumption growth does not merely move one-to-one with idiosyncratic GDP growth.　The consumption growth of Luxemburg is deeply affected by the economic situation of OECD members.

For Asian countries, the co-movement between consumption and output growth exists in Japan, which belongs to the largest regime, and other Asian countries belong to the smallest regime.　This outcome demonstrates that expanding economic scale for Asian emerging markets advances consumption risk sharing.

Table 7 presents the results of the threshold effect of government size on consumption risk sharing in each country group.   The regime of each country group, including China, obviously outperforms others.   In each country group, the coefficient of the regime which only include China implies that the effect of their fiscal stabilizer on the steadily consumption may be near perfection.

We speculate that this is because the government of China is so big that crowd out the fiscal effects of these countries.   Even if the financial development of OECD members is more complete, the strength of their government is weaker than the one of China.   It is surely insufficient for OECD members to absorb more consumption volatility just by increasing development, as a result of the latent threat from China.

Is it possible that relatively larger government of OECD unable to improve international risk sharing? Does China really obstruct other governments to stabilize consumption?   In order to confirm the effect of government size on international risk sharing, we removed the data about China, and the results are displayed in Section 4.3.

Table 8 presents the results of the threshold effect of trade openness on consumption risk sharing in each country group.   For the whole world, the performance of consumption smoothing in different trade openness regime is not evident, but not for the other country groups.

Without the existence of OECD members, the coefficient of the secondary regime of emerging economies is statistically significant, implying that the idiosyncratic consumption growth of those countries moves one-to-one with the corresponding idiosyncratic GDP growth.   Some countries began to be classified in this regime since 1999, and a half of emerging economies are classified in the highest regime, which hardly smoothes consumption. Likewise, if there are only Asian countries present, the highest openness regime confronts with serious risk exposure, and only absorbs 1.41% of consumption risk.   The moderate trade openness of the two country groups (emerging markets and Asian countries) can achieve

consumption smoothing.　That is to say, appropriate trade openness is necessary for Asian emerging countries to prevent consumption volatility.　Even if it does not increase consumption smoothing from a worldwide comparison, least in Asian emerging comparison.

Astonishingly, the threshold values for OECD countries are much bigger than others. However, there are 26 member countries belong to the smallest regime.　The special case mentioned previously is presented again in the highest regime, where only Luxembourg is included.　It implies that the country is considerably associated with the economic impacts of OECD.

Overall, the amounts of the threshold effects are more important in terms of consumption risk sharing than income, particularly in each sub-sample group.　Almost all countries either exceeds achieve well situated economic and governmental scales and trade openness to absorb consumption volatility.　Only the government of China is large enough to support the uncertainty of consumption.　This behavior of other governments cannot be clearly distinguished from these results unless China is removed.　Overall, enlarging country size and trade openness may be good development strategies for Asian emerging economies to share consumption volatility.

4.3　On the Role of China

In this section, we would like to research the influence of country-specific characteristics on ability of international risk sharing, if China was ignored.　Empirical results are displayed in Tables 9~14, some conclusions show the role of China is observed.

Before clarifying the new findings, it is worthy of attention a robust conclusion.　For all countries, larger countries and governments are still able to sustain more risk, but the extreme ones are also adverse to income and consumption smoothing.

To view the changes in *income risk sharing*, the conclusions of country size and government size are not the same as previous results. We find that, if China and OECD members are absent, the third large country regime of emerging economies shares the most income risk, which is shown in Table 9. The performance of income smoothing of middle countries, including India, Russia and South Africa, is next to China.

Small countries still cannot sustain more risk. Most of emerging economies which belong to the smallest country regime are classified in the highest trade openness regime, which is higher than 78.78%. The coefficients of those regimes demonstrate their limited ability for income risk sharing. Likewise, smaller countries of Asian emerging economies belong to the highest trade openness regime, except for India, absorb income risk unsuccessfully.

The foregoing statement mentions that the largest government of China perfectly smoothes income risk. According to Table 10, if China is ignored, the largest government regime of other emerging markets and Asian countries still relatively outperform than smaller ones, but not for the largest one of all countries. It shows that the presence of emerging markets contributes to income dispersion of the countries with suitable government scale, if China is excluded.

These outcomes of *income risk sharing* include: (1) The trade openness of smaller emerging economies is too excessive to absorb income volatility; (2) In order to smooth income, it is essential for countries to moderately expand public consumption; (3) The government of China guides the structure of income dispersion, so some threshold effects only occur while China is excluded.

To view the outcomes of *consumption risk sharing*, some conclusions of the original results are greater emphasized, but the effects of government size and trade openness for emerging markets and Asian countries are shifting.

While OECD members are ignored, consumption risk is still smoothed more by larger countries, displayed in Table 12. Although the smallest country regime absorbs most of the consumption risk, only three quarters of it is absorbed by the Philippines. The other quarter of it belongs to middle regimes whose idiosyncratic consumption growth statistically co-varies with GDP. Thus, it can be seen that the larger country regime outperforms in terms of smooth consumption risk. The effect of country size on consumption risk sharing still identified with our finding.

Some OECD members with government size between 0.66% and 4.69% sustain less consumption risk while emerging economies are present (see Table 7). However, their performance is apparently improved while China is absent, as shown in Table 13. The huge government of China indeed crowds out the fiscal effects of some OECD members, and therefore the foregoing conclusion is correct.

Table 14 shows some unshared consumption risk of Luxemburg is vanished while China is included, but it is still present if China is driven out, which suggests that their consumption volatility is absorbed principally by China[6]. In order to confirm this conclusion, we returned the data about China and removed the one about India, Japan, and United States individually, and found the unabsorbed consumption risk is absent.

If China is ignored, the domestic consumption growth of Philippines, Taiwan, and Thailand is strongly correlated with Asian countries. These finding suggests that China is better at sustaining the shock which attacks their output, so the existence of China intensifies the average amount of consumption risk sharing for this trade openness regime.

The outcomes of *consumption risk sharing* include: (1) The huge government of China crowds out the fiscal effects of some OECD members; (2) Consumption volatility transferred

---

[6] The coefficient of Luxemburg is still more than one, if we put China back the threshold model, and drove out Argentina, Denmark, India, Japan, and Unite States separately.

from Luxemburg to emerging economies is principally supported by China; (3) China promotes international risk sharing and the action of it stands out in emerging markets.

This comprehensive empirical discussion indicates that China acts as an important role for the world economies.   China sustains the majority of consumption volatility transferred to emerging economies, and its government is so huge that it hiders some governments of OECD members from absorbing volatility.

5 Conclusion

The objective of this paper is to investigate the country-specific characteristics that affect international risk sharing. We measured the performance of risk sharing by the framework of Sorensen *et al.* (2007), and applied a panel threshold model, which proposed by Hansen (1999), to four country groups: all countries, emerging markets, OECD countries, and Asian countries.

First, a golden rule explains the performance of international risk sharing. For the total countries, larger economies and governments facilitate to international risk sharing, but not for extreme ones; higher trade openness is useless to smooth volatility.

Second, we capture the structure of international risk sharing. International risk sharing is realized only if emerging markets participates in the world economies. However, some smaller Asian emerging economies hardly share risk on account of excessive trade openness and limited government consumption simultaneously.

Third, China, the only emerging markets can be parallel to the world economies sustains international risk in chief. For example, the idiosyncratic consumption growth in Luxembourg is principally absorbed by China.

Finally, China may obstruct some government of countries which attempt to absorb risk. Although we agree with Rodrik (1998), public consumption can mitigate the external shock of its country, the huge government of China obstruct some OECD members with middle government to smooth the consumption growth of their own country.

It is somewhat irrational for this study to separate all sample countries into four country groups, because no country is able to choice which market it participates, in particular on the background of globalization. However, the economic situations on emerging markets are so

unique to the ordinary sense of the developed countries. According to Kose *et al.* (2007b), even if emerging markets have begun to financial liberalization, their consumption growth cannot smooth as industry countries. We find that the role of emerging markets is important for international risk sharing, and some results for Asian emerging countries are not perceived by the model with all sample countries. To take the total forty-two countries apart is surely essential.

Nevertheless, there are some drawbacks in our study. First, the employed model ignores the correlations among sample countries, which must have some direct or indirect connections with each other. Second, we only analyze the aspects of real economy, but the financial issues are not considered, the threshold effects of financial openness or development could be considered in future research. Besides, we cannot demonstrate that higher international risk sharing leads to economic growth and causes the rich-poverty gaps to diminish, but we conjecture that the answer is negative. As the result, it is a study in the future.

References

1. Alesina A. and Wacziarg R., 1998. Openness, Country size and Government. *Journal of Public Economics*, 69, pp. 305-321.

2. Athanasoulis S. and Wincoop E. V., 2001. RiskSharing within the United States: What Do Financial Markets and Fiscal Federalism Accomplished? *Review of Economics and Statistics*, 83(4), pp. 688-698.

3. Becker S. O. and Hoffmann M., 2006. Intra- and International Risk Sharing in the Short Run and the Long Run. *European Economic Review*, 50(3), pp. 777-806.

4. Beakert G., Harvey C. R., and Lundblad C. T., 2007. Liquidity and Expected Returns: Lessons from Emerging Markets. *Review of Financial Studies*, 20(6), pp. 1783-1831.

5. Fatas A. and Mihov I., 2001. Government Size and Automatic Stabilizers: International and Intranational Evidence. *Journal of International Economics*, 55(1), pp. 3-28.

6. Furceri, D. and Karras, G., 2007. Country Size and Business Cycle Volatility: Scale Really Matters. *Journal of the Japanese and International Economies*, 21(4), pp. 424-434.

7. Garen J. and Trask K., 2005. Do More Open Economies Have Bigger Governments? Another Look. *Journal of Development Economics*, 77(2), pp. 533-551.

8. Giannetti, M. and Koskinen,Y., 2003. Investor Protection and Equity-Holdings: An Explanation of Two Puzzles. *CEPR Discussion Papers*, No. 4017.

9. Giovanni, J. D. and Levchenko, A. A., 2008. Trade Openness and Volatility. *International Monetary Fund Working Paper*.

10. Hansen B. E., 1999. Threshold Effects in non-dynamic panels: Estimation, testing, and inference. *Journal of Econometrics*, 93, pp. 345-368.

11. Karras G., 2006. Trade Openness, Economic Size, and Macroeconomic Volatility: Theory and Empirical Evidence. *Journal of Economic Integration*, 21(2), pp. 254-272.

12. Kose, M. A., Prasad, E. S., Rogoff, K., and Wei, S. J., 2006. Financial Globalization: A Reappraisal. *International Monetary Fund Working Paper*.

13. Kose, M. A., Prasad, E. S., Rogoff, K., and Wei, S. J., 2007. Financial Globalization Beyond the Blame Game: A New Way of Looking at Financial Globalization Reexamines Its Costs and Benefits. *Finance and Development*, 44(1), pp. 9-13.

14. Kose, M. A., Prasad, E. S., and Terrones M. E., 2007. How Does Financial Globalization Affect Risk Sharing? Patterns and Channel. *International Monetary Fund Working Paper*.

15. Leibrecht M. and Scharler J., 2008. Reconsidering Consumption Risk Sharing among OECD Countries: Some Evidence Based on Panel Cointegration. *Open Economies Review*, 19(4), pp. 493-505.

16. Mishkin, F., 2006. *The Next Great Globalization*. New Jersey: Princeton University

Press.

17. Rodrik, D., 1998. Why Do More Open Economies Have Bigger Governments? *Journal of Political Economy*, 106(5), pp. 997-1032.

18. Scharler, J., 2004. International Risk Sharing and Investor Protection: Some Evidence from the EU−15. *Economics Bulletin*, 6(23), pp. 1-13.

19. Sorensen, B. E., Wu, Y. T., Yosha O., and Zhu, Y., 2007. Home Bias and International Risk Sharing: Twin Puzzles Separated at Birth. *Journal of International Money and Finance*, 26(4), pp. 587-605.

20. Sorensen, B.E., Yosha, O., 1998. International Risk Sharing and European Monetary Unification. *Journal of International Economics*, 45(2), pp. 211-238.

21. Terra C. T., 1993. Openness and Inflation: a New Assessment. *Quarterly Journal of Economics*, 113(2), pp. 641-648.

22. Tobin D. and Sun L., 2009. International Listing as a Means to Mobilize the Benefits of Financial Globalization: Micro-level Evidence from China. *World Development*, 37(4), pp. 825-838.

23. Wagner W., 2007. International Risk Sharing and Government Moral Hazard. *Open Economies Review*, 18(5), pp. 577-598.

24. Yanikkaya, H., 2003. Trade Openness and Economic Growth: a Cross-Country Empirical Investigation. *Journal of Development Economics*, 72(1), pp. 57-89.

Table 1. Summary Statistics of Threshold Variables

All of countries in the sample are 12 emerging markets and 30 OECD countries over 1993Q1-2008Q1. Country size is each country's GDP over all countries' GDP. Government size is government consumption as share of GDP. Trade openness is the sum of imports and exports as share of GDP.

Country	Country size		Government Size		Trade Openness	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Emerging Markets						
Argentina	0.0085	0.0051	0.1101	0.0206	0.8045	0.0202
Brazil	0.0069	0.0018	0.1969	0.0184	0.2235	0.0570
China	0.0123	0.0032	0.6078	0.0780	0.4562	0.1380
India	0.0044	0.0004	0.1122	0.0245	0.3106	0.0845
Indonesia	0.0014	0.0002	0.0000	0.0000	0.7556	0.0892
Malaysia	0.0009	0.0001	0.1223	0.0250	2.1792	0.1397
Philippines	0.0003	0.0001	0.0753	0.0100	0.9715	0.1120
Russia	0.0035	0.0003	0.1617	0.0162	0.6807	0.0785
Singapore	0.0009	0.0001	0.1019	0.0131	3.9125	0.5717
South Africa	0.0063	0.0033	0.2119	0.0117	0.5835	0.0541
Taiwan	0.0030	0.0006	0.1439	0.0224	1.0043	0.1337
Thailand	0.0009	0.0004	0.0873	0.0116	1.0649	0.1375
OECD Countries						
Australia	0.0045	0.0005	0.2151	0.0290	0.4025	0.0254
Austria	0.0023	0.0004	0.1860	0.0168	0.8763	0.1422
Belgium	0.0027	0.0005	0.2468	0.0202	1.5303	0.1687
Canada	0.0301	0.0051	0.2041	0.0149	0.7716	0.0609
Czech Republic	0.0007	0.0001	0.2050	0.0319	1.2645	0.1763
Denmark	0.0000	0.0000	0.2550	0.0262	0.8280	0.1159

Finland	0.0014	0.0001	0.2173	0.0389	0.7197	0.0800
France	0.0159	0.0029	0.0864	0.0116	0.5007	0.0481
Germany	0.0228	0.0054	0.1889	0.0108	0.6324	0.1361
Greece	0.0015	0.0001	0.1486	0.0189	0.5682	0.0315
Hungary	0.0006	0.0001	0.1111	0.0516	1.2945	0.2168
Iceland	0.0001	0.0000	0.2137	0.0342	0.7547	0.0560
Ireland	0.0012	0.0002	0.1696	0.0290	1.5992	0.1436
Italy	0.0129	0.0019	0.1985	0.0282	0.4935	0.0521
Japan	0.1764	0.0608	0.1699	0.0163	0.2682	0.0573
Korea	0.0051	0.0003	0.0056	0.0005	0.7225	0.1237
Luxembourg	0.0002	0.0000	-	-	2.5894	0.3707
Mexico	0.0195	0.0023	0.0033	0.0001	0.5884	0.0466
Netherlands	0.0044	0.0005	0.0466	0.0051	1.2321	0.1104
New Zealand	0.0007	0.0001	-	-	0.5998	0.0412
Norway	0.0018	0.0002	0.0887	0.0104	0.7224	0.0301
Poland	0.0019	0.0002	0.0340	0.0100	0.6158	0.1109
Portugal	0.0012	0.0002	0.0017	0.0003	0.7034	0.0683
Slovak Republic	0.2651	0.0592	0.1162	0.0098	1.4409	0.2004
Spain	0.0068	0.0006	0.1117	0.0143	0.5503	0.0479
Sweden	0.0027	0.0004	0.2690	0.0471	0.8110	0.1001
Switzerland	0.0029	0.0006	0.1142	0.0071	0.8127	0.1135
Turkey	0.0028	0.0005	0.0345	0.0300	0.4659	0.0456
United Kingdom	0.0547	0.0038	0.2286	0.0337	0.5584	0.0275
United States	0.3676	0.0472	0.1819	0.0244	0.2458	0.0234

Table 2. Performance of International Risk Sharing

The amount of income and consumption risk sharing are measured by 100 (1-β), and each β are resulted from the simplest

models, $\Delta log\ GNI_{it}$ -$\Delta log\ GNI_t$=constant+$\beta_{nt}(\Delta log\ GDP_{it}$-$\Delta log\ GDP_t)$+$\varepsilon_{it}$ and

$\Delta log\ C_{it}$-$\Delta log\ C_t$=constant+$\beta_{ct}(\Delta log\ GDP_{it}$-$\Delta log\ GDP_t)$+$\varepsilon_{it}$, which do not consider threshold and any other variables.

	Full Sample	Sub-Periods		
		1993Q1-1997Q4	1998Q1-2002Q4	2003Q1-2008Q1
Income Risk Sharing				
All Countries	42.14	43.45	36.03	8.15
Emerging Markets	58.53	59.04	57.68	66.20
OECD Countries	35.15	36.34	20.28	7.38
Asia	61.22	58.44	65.84	55.27
Consumption Risk Sharing				
All Countries	13.89	12.62	28.42	33.19
Emerging Markets	49.36	64.74	37.25	52.78
OECD Countries	14.82	14.26	25.41	23.59
Asia	47.64	48.09	38.71	55.93

Table 3. The Threshold Effects of Country Size on Income Risk Sharing

LR Test for Threshold Effect

	H_0: no threshold effect H_A: single threshold effect	H_0: single threshold effect H_A: double threshold effect	H_0: double threshold effect H_A: triple threshold effect
All Countries	2.15 (9.27, 13.49, 21.19)		
Emerging Markets	43.87*** (13.70, 17.58, 19.87)	18.54** (16.54, 18.41, 21.08)	4.68 (16.09, 17.73, 20.27)
OECD Countries	0.87 (10.04, 16.06, 21.44)		
Asian Countries	20.89 (28.56, 52.50, 56.31)		

Results of Country Size Regimes

	Country Size Regime	β	Income Risk Sharing
Emerging Markets			
	Country Size $\leqq$ 0.31%	0.7518 [0.0719]	24.82
	0.31% $<$ Country Size $\leqq$ 1.64%	0.1347 [0.0568]	86.53
	1.64% $<$ Country Size	-0.5350 [0.2896]	153.50

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over 1993Q1-2008Q1.   The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively.   And we report the *β* of the group whose threshold effect of country size is significant, and numbers in the bracket, [ ] are standard errors of *β*.   Besides, the amount of income risk sharing is 100(1-*β*).

Table 4. The Threshold Effects of Government Size on Income Risk Sharing

LR Test for Threshold Effect

	H₀: no threshold effect Hₐ: single threshold effect	H₀: single threshold effect Hₐ: double threshold effect	H₀: double threshold effect Hₐ: triple threshold effect
All Countries	20.86** (12.44, 16.01, 25.01)	8.63 (9.52, 12.71, 25.96)	
Emerging Markets	31.06*** (10.09, 12.19, 18.19)	8.78 (21.80, 28.06, 33.28)	
OECD Countries	0.73 (11.17, 17.29, 28.58)		
Asian Countries	7.54 (8.60, 9.86, 13.72)		

Results of Government Size Regimes

	Government Size Regime	β	Income Risk Sharing
All Countries			
	Government Size ≦ 48.48%	0.5636 [0.0048]	43.64
	48.48% < Government Size	0.3494 [0.1052]	65.06
Emerging Markets			
	Government Size ≦ 24.29%	0.4660 [0.0894]	53.40
	24.29% < Government Size	-0.0630 [0.0501]	106.30

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over 1993Q1-2008Q1. The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively. And we report the β of the group whose threshold effect of government size are significant, and numbers in the bracket, [ ] are standard errors of β. Besides, the amount of income risk sharing is 100(1-β).

Table 5. The Threshold Effects of Trade Openness on Income Risk Sharing

LR Test for Threshold Effect

	H₀: no threshold effect Hₐ: single threshold effect	H₀: single threshold effect Hₐ: double threshold effect	H₀: double threshold effect Hₐ: triple threshold effect
All Countries	1.20 (11.08, 25.25, 48.05)		
Emerging Markets	1.20 (11.08, 25.25, 48.05)		
OECD Countries	2.44 (12.41, 18.82, 41.19)		
Asian Countries	12.12** (10.01, 11.74, 14.44)	4.48 (35.47, 39.24, 50.16)	

Results of Trade Openness Regimes

	Trade Openness Regime	β	Income Risk Sharing
Asian Countries			
	Trade Openness ≦ 84.30%	0.2693 [0.1099]	73.07
	84.30% < Trade Openness	0.7193 [0.0562]	28.07

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over 1993Q1-2008Q1. The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively. And we report the β of the group whose threshold effect of trade openness is significant, and numbers in the bracket, [ ] are standard errors of β. Besides, the amount of income risk sharing is $100(1-\beta)$.

Table 6. The Threshold Effects of Country Size on Consumption Risk Sharing

LR Test for Threshold Effect

	H_0: no threshold effect H_A: single threshold effect	H_0: single threshold effect H_A: double threshold effect	H_0: double threshold effect H_A: triple threshold effect
All Countries	34.67*** (9.85, 14.11, 32.89)	69.90*** (16.66, 26.99, 34.68)	69.92 (182.89, 210.86, 292.93)
Emerging Markets	221.81*** (41.40, 61.14, 85.76)	4.51** (19.09, 23.52, 30.57)	10.92 (12.56, 14.59, 16.30)
OECD Countries	5.00 (19.58, 28.00, 50.14)	199.76*** (22.00, 69.90, 149.41)	9.54 (184.00, 233.43, 303.65)
11 Asian Countries	396.44*** (39.39, 69.26, 134.29)	31.38* (29.94, 35.81, 42.91)	22.83** (18.93, 19.67, 29.77)

Results of Country Size Regimes

	Country Size Regime	β	Consumption Risk Sharing
All Countries			
	Country Size ≦ 0.65%	0.8845 [0.0025]	11.55
	0.65% < Country Size ≦ 1.70%	0.7855 [0.0324]	21.45
	1.70% < Country Size	0.8865 [0.0037]	11.35
Emerging Markets			
	Country Size ≦ 0.04%	0.9298 [0.0604]	7.02
	0.04% < Country Size ≦ 0.77%	0.7612 [0.0507]	23.88
	0.77% < Country Size	0.0771 [0.0404]	92.29
OECD Countries			
	Country Size ≦ 0.02%	0.8594 [0.0025]	14.06
	0.02% < Country Size ≦ 0.05%	2.4222 [0.2970]	-142.22
	0.05% < Country Size	0.8477 [0.0026]	15.23
Asian Countries			
	Country Size ≦ 0.53%	0.9613 [0.0241]	3.87
	0.53% < Country Size ≦ 0.73%	0.4442 [0.1452]	55.58
	0.73% < Country Size ≦ 1.30%	0.0457 [0.0414]	95.43

1.30%＜Country Size	0.9593 [0.0280]	4.07

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over 1993Q1-2008Q1.　The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively.　And we report the β of the group whose threshold effect of country size is significant, and numbers in the bracket, [ ] are standard errors of β.　Besides, the amount of consumption risk sharing is $100(1-\beta)$.

Table 7. The Threshold Effects of Government Size on Consumption Risk Sharing

LR Test for Threshold Effect

	H_0: no threshold effect H_A: single threshold effect	H_0: single threshold effect H_A: double threshold effect	H_0: double threshold effect H_A: triple threshold effect
All Countries	410.05*** (16.34, 29.79, 317.01)	220.64*** (10.28, 14.17, 140.74)	4.35 (8.93, 11.37, 22.60)
Emerging Markets	236.10*** (31.13, 54.32, 89.56)	9.09 (12.42, 14.20, 16.65)	
OECD Countries	3.54 (6.17, 8.01, 14.86)	45.40*** (22.68, 29.50, 39.82)	13.32 (274.43, 323.59, 372.48)
Asian Countries	406.67*** (69.81, 108.29, 149.09)	10.53 (22.48, 26.32, 34.80)	

Results of Government Size Regimes

	Government Size Regime	β	Consumption Risk Sharing
All Countries			
	Government Size ≦ 46.02%	0.8850 [0.0023]	11.50
	46.02% < Government Size ≦ 64.97%	-0.0711 [0.0823]	107.11
	64.97% < Government Size	0.6849 [0.0896]	31.51
Emerging Markets			
	Government Size ≦ 24.19%	0.8056 [0.0438]	19.44
	24.19% < Government Size	0.0891 [0.0729]	91.09
OECD Countries			
	Government Size ≦ 0.66%	0.8614 [0.0029]	13.86
	0.66% < Government Size ≦ 4.69%	0.7520 [0.0823]	24.80
	4.69% < Government Size	0.8554 [0.0022]	14.46
Asian Countries			
	Government Size ≦ 19.05%	0.9274 [0.0289]	7.26
	19.05% < Government Size	0.0974 [0.0717]	90.26

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over

1993Q1-2008Q1.   The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively.   And we report the β of the group whose threshold effect of government size is significant, and numbers in the bracket, [ ] are standard errors of β.   Besides, the amount of consumption risk sharing is 100(1-β).

Table 8. The Threshold Effects of Trade Openness on Consumption Risk Sharing

LR Test for Threshold Effect

	H_0: no threshold effect H_A: single threshold effect	H_0: single threshold effect H_A: double threshold effect	H_0: double threshold effect H_A: triple threshold effect
All Countries	14.80* (12.74, 18.37, 27.59)	24.52 (19.17, 29.52, 56.52)	
Emerging Markets	91.68*** (19.40, 25.32, 50.16)	54.59*** (13.11, 15.81, 18.99)	17.09** (13.05, 15.45, 18.55)
OECD Countries	260.81*** (11.37, 18.44, 163.52)	3.19 (6.00, 8.39, 14.66)	54.74*** (23.57, 29.77, 41.31)
Asian Countries	118.63*** (27.34, 40.64, 64.48)	140.40*** (22.04, 27.90, 35.15)	23.40* (19.79, 28.77, 38.31)

Results of Trade Openness Regimes

	Trade Openness Regime	β	Consumption Risk Sharing
All Countries			
	Trade Openness $\leqq$ 69.65%	0.8622 [0.0070]	13.78
	69.65% $<$ Trade Openness	0.8881 [0.0039]	11.19
Emerging Markets			
	Trade Openness $\leqq$ 23.41%	0.5847 [0.0872]	41.53
	23.41% $<$ Trade Openness $\leqq$ 28.24%	1.1175 [0.0887]	-11.75
	28.24% $<$ Trade Openness $\leqq$ 74.12%	0.2385 [0.0570]	76.15
	74.12% $<$ Trade Openness	0.8864 [0.0608]	11.36
OECD Countries			
	Trade Openness $\leqq$ 132.90%	0.8520 [0.0018]	14.80
	132.90% $<$ Trade Openness $\leqq$ 159.59%	0.4593 [0.0561]	54.07
	159.59% $<$ Trade Openness $\leqq$ 244.18%	0.8568 [0.0065]	14.32
	244.18% $<$ Trade Openness	2.4299 [0.2910]	-142.99
Asian Countries			
	Trade Openness $\leqq$ 28.24%	0.9185 [0.0533]	8.15
	28.24% $<$ Trade Openness $\leqq$ 34.54%	0.0231 [0.0661]	97.69

34.54%＜Trade Openness≦70.62%	0.3325 [0.0606]	66.75
70.62%＜Trade Openness	0.9859 [0.0365]	1.41

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over 1993Q1-2008Q1.   The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively.   And we report the β of the group whose threshold effect of trade openness is significant, and numbers in the bracket, [ ] are standard errors of β.   Besides, the amount of consumption risk sharing is $100(1-\beta)$.

Table 9. The Threshold Effect of Country Size on Income Risk Sharing-China Excluded

LR Test for Threshold Effect

	H_0: no threshold H_A: single threshold	H_0: single threshold H_A: double thresholds	H_0: double threshold H_A: triple thresholds
All Countries	51.28*** (17.24, 19.75, 27.81)	39.21*** (15.44, 21.39, 33.69)	40.48 (45.96, 67.29, 94.89)
Emerging Markets	50.46*** (20.50, 22.44, 34.79)	33.46*** (18.39, 22.18, 27.86)	43.91*** (22.80, 25.42, 32.45)
Asian Countries	218.02*** (30.10, 36.78, 89.19)	56.60*** (25.06, 34.75, 54.96)	28.49*** (15.07, 16.61, 19.67)

Results of Country Size Regimes

	Country Size Regime	β	Income Risk Sharing
All Countries			
	Country Size $\leqq$ 0.02%	0.9392 [0.0786]	6.08
	0.02% $<$ Country Size $\leqq$ 0.24%	0.4227 [0.1101]	57.73
	0.24% $<$ Country Size	0.6657 [0.0421]	33.43
Emerging Markets			
	Country Size $\leqq$ 0.33%	0.6843 [0.0341]	31.57
	0.33% $<$ Country Size $\leqq$ 0.57%	0.2131 [0.0647]	78.69
	0.57% $<$ Country Size $\leqq$ 0.70%	1.0879 [0.0916]	-8.79
	0.70% $<$ Country Size	0.3723 [0.0668]	62.77
Asian Countries			
	Country Size $\leqq$ 0.06%	0.9161 [0.0247]	8.39
	0.06% $<$ Country Size $\leqq$ 0.38%	0.6662 [0.0474]	33.38
	0.38% $<$ Country Size $\leqq$ 17.29%	0.1395 [0.0465]	86.05
	17.29% $<$ Country Size	0.7169 [0.1151]	28.31

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over

1993Q1-2008Q1. The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels,

and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively. And we report the β of the group whose threshold effect of country size is significant, and numbers in the bracket, [ ] are standard errors of β. Besides, the amount of income risk sharing is $100(1-\beta)$.

Table 10. The Threshold Effects of Government Size on Income Risk Sharing-China Excluded

LR Test for Threshold Effect

	H_0: no threshold H_A: single threshold	H_0: single threshold H_A: double thresholds	H_0: double thresholds H_A: triple thresholds
All Countries	45.09*** (14.47, 18.57, 26.57)	82.55*** (14.59, 19.76, 36.33)	11.23 (17.70, 24.29, 36.50)
Emerging Markets	78.07*** (20.92, 26.66, 32.56)	18.07*** (18.13, 26.26, 32.36)	
Asian Countries	170.02*** (27.77, 29.85, 40.37)	23.73* (17.17, 24.79, 40.80)	20.49** (16.95, 19.56, 27.27)

Results of Government Size Regimes

	Government Size Regime	β	Income Risk Sharing
All Countries			
	Government Size ≦ 8.14%	0.7468 [0.0455]	25.32
	8.14% < Government Size ≦ 11.32%	0.2327 [0.1138]	76.73
	11.32% < Government Size	0.6694 [0.0422]	33.06
Emerging Markets			
	Government Size ≦ 8.75%	0.7660 [0.0498]	23.40
	8.75% < Government Size	0.3726 [0.0418]	62.74
Asian Countries			
	Government Size ≦ 8.59%	0.8576 [0.0376]	14.24
	8.59% < Government Size ≦ 14.32%	0.2319 [0.0508]	76.81
	14.32% < Government Size ≦ 15.49%	0.8095 [0.0880]	19.05
	15.49% < Government Size	0.3835 [0.0884]	61.65

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over 1993Q1-2008Q1. The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively. And we report the β of the group whose threshold effect of government size are significant, and numbers in the bracket, [ ] are standard errors of β.

Besides, the amount of income risk sharing is $100(1-\beta)$.

Table 11. The Threshold Effects of Trade Openness on Income Risk Sharing-China Excluded

LR Test for Threshold Effect

	H_0: no threshold H_A: single threshold	H_0: single threshold H_A: double thresholds	H_0: double thresholds H_A: triple thresholds
All Countries	139.29*** (17.17, 22.13, 37.47)	29.65*** (14.86, 18.75, 28.21)	42.22*** (13.31, 16.64, 32.12)
Emerging Markets	37.93*** (16.90, 21.83, 33.09)	27.49*** (16.31, 19.48, 27.15)	12.22 (16.48, 19.47, 24.98)
Asian Countries	61.23*** (25.66, 32.72, 50.12)	44.74*** (24.93, 29.16, 40.65)	24.99 (25.87, 32.78, 57.90)

Results of Trade Openness Regimes

	Trade Openness Regime	β	Income Risk Sharing
All Countries			
	Trade Openness ≦ 53.37%	0.8096 [0.0502]	19.04
	53.37% < Trade Openness ≦ 81.00%	0.5207 [0.0430]	47.93
	81.00% < Trade Openness ≦ 101.03%	0.9602 [0.0696]	3.98
	101.03% < Trade Openness	0.2300 [0.1056]	77.00
Emerging Markets			
	Trade Openness ≦ 33.43%	0.5545 [0.0497]	44.55
	33.43% < Trade Openness ≦ 78.78%	0.2327 [0.0606]	76.73
	78.78% < Trade Openness	0.7102 [0.0485]	28.98
Asian Countries			
	Trade Openness ≦ 26.03%	0.6444 [0.0757]	35.56
	26.03% < Trade Openness ≦ 79.29%	0.2899 [0.0569]	71.01
	79.29% < Trade Openness	0.8181 [0.0385]	18.19

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over

1993Q1-2008Q1.   The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10%

levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively.   And we report the

β of the group whose threshold effect of trade openness is significant, and numbers in the bracket, [ ] are standard errors of β.

Besides, the amount of income risk sharing is $100(1-\beta)$.

Table 12. The Threshold Effects of Country Size on Consumption Risk Sharing-China Excluded

LR Test for Threshold Effect

	H₀: no threshold Hₐ: single threshold	H₀: single threshold Hₐ: double thresholds	H₀: double thresholds Hₐ: triple thresholds
All Countries	26.13** (18.94, 23.52, 39.20)	34.77** (22.28, 25.89, 43.74)	60.09** (30.58, 37.14, 62.46)
Emerging Markets	39.42** (24.62, 30.77, 43.71)	16.89 (18.45, 21.36, 31.82)	32.94*** (15.52, 19.62, 24.12)
11 Asian Countries	10.67 (22.31, 27.91, 41.36)		

Results of Country Size Regimes

	Country Size Regime	β	Consumption Risk Sharing
All Countries			
	Country Size ≦ 0.04%	0.9563 [0.0427]	4.37
	0.04% < Country Size ≦ 0.39%	0.7305 [0.0504]	26.95
	0.39% < Country Size	0.9404 [0.0338]	5.96
Emerging Markets			
	Country Size ≦ 0.01%	0.3842 [0.0447]	61.58
	0.01% < Country Size ≦ 0.04%	1.2037 [0.0885]	-20.37
	0.04% < Country Size	0.7986 [0.0380]	20.14

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over 1993Q1-2008Q1. The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively. And we report the β of the group whose threshold effect of country size is significant, and numbers in the bracket, [ ] are standard errors of β. Besides, the amount of consumption risk sharing is 100(1-β).

Table 13. The Threshold Effect of Government Size on Consumption Risk Sharing-China Excluded

LR Test for Threshold Effect

	H_0: no threshold H_A: single threshold	H_0: single threshold H_A: double thresholds	H_0: double thresholds H_A: triple thresholds
All Countries	32.36** (21.47, 29.26, 38.21)	118*** (25.15, 31.83, 58.56)	6.37 (31.31, 36.76, 47.54)
Emerging Markets	43.56** (21.97, 26.37, 41.49)	17.01** (13.18, 16.24, 25.07)	5.74 (13.02, 20.16, 26.01)
Asian Countries	4.34 (16.96, 20.27, 25.40)		

Results of Government Size Regimes

	Government Size Regime	β	Consumption Risk Sharing
All Countries			
	Government Size ≦ 1.01%	0.9784 [0.0483]	2.16
	1.01% < Government Size ≦ 5.64%	0.4180 [0.0830]	58.20
	5.64% < Government Size	0.8661 [0.0257]	13.39
Emerging Markets			
	Government Size ≦ 5.07%	0.4080 [0.0513]	59.22
	5.07% < Government Size	0.8433 [0.0347]	15.67

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over 1993Q1-2008Q1. The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10% levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively. And we report the *β* of the group whose threshold effect of government size is significant, and numbers in the bracket, [ ] are standard errors of *β*. Besides, the amount of consumption risk sharing is 100(1-*β*).

Table 14. Threshold Effects of Trade Openness on Consumption Risk Sharing-China Excluded

LR Test for Threshold Effect

	H₀: no threshold effect Hₐ: single threshold effect	H₀: single threshold effect Hₐ: double threshold effect	H₀: double threshold effect Hₐ: triple threshold effect
All Countries	49.87** (24.46, 38.53, 65.12)	74.06*** (25.62, 32.28, 41.51)	32.28** (28.11, 30.70, 56.34)
Emerging Markets	42.97** (27.06, 35.08, 43.83)	36.43*** (17.76, 21.27, 24.92)	38.17*** (18.30, 23.76, 26.63)
Asian Countries	12.01 (29.74, 34.41, 46.09)	23.97* (22.28, 24.06, 35.49)	9.34 (18.81, 22.69, 29.83)

Results of Trade Openness Regimes

	Trade Openness Regime	β	Consumption Risk Sharing
All Countries			
	Trade Openness ≦ 78.88%	0.7344 [0.0265]	26.56
	78.88% < Trade Openness ≦ 244.18%	0.8915 [0.0342]	10.85
	244.18% < Trade Openness ≦ 330.56%	2.5685 [0.4255]	-156.85
	330.56% < Trade Openness	0.8319 [0.0845]	16.81
Emerging Markets			
	Trade Openness ≦ 15.37%	0.3482 [0.0406]	65.18
	15.37% < Trade Openness ≦ 94.70%	0.8713 [0.0389]	18.27
	94.70% < Trade Openness ≦ 195.34%	1.3390 [0.0872]	-33.90
	195.34% < Trade Openness	0.2515 [0.1040]	74.85
Asian Countries			
	Trade Openness ≦ 89.37%	0.7257 [0.0358]	27.43
	89.37% < Trade Openness ≦ 195.34%	1.0689 [0.0630]	-6.89
	195.34% < Trade Openness	0.3841 [0.1219]	61.59

Notes: There are four groups in this examine, including all countries, emerging markets, OECD countries, and Asian countries over

1993Q1-2008Q1. The upside of the table reports LR statistics, ***, **, * denotes rejection of the null at the 1%, 5%, and 10%

levels, and numbers in the parentheses, () are bootstrapped critical values at 10%, 5% and 1% levels, respectively.   And we report the

β of the group whose threshold effect of trade openness is significant, and numbers in the bracket, [ ] are standard errors of β.

Besides, the amount of consumption risk sharing is $100(1-\beta)$.

Appendix 1. The Details of Data

The data of this paper collecting from Datastream; most countries have a quarter frequency, which is a blank space in this table, some of them are noted by yearly or monthly. In order to keep the frequency of data, we converse yearly data to quarterly by quadratic-match average, and converse monthly data to quarterly by average observations. The dashes in this table mean that the data is coded as missing value.

	GNI	GDP	Final Consumption	Government Consumption	Exports	Imports
Emerging Markets						
Argentina						
Brazil						
China	yearly		yearly	yearly	monthly	monthly
India	yearly					
Indonesia						
Malaysia						
Philippines						
Russia	-					
Singapore	yearly					
South Africa	-					
Taiwan						
Thailand	yearly					
OECD Countries						
Australia						
Austria	yearly					
Belgium						

Canada			
Czech Republic	yearly		
Denmark			
Finland			
France	-		
Germany			
Greece	-		
Hungary	-		
Iceland	yearly		
Ireland			
Italy	-		
Japan			
Korea			
Luxembourg	yearly		outliner
Mexico	-		
Netherlands			
New Zealand			outliner
Norway			
Poland	-		
Portugal	-		
Slovak Republic			
Spain	-		
Sweden			
Switzerland	yearly		
Turkey			

United Kingdom   50

United States