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Increasing the Resilience of Asian Supply Chains to Natural Disasters: The Role of the Financial Sector

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Abstract: *The financial sector is a part of the vital infrastructure of the economy. It can play an important role in mitigating the economic dislocation caused by natural disasters. Resilient financial institutions can ease anxiety and maintain confidence following a disaster. Robust insurance markets provide funds for reconstruction and are an efficient way to prepare for catastrophes. Deep and efficient bond markets allow governments to finance expenditures for emergency relief at lower cost. This paper considers steps that member countries of the Association of Southeast Asian Nations can take to develop the financial sector in these ways and thus be better prepared for the earthquakes, typhoons, tidal waves, and other catastrophes that buffet the region.*

Keywords: production networks; financial services; natural disasters

JEL Classification: F23; G22

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1. Introduction

Over the last 30 years, intricate production networks centred in East Asia and the Association of Southeast Asian Nations (ASEAN) have emerged. These networks have multiplied efficiency gains and raised living standards in the region. On the other hand, Asia has also been buffeted by geological disasters such as tidal waves and climactic disasters such as floods. These disasters have not only caused tragic human losses but have also interfered with the operation of regional value chains.

There are many ways to mitigate the risks that Asian economies and supply chains face from catastrophes. One is to construct deep, resilient financial markets. Financial institutions that continue to function following a natural disaster help to ease anxiety. They also especially benefit smaller firms in Asia that might otherwise face severe credit constraints following a disaster. Robust insurance markets facilitate reconstruction from a catastrophe. Deep and efficient bond markets allow governments to finance emergency relief expenditures at lower cost. This paper considers how Asian countries can strengthen their financial sectors in these ways.

Thailand and Japan both play important roles in East Asian supply chains. Both experienced natural disasters in 2011 (i.e. flooding in the case of Thailand and an earthquake in the case of Japan). The next section investigates the factors affecting exports from these two countries. Results indicate that, controlling for other factors such as exchange rates and rest of the world GDP, Thai exports fell by about 25 percent as a result of the flood while there is little evidence that Japanese exports fell as a result of the earthquake.

There are many factors that contributed to the resilience of Japan's exports after the tragic earthquake. One was the fact that the Japanese cooperated and maintained business continuity in the financial sector following the disaster. This is important since the financial sector is part of the vital infrastructure of the economy, and keeping it functioning nurtures confidence and contributes to economic recovery following a natural disaster. Section 3 seeks to draw lessons from Japan's financial sector following the earthquake that can be useful for other countries facing catastrophes.

Melecky and Raddatz (2015) have investigated the response of gross domestic product (GDP), budget deficits, and other variables to natural disasters. Using annual data from a panel of countries over the 1975–2008 period, they report that countries

with higher insurance penetration levels did not, on average, experience drops in GDP or increases in the budget deficit after disasters. Also, countries with more developed debt markets experienced smaller drops in GDP and larger increases in the budget deficit following catastrophes. Their results indicate that having high levels of insurance before a crisis is the most efficient way to deal with catastrophes. In countries where private insurance can pay for much of the reconstruction costs, governments can focus on emergency aid relief and face less danger of growing the debt unsustainably. Even if insurance coverage is incomplete, governments in countries with well-developed debt markets may be able to borrow at lower cost. This can enable them to spend for emergency relief operations and infrastructure reconstruction without putting their fiscal sustainability at risk.

Section 4 investigates the amount of insurance coverage of ASEAN countries. To do this, it focuses on the insurance penetration ratio for insurance companies other than life insurance firms. This is the ratio of insurance premiums to GDP. Evidence from a cross-section of countries shows that the income elasticity of insurance expenditures is greater than one, indicating that insurance is a luxury good. Results also indicate that, while insurance expenditures in Indonesia and the Philippines are around what the model predicts, the level of expenditure is very low. This implies that, in order to increase their insurance coverage, these countries need to grow and develop.

Section 5 considers how to develop the insurance industry in ASEAN. On the supply side, the goal should be to develop a well-integrated regional insurance market. This can be accomplished over time as countries harmonize regulations and foster a single market governed by the rule of law. On the demand side, the goal should be to help countries in the region to continue to grow and develop. One way to accomplish this would be for these economies to attract foreign direct investment (FDI) and become more linked with regional value chains. Key steps to accomplishing this include improving infrastructure, reducing corruption, and investing in human capital.

Melecky and Raddatz (2015) also report that countries with more efficient financial markets are more resilient when faced with catastrophes. Given this, Section 5 attempts to analyse how ASEAN can develop its debt markets. The study of Almekinders, Fukuda, Mourmouras, and Zhou (2015) note that ASEAN financial integration can stimulate financial sector development and lead to deeper, more

efficient financial markets. Section 5 thus considers how to promote financial sector integration in the region.

Section 6 then summarises the lessons from this paper and presents its conclusions.

2. Effect of Natural Disasters on Japan and Thailand's Exports

Japan and Thailand both experienced catastrophes in the same year. In March 2011, Japan experienced a magnitude 9 earthquake on the Richter scale. This was the strongest earthquake recorded in Japan's history, where 16,000 people died and economic damages exceeded US$200 billion (World Bank, 2012). Meanwhile, between August and November 2011, Thailand experienced severe floods , where 813 people died and economic damages exceeded US$40 billion (METI, 2012). In addition, millions of people were displaced.

While the human costs are beyond measure, one aspect of the economic costs was the disruption to supply chains. The popular press has highlighted supply chain disruptions, but it is important to look at the impact using hard data.

Ando and Kimura (2012) have investigated the impact of the Global Financial Crisis (GFC) and the Great East Japan Earthquake (GEJE) on Japanese exports and production networks in the machinery industries. Their findings show that the GFC shock was massive and triggered permanent changes. After the GEJE shock, on the other hand, economic activity recovered quickly.

This section compares the response of Japanese and Thai exports to the major disasters in 2011 with the reaction of these countries` exports to the GFC. Figures 1a and 1b plot Japanese and Thai exports in recent years. The figures suggest that, while the GFC caused a large fall in exports from both countries, the GEJE caused a minor drop in Japanese exports while the Thai floods triggered a severe decline in exports from Thailand.

To further investigate this issue formally, the imperfect substitutes model is used. This model is a 'workhorse' for estimating the factors affecting exports. In this framework, exports are modelled as a function of the real exchange rate and real income:

$$ex_t = \alpha_{10} + \alpha_{11}\, rer_t + \alpha_{12}\, rgdp_t^* + \varepsilon_t \qquad (1)$$

where ex_t represents the log of real exports, rer_t represents the log of the real exchange rate, and $rgdp_t^*$ represents the log of foreign real GDP.

Data on the volume of exports from Japan and Thailand to the world are obtained from the CEIC database. Meanwhile, data on the real exchange rate are obtained from the International Monetary Fund for Japan and from the Bank for International Settlements for Thailand. The exchange rates are consumer price index-deflated and are available starting 1980 for Japan and 1994 for Thailand. The sample periods for the estimation_ thus start in 1980 for Japan and 1994 for Thailand. For both countries, the sample period extends to 2014. The effects of the GEJE and the Thai floods are captured by dummy variables.

Foreign GDP is calculated as a weighted average of GDPs in major trading partners, with weights determined by the share of exports going to the trading partners. $rgdp_t^*$ is constructed using the following formula:

$$rgdp_t^* = rgdp_{t-1}^* \prod_{i=1}^{13} (r_{i,t} / r_{i,t-1})^{w_{i,t}}, \qquad (2)$$

where the number 13 above the product operator indicates that 13 leading importing countries are used, $r_{i,t}$ represents real GDP in importing country *i*, and $w_{i,t}$ is the value of exports going to country *i* divided by the value of exports going to all 13 countries together. The sum of the $w_{i,t}$ thus equals 1. For Japan, its 13 importing countries are Australia, Canada, China, Germany, Hong Kong, Indonesia, Malaysia, the Philippines, Republic of Korea (henceforth, Korea), Taiwan, Thailand, the United Kingdom, and the United States. Thailand, on the other hand, has the same importing partners as above, including Japan. Data on real GDP in these countries are obtained from the CEIC database. For Japan, $rgdp_t^*$ is equal to 100 in Q1 1980; for Thailand, it is equal to 100 in Q1 1994.

Augmented Dickey-Fuller tests indicate that the variables are integrated of order 1. The trace and maximum eigenvalue statistics permit rejection of the null hypothesis of no co-integrating relations against the alternative of one co-integrating relation in almost every case. Johansen's maximum likelihood estimation, a technique for estimating co-integrating relations, is thus employed.

To specify the Johansen model, the imperfect substitutes model can be written in vector error correction form as:

$$\Delta ex_t = \beta_{10} + \varphi_1(ex_{t-1} - \alpha_{10} - \alpha_{11}rer_{t-1} - \alpha_{12}rgdp_{t-1}^*) + \beta_{11}(L)\Delta ex_{t-1} + \beta_{12}(L)\Delta\, rer_{t-1} + \beta_{13}(L)\Delta rgdp_{t-1}^* + \nu_{1t} \quad (3a)$$

$$\Delta rer_t = \beta_{20} + \varphi_2(ex_{t-1} - \alpha_{10} - \alpha_{11}rer_{t-1} - \alpha_{12}rgdp_{t-1}^*) + \beta_{21}(L)\Delta ex_{t-1} + \beta_{22}(L)\Delta\, rer_{t-1} + \beta_{23}(L)\Delta rgdp_{t-1}^* + \nu_{2t} \quad (3b)$$

$$\Delta rgdp_t^* = \beta_{30} + \varphi_3(ex_{t-1} - \alpha_{10} - \alpha_{11}rer_{t-1} - \alpha_{12}rgdp_{t-1}^*) + \beta_{31}(L)\Delta ex_{t-1} + \beta_{32}(L)\Delta\, rer_{t-1} + B_{33}(L)\Delta rgdp_{t-1}^* + \nu_{3t} \quad (3c)$$

where the φ's are the error correction coefficients, the L's represent polynomials in the lag operator, and the other variables are defined after equation (1). The coefficient φ_1 measures how quickly exports respond to disequilibria. If exports move towards their equilibrium values, then φ_1 will be negative and statistically significant.

Table 1 presents Johansen's maximum likelihood estimates for Japan and Thailand from equations (3a)-(3c). The first row presents results for Japan without the earthquake dummy variable; the second row, with the dummy variable; the third row for Thailand, without the flood dummy; and the fourth row, including the flood dummy.

In rows 1 and 2, the results indicate that a 1 percent appreciation of the Japanese yen would decrease Japan's exports by 0.6 percent and a 1 percent increase in the rest of the world's income would increase exports by 7.4 percent. The error correction coefficient φ_1 for exports is negative and statistically significant at the 6 percent level, implying that exports move towards their equilibrium values. The results indicate that the gap between the actual and the long-run values closes at a rate of 8 percent per quarter. The error correction coefficient φ_2 for the real exchange rate is not significantly different from zero, indicating that the real exchange rate is weakly exogenous.

The results for the earthquake dummy indicate that there was no statistically significant decline in exports in the first quarter of 2011. The same is true of the second quarter and the third quarter. Therefore, controlling for other relevant factors, the most violent earthquake ever recorded in Japan's history had little measurable impact on Japanese exports.

It is possible that exports within Japanese supply chains fell measurably even though aggregate exports did not appear to be affected much. Figure 2a and 3b plot

two leading export categories within Asian supply chains: automobile parts and components, and electronics parts and components. The figures indicate that these parts and components exports also fell much less after the earthquake then they did after the GFC.

In rows 3 and 4 of Table 1, the results indicate that a 1 percent appreciation of the Thai baht would decrease Thai exports by between 1.5 and 1.7 percent, and that a 1 percent increase in the rest of the world's income would increase exports by between 1.7 and 1.8 percent. The error correction coefficient φ_1 for exports is negative and statistically significant in the third row, implying that exports move towards their equilibrium values. Results indicate that the gap between the actual and the long-run values closes at a rate of 4 percent per quarter. The error correction coefficient φ_2 for the real exchange rate is not significantly different from zero, indicating that the real exchange rate is weakly exogenous.

Results for the flood dummy variable indicate that, controlling for other factors, Thai exports were 25 percent less than predicted in the fourth quarter of 2011. The floods, thus, caused considerable disruption to Thailand's exports.

3. Lessons from the Crisis Preparedness of Japan`s Financial Sector

Many factors contributed to the rapid recovery of Japan's exports after the tragic earthquake. Among these factors is the degree of cooperation between the government, businesses, and citizens. This section focuses on lessons on how Japan cooperated and maintained business continuity in the financial sector following the disaster. This is important since the financial sector is part of the vital infrastructure of the economy, and keeping it functioning nurtures confidence and contributes to economic recovery following a natural disaster.

Figure 3 illustrates the various interactions necessary to maintain stability in the financial sector. First, the government itself needs to continue essential operations. It also needs to interact with financial institutions such as banks and insurance companies. Financial institutions have to continue operating and to provide services to businesses and individuals after a catastrophe. It should be noted here that while Figure 3 focuses

on hierarchal interactions between the government, financial institutions and the public, there are, of course, many other forms of interactions (e.g. direct interactions between the government and the public).

In Japan, the Financial Services Administration (FSA) has direct responsibility for overseeing the financial sector and a detailed business continuity plan to respond to disasters such as earthquakes (FSA, 2011).

The first part of the plan involves enumerating the essential functions that the FSA must perform after a disaster. These include:

a) maintaining a disaster countermeasures headquarters directed by the FSA Minister;
b) working with disaster countermeasures headquarters in other parts of the government;
c) managing and assigning FSA staff;
d) monitoring financial markets and financial institutions;
e) providing information to financial markets and institutions as well as to the public and foreign governments;
f) maintaining the FSA's internet technology system; and
g) asking financial institutions to provide support to crisis victims.

One challenge the FSA can face after a disaster is how to ensure that there are enough employees to continue these essential operations, especially if public transportation is interrupted. To overcome this challenge, the FSA identifies staff members who can reach the head office even without available public transportation. It then establishes a reserve group composed of these staff members who do not have other essential operations in an emergency and can be assigned where needed.

So that these staff who gather at the head office know what needs to be done, the FSA maintains a checklist of priority operations. The people in charge use this checklist to ensure that the important tasks of every section and bureau are performed.

In case the minister is unable to direct operations at the disaster countermeasures headquarters, the FSA specifies the succession of authority up to the seventh person. For other people with authority over priority emergency operations, the succession is specified up to the fifth person.

In addition, forethought has been given by the FSA on how information will be provided, how communication will be maintained, and how priority operations will continue. The FSA also provides disaster drills and training and continually revises these as the financial environment changes.

After the GEJE, the FSA and the Japanese central bank (the Bank of Japan [BoJ]) established DCHs and maintained business continuity. The FSA and the BoJ together then asked financial institutions to provide support to victims of the crisis (Nakatsuka, 2012). These requests included asking banks to remain open on weekends and holidays, to be flexible in allowing depositors to identify themselves, and to suspend the dishonouring of checks that could not be processed because of the emergency. These also included asking insurance companies to use aerial photography to expedite the handling of claims rather than relying on spot visits and to promptly pay out claims. The discussion below highlights other ways that financial institutions, with the encouragement of the government, were able to flexibly meet the needs of customers following the GEJE.

The BoJ took several other actions following the 2011 earthquake.[1] After any crisis, depositors typically withdraw large amounts of cash because of extra expenses and anxiety over the future. In Japan, the BoJ thus provided financial institutions with massive amounts of cash to meet the needs of depositors. It stayed open during the weekend to provide cash (including coins that were in short supply). Many banknotes were also damaged by water, fire, and other side effects of the earthquake. The BoJ exchanged these for clean notes.

During the crisis, the BoJ maintained its computer network, the BOJ-NET, for payments and settlement between banks. It also did its best to continue paying public pensions, receiving taxes, and fulfilling other responsibilities. The BoJ, together with the FSA, also collected and propagated timely information about the state of financial institutions and financial markets. This helped to dispel rumours and false information that were circulating and could have sparked panic.

Because of the government's support as well as the gravity of the situation, financial institutions cooperated extensively with each other in providing services.

[1] This paragraph and the following ones draw on BoJ (2011).

Financial institutions shared the use of cash delivery cars to ensure that neighbouring institutions also had adequate cash on hand. This was meant to assist the victims who had evacuated far from their homes and did not have their passbooks or other important documents with them. Often, the place where they had evacuated to did not have a local branch of their banks. Other financial institutions in a remote city would then verify the customers' identities (even when they had lost their passbooks and seals), contact the customers' local banks, and make payments to the customers on behalf of their local banks. This helped maintain the functioning of the financial infrastructure in the face of the disaster.

Many bill and check clearing houses in the Tohoku region were unable to function. Other clearing houses then took on the activities that these clearing houses could not perform.

Some banks were unable to use their own computer systems. They, however, already had backup systems in place and were able to access their systems using remote terminals.

Moreover, even if many bank buildings had been destroyed, information on deposits, loans, and other basic data had earlier been stored on central computers, and thus could continue to be accessed.

The Japanese government also injected capital into banks that had suffered losses because of the earthquake. This enabled them to continue extending credit (Hosono and Miyakawa, 2014).

Major financial markets such as the foreign exchange market, the securities market, and the money market had business continuity plans in place. Major trade associations checked with participants on whether certain business processes would need to be adjusted due to the disaster. When they learned that the market infrastructure continued to function, these associations recommended no changes to business practices following the earthquake. There was a surge in trading in financial markets following the disaster, but the Japanese financial infrastructure was able to accommodate this.

The BoJ also surveys financial institutions and central payments and settlements institutions each year on their business continuity plans. It then publicises the results in a bid to encourage institutions to continually improve their plans (see BoJ, 2015). In these surveys, the BoJ focuses on several issues. Its concerns pertain to:

a) causative events (e.g., earthquakes, infectious diseases) that banks are preparing for ;
b) probability that the primary and backup workplaces will be functional following different types of disasters;
c) identification of priority operations that need to be restored as quickly as possible;
d) establishment of cooperative frameworks with other financial institutions in the event of an emergency ;
e) identification of business continuity staff, such as those who may be able to get to the office if an emergency occurs at night or over the weekend ;
f) training of staff on how to function in a crisis situation ;
g) how to secure electric generators, fuel, food, and other resources needed to maintain operations following a natural disaster.

It is also important to update the technology. Banks should consider using solar power where possible, to mitigate the problem of finding fuel for generators. In the past, the FSA often relied on leaflets and radios to get information out. Efforts should also focus on bolstering cell towers, establishing satellite technology, and increasing bandwidth so that cell phones, too, can be used for communication following disasters.

4. Insurance Penetration and Financial Market Deepening as Tools to Cope with Natural Disasters

In their 2015 study, Melecky and Raddatz investigated the response of GDP, budget deficits, and other variables to catastrophes ---both geological catastrophes such as earthquakes, volcanic eruptions, and tidal waves and climactic catastrophes such as floods and droughts. They tested whether the level of financial development and the degree of insurance penetration influence a country's ability to respond to natural disasters. Using annual data from a panel of countries over the 1975-2008 period, they reported that those nations with more developed debt markets experienced a smaller decline in GDP and larger increases in the budget deficit following catastrophes. They also reported that countries with higher insurance penetration levels did not, on average, experience dips in GDP or increases in the budget deficit after disasters.

As Melecky and Raddatz (2015) discussed, these findings are relevant for their recovery from catastrophes. Following natural disasters, governments often need to provide emergency relief and to reconstruct damaged infrastructure. However, government finances may be constrained after disasters, since more spending is needed around the same time that the crisis is reducing economic activity and, thus, tax receipts. If countries have well-developed debt markets, they may be able to tap into these at low cost. The authors reported that countries with more efficient debt markets increase government expenditures on average by 55 percent following a climactic crisis. Conversely, nations lacking an efficient financial market do not, on average, increase expenditures following climactic disasters.

Although the deficit is seen to climb more in countries with well-developed financial markets after catastrophes, their GDP also increases. On the other hand, GDP decreases by between 2 and 10 percent in nations with less developed financial markets.

Melecky and Raddatz's study also indicates that having high levels of insurance before a crisis is the most efficient way to deal with catastrophes. In countries where private insurance can pay for much of the reconstruction costs, governments are able to focus on emergency aid relief and face less danger of growing the debt unsustainably. The countries on average also experience no drop in GDP after a crisis.

This section investigates the amount of insurance coverage that ASEAN countries have. To do this, it focuses on the insurance penetration ratio for insurance companies other than life insurance companies. As Lee and Takagi discussed in their 2013 study, the ratio of insurance premiums to GDP is a key measure of the amount of insurance in a country.

Data on the insurance penetration ratio for non-life insurance companies are available from the World Bank's Global Financial Development Database.[2] An attempt is made to use all countries that have data available starting in 1991 and that do not have gaps in the data. As a result, data for 81 countries were culled. These countries are listed in the Appendix.

Following Millo (forthcoming), the data are transformed in per-capita terms. Two measures are constructed. One is real US dollars per capita spent on non-life insurance.

[2] The website for this database is: http://data.worldbank.org/data-catalog/global-financial-development .

The second is purchasing power parity (PPP) US dollars per capita spent on non-life insurance.[3]

Table 2a reports non-insurance values in real US dollars for the ASEAN-4 countries and for China, Japan, and Korea; Table 2b presents the values in PPP dollars. Columns are ordered from the lowest values in the latest year for which data are available to the highest value in the latest year. Both Tables 2a and 2b tell similar stories.

Focusing on Table 2a, both the Philippines and Indonesia have values far lower than that of other countries in 2010 or 2011. Also, their values have not increased since 1990. In contrast, China's values have increased almost five times and Thailand's values have more than doubled. China's and Thailand's values are about equal, and almost five times the values for the Philippines and Indonesia. Malaysia's values are about six times larger than those for China and Thailand. Japan's and Korea's values are respectively about twice and thrice as large as Malaysia's.

To try to explain the values in the two tables, this study relies on Millo (forthcoming) process. He regressed the log of the values on the log of GDP per capita and a series of fixed effect variables.

To specify the equation, panel unit root and co-integration tests are performed. There is some ambiguity for the unit root test for insurance expenditures per capita but not for GDP per capita. Kao residual co-integration tests indicate that there is a co-integrating relationship between the variables. The equation is estimated by panel dynamic ordinary least squares.

Mark and Sul's (2003) panel dynamic ordinary least squares (DOLS) techniques are employed. The model takes the form:

$$NLI_{i,t} = \beta_0 + \beta_1 GDP_{i,t} + \sum_{k=-p}^{p} \alpha_{1,i,k} \Delta GDP_{i,t-k} + u_{i,t}, \quad (4)$$

$$t = 1, \cdots, T; \qquad i = 1, \cdots, N.$$

[3] To construct these measures, the original penetration ratio data for each country are multiplied by the country's GDP measured either in real US dollars or in PPP. The resulting value is divided by the country's population. Data on GDP and population come from the CEPII-CHELEM database.

Here, $NLI_{i,t}$ represents non-life insurance payments per capita by country *i* in year *t* measured either in real US dollars or in PPP US dollars, and $GDP_{i,t}$ represents GDP per capita in country *i* in year *t* measured either in real US dollars or in PPP US dollars. Cross-section specific lags and leads of the first-differenced regressors are included to asymptotically remove endogeneity and serial correlation.[4] A sandwich estimator is employed to allow for heterogeneity in the long-run residual variances. Individual-specific fixed effects and individual-specific time trends are also included.

Table 3 presents the results from estimating equation (4). Column (1) presents the results for real insurance payments per capita while Column (2) is for insurance payments measured in PPP. The results are very similar. In both cases, the income elasticity equals 1.22, which means that a 1 percent increase in GDP will produce a 1.22 percent increase in insurance premiums on average. The hypothesis that the GDP elasticity equals unity is also rejected at the 1 percent level, implying that a percentage increase in GDP will result in an even larger percentage increase in insurance spending. In economic terms, this implies that insurance is a luxury good.

Table 4a presents the difference measured in real US dollars per capita for ASEAN-4, China, Japan, and Korea, whereas Table 4b is in terms of PPP US dollars. Results are similar across the two specifications.

To facilitate the interpretation of these results, Figures 4a to 4d plot actual and predicted expenditures on non-life insurance as measured in real US dollars for each of the ASEAN-4 countries. Expenditures are slightly more than predicted for the Philippines, while they are slightly less for Indonesia. These figure indicate that expenditures tend to fluctuate around their predicted values for the ASEAN-4 countries.

What is worth noting is how much less the values are for the Philippines and Indonesia as compared to other countries. Expenditures per capita average about US$10 in these two countries, compared with Malaysia's US$350. The two nations' level of expenditures cannot be explained by a claim that they do not face natural disasters, given the many tsunamis, volcanic eruptions, typhoons, and other disasters

[4] The numbers of leads and lags are determined using the Schwartz Criterion.

that do visit them. Rather, as *The Economist* (2015) noted, Asia is woefully underinsured.

5. Promoting Financial Sector Integration in the ASEAN

5.1. Developing the Insurance Industry in ASEAN[5]

Melecky and Raddatz (2015) note that countries with high insurance penetration ratios did not, on average, experience drops in GDP or increases in the budget deficit after disasters. Thus, it is important for emerging economies to increase insurance coverage as a way of preparing for catastrophes. To increase the quantity of insurance in ASEAN, it is necessary to work on both the supply side and the demand side.

On the supply side, the emerging ASEAN Economic Community offers the possibility of developing well-integrated regional insurance markets. Currently, the insurance market in ASEAN is fragmented and segmented. Countries have different licensing procedures, varying restrictions on foreign equity, and inconsistent policies regarding cross-border trade. Insurance markets are also at different levels of maturity. Over time, ASEAN countries should seek to harmonize regulations and work towards establishing a single market governed by the rule of law. A region-wide insurance market with healthy competition would lower prices and increase the insurance options available.

As the insurance market becomes more integrated it would be desirable to nurture local talent. Universities in ASEAN could highlight insurance studies, actuarial training could be strengthened, and restrictions on the movement of insurance professionals could be removed. Capacity building and sharing of best practices may be promoted across the region. The need for underwriting discipline could also be emphasized as opposed to selling policies below the actuarially fair price so as to earn short-run profits.

After the Thai floods, many companies that had purchased insurance from abroad had trouble collecting. Some foreign insurers used legalistic arguments to deny

[5] This section draws on the ASEAN Insurance Council (www.aseanic.org).

payments. Local companies may fare better if they deal with local insurers. It thus seems desirable to nurture local champions in the ASEAN insurance industry.

The ASEAN insurance companies use reinsurance companies to bear risks that are beyond their capacity to insure. However, when premiums charged by reinsurance companies soar, the government can step in and provide reinsurance. For instance, as Chantanusornsiri (2013) discussed, before the Thai floods, companies in Thailand could insure against disaster risk for 0.01 percent of the insured amount. After the floods, foreign reinsurance companies charged 12 percent to 15 percent of the insured amount or refused to insure disaster risks at all. To fill this gap, the government of Thailand started the National Catastrophe Insurance Fund of Thailand. The fund charged premiums that were closer to 1 percent of the insured amount. This fund, together with government actions to fight against flooding, helped restore confidence and increased the willingness of private reinsurers to provide flood insurance again. Government reinsurance can thus be useful when the cost of private reinsurance becomes prohibitive. The government's intervention should also be accompanied by policies to reduce the underlying risks and to restore the confidence of private insurers.

Results in the previous section indicate that, as countries grow, their expenditures on insurance tend to grow more than proportionally. On the demand side, a burgeoning middle class is likely to spend more on insurance coverage. Thus, fostering economic growth can increase insurance penetration.

For ASEAN countries such as the Philippines and Indonesia, economic growth could be nurtured if companies advance from simple to complex production activities, from low-skilled assembly to participation in the engineering and design aspects of production (Wie, 2006). One way to accomplish this would be for these economies to attract FDI and become more linked with regional value chains.

As Kimura and Lim (2010) note:

> Policymakers in less developed countries must be patient until they are hosting a critical mass of FDI, rather than hastily introducing performance requirements for technology transfers. Once the seed of industrial agglomeration has been planted, local firms and entrepreneurs will have ample opportunities for penetrating into production networks, which will eventually accelerate technology transfers and spillovers (Lim and Kimura 2010: p. 12).

Kimura and Ando (2005) have presented a model to explain why firms fragment production. In their framework, firms decide to slice up the value chain when the production cost savings arising from fragmentation exceed the cost of linking geographically separated production blocks (the service link cost). Some ways to lower service link costs include

a) strengthening physical infrastructure such as the network of highways, ports, and airports, information and communication technology infrastructure, container yards; and
b) reinforcing market-supportive institutional infrastructure such as enforcement of the legal system; access to information on vendors; enforcement of the stability of private contracts; corporate governance; and legal remedies when firms violate intellectual property rights agreements.

Data from the World Economic Forum (2014) Global Competitiveness Index indicate that Indonesia and the Philippines need to improve in the areas of infrastructure and corruption. The World Economic Forum (WEF), which surveyed 13,000 business executives in 2014 to learn about the business environment across the world , ranked Indonesia and the Philippines 56th and 91st, respectively, in terms of infrastructure. Areas of special concern were the quality of ports and of electrical supply. The WEF ranked Indonesia 60th and the Philippines 81st in terms of ethics and corruption. While Indonesia and the Philippines have improved in these areas, continued improvement would lower the service link cost even more and help attract FDI.

For ASEAN countries to benefit fully from FDI, it is necessary for technology transfer to take place. Urata, Matsuura, and Wei (2006) report that technology transfer is facilitated when workers in the host country are better educated. Thorbecke, Lamberte, and Komoto (2013) argue that ASEAN countries should invest in human capital. They highlighted the need to provide children with adequate nutrition, healthcare, and primary education, provide high school students with high-quality education in science and math, and grant university students with scientific and engineering training. Yoshitomi (2003) also note that the educational system should provide students with marketable skills that businesses need. Bodewig (2013)

discusses how improving education in ASEAN can take place as schools, businesses, universities, parents, students, and the government engage in open discussion.

The WEF data also underscore the need to improve education in ASEAN countries. For primary education, Indonesia and the Philippines are ranked 66th and 88th, respectively. For post-primary education, WEF ranks Indonesia 61st and the Philippines, 64th.

5.2. Supply Chain Activities and Financial Markets

As Manova (2015) discusses in his report, exporting involves extra upfront costs.[6] Extra fixed costs associated with exports include researching market profitability, investing in capacity-tailoring products for specific markets, fulfilling country-specific regulatory requirements, and maintaining distribution networks. Extra variable costs include shipping goods across countries and paying duties and insurance. Delivery also takes 60 days longer on average for exports than for goods sold to the domestic market, putting pressure on firms' working capital. These extra costs increase exporting firms' reliance on external sources of finance as opposed to internal sources such as retained earnings or cash flow.

This dependence on external finance implies that firms that face difficulty obtaining credit can be hindered in their attempts to export and to participate in global value chains. Manova and Yu (2012) report that credit-constrained firms in China are restricted to lower value added, less remunerative activities within global value chains. Also, Chinese firms' balance sheets mattered more for trade in provinces with weaker financial systems, suggesting that liquidity constraints are important for exporters. By contrast, multinational firms and their affiliates abroad are less constrained by access to credit.

An adverse shock such as a natural disaster can increase the cost of raising funds externally as opposed to the opportunity cost of internal funds (Bernanke and Gertler, 1995). For instance, if a natural disaster damages several firms that have borrowed from a bank, it might worsen the bank's loan portfolio and reduce its capital. The bank may then respond to the fall in capital by restricting the supply of loans and raising interest rates.

[6] This section draws on Manova (2015).

Multinational firms and their foreign affiliates will be least affected by this credit constraint. They often have substantial internal funds and can borrow from banks in many locations. Foreign affiliates can also borrow directly from multinationals. However, local small-and medium-sized firms are much more restricted in their ability to borrow elsewhere. Thus, a natural disaster that impairs bank capital can force small- and medium-sized firms to reduce investment and production and hinder them from advancing to higher value-added activities.

To alleviate the pressure on small- and medium-sized firms following a natural disaster, governments in emerging Asia should learn from the example of the Japanese government after the Tohoku earthquake, wherein it injected capital into banks that had suffered losses from the calamity. Hosono and Miyakawa (2014), investigating the relationship between damaged banks and firms following the 1995 Kobe earthquake, have found that the adverse effects of bank damage on firm activities usually dissipate after a year. They thus recommend that government actions to recapitalize banks and to increase the supply of credit following a disaster should be implemented quickly and withdrawn after a short period. By easing the credit constraints facing smaller firms, these policies to facilitate the flow of credit can accelerate economic recovery.

The 2008–2009 GFC provides further evidence that maintaining the flow of credit is important in times of crisis. Chor and Manova (2011) find that financially constrained sectors experienced larger drops in exports. Bems, Johnson, and Yi (2012), reviewing several papers, note that credit constraints play an important secondary role in the collapse of trade. Thus, a functioning banking sector that continues to extend credit during a crisis can reduce the economic costs coming from lost exports and output.

5.3. Promoting ASEAN Financial Integration

The discussion in the previous section highlights how a strong financial sector can help firms keep on producing and exporting following a crisis. Melecky and Raddatz (2015) report that countries with better developed financial markets recover more quickly from natural disasters. When countries have efficient bond markets,

governments can borrow from these at low costs to finance spending on emergency relief and infrastructure reconstruction.

Almekinders, Fukuda, Mourmouras, and Zhou (2015) note that ASEAN financial integration can stimulate financial sector development and lead to deeper, more efficient financial markets. It can also promote the development of innovative financial and insurance products, contributing to vibrant insurance markets in the region.

The ASEAN Economic Community is pursuing regional financial integration.[7] At present, the financial integration among the ASEAN member countries is currently weaker than in other economically linked regions such as Europe. As Takagi (2009) notes, financial integration—although it has risks—can help to foster a local-currency funded bond market. Integration could also be an effective mechanism for channelling Asia's savings to investments in the region, including those of regional insurance companies, rather than round tripping savings out of the region and back in. Aldaba and Yap (2009) note that integration will contribute to greater portfolio diversification in the region. Finally, given the importance of local information and common time zones in Asia, lower cross-border transaction costs add to the benefits of regional financial integration (Takagi, 2009; Garcia-Herrero and Wooldridge, 2007).

Currently, ASEAN countries are heavily bank dependent. It would be desirable to accelerate the development of bond markets so as to provide the private sector with alternative sources of funding and to increase resilience after natural disaster. Thus, ASEAN countries have improved the supervisory and regulatory framework for the equity and bond markets, modernized financial infrastructure including trading/auction platforms and accounting systems, and introduced a framework for enhancing corporate governance. However, as Almekinders, Fukuda, Mourmouras, and Zhou (2015) note, the development of the bond market has been slow.

Credit rating agencies can foster bond market development. Nurturing regional rating agencies would be especially helpful in this regard.

According to Almekinders, Fukuda, Mourmouras, and Zhou (2015), financial integration is fraught with risks and must be carefully phased and sequenced. However, provided that countries in the region follow the ASEAN way of safe and gradual

[7] This paragraph draws from Thorbecke, Lamberte, and Kimoto (2013).

decision-making, integration offers the potential to develop more efficient financial markets that can make regional economies more resilient in the face of natural disasters.

6. Conclusion

Although blessed with natural resources, a hard working labour force and pragmatic policymakers, ASEAN countries have faced many twists and turns on their path towards economic development. Rapid growth has been punctuated with major crises. Some of these crises are economic, such as the 1997-1998 Asia Crisis and the 2008-2009 GFC. Others are of natural causes, such as the 2004 Indian Ocean tsunami and the 2011 Thai flooding. A robust financial sector can help promote recovery following a natural disaster.

Countries in the ASEAN can learn lessons from how Japan managed to keep financial institutions functioning after a catastrophe. First of all, both of Japan's financial regulators and financial institutions have well-thought out business continuity plans in place even before a crisis occurs. After the earthquake, regulators asked institutions to accommodate customers, and the institutions responded accordingly. This included providing funds to depositors who had lost their passbooks and other vital documents after the earthquake and using aerial photography to expedite insurance claims. Japan's central bank provided financial institutions with plenty of cash to meet depositors' demands. Also, regulators and institutions stayed open during weekends and holidays. Competing financial institutions went to great lengths to cooperate with each other so as to attend to depositors' needs.

Researchers have found that having a vibrant insurance market is an efficient way to be prepared for natural disaster. This paper has investigated whether insurance penetration in ASEAN is less that one would predict. Results indicate that, given the level of development in Indonesia and the Philippines, insurance coverage is about at the level one expects. However, insurance penetration in these countries is still very low. This implies that these countries need to continue growing and developing. One way for this to happen is for both countries to continue joining regional production

networks. They can attract FDIs by improving infrastructure, reducing corruption, and investing in their young human capital.

Researchers have also found out that nations with deep and efficient bond markets recover more quickly from natural disasters. As many ASEAN countries currently have underdeveloped bond markets, one way to strengthen these debt markets and feature more innovative financial and insurance products is to promote financial market integration in the region.

Financial integration can effectively channel ASEAN's high savings to investments in the region, including investments from regional insurance companies, rather than round tripping savings out of the region and back in. Integration can also lead to greater portfolio diversification and deeper markets.

Currently, ASEAN countries are heavily bank dependent. By accelerating the development of bond markets, nations can provide the private sector with alternative sources of funding and increase resilience after natural disaster. Credit rating agencies can foster the bond market's development, and therefore should be encouraged.

As Almekinders, Fukuda, Mourmouras, and Zhou (2015) note, financial integration is fraught with risks and must be carefully phased and sequenced. However, as long as countries in the region follow the ASEAN way of safe, gradual decision-making, integration has the potential to develop more efficient financial markets that can make regional economies more resilient in the face of natural disasters.

One should distinguish between pre- and post-disaster management, between what firms and government should do pre-disaster and post-disaster. Firms before a disaster should maintain adequate insurance coverage. After a crisis, they should exert every effort to maintain a credit lifeline with their financial institutions. The government before a crisis should seek to strengthen the banking sector, and to aim for more efficient bond markets and a robust insurance industry. After a crisis, the government should be ready to inject capital into the banking sector so as to facilitate the flow of credit, and to borrow in the bond market to finance disaster relief operations and infrastructure rebuilding.

The emergence of efficient financial markets with innovative products could help increase the ASEAN's resilience in other ways. Such is one lesson that can be derived from nations' experience during the GFC in 2008-2009. Figures 1a, 1b, 2a and 2b

indicate that the GFC led to a collapse in exports. The fall in GDP in final markets caused exports from Asia to tumble. If there were well-developed financial markets in Asia, investors could have developed vibrant derivatives markets. This would make it possible to trade financial instruments linked with the GDP in the United States (or other major final markets). Exporters in Asia could insure themselves against another financial crisis by going short in these instruments. When the final markets are doing well, Asian businesses linked to supply chains would benefit by selling more to these markets. On the other hand, when the final markets are in a deep recession, Asian businesses could receive some compensation from these derivative assets that pay off when GDP in final markets contracts.

Figure 1a: Japanese Real Exports to the World

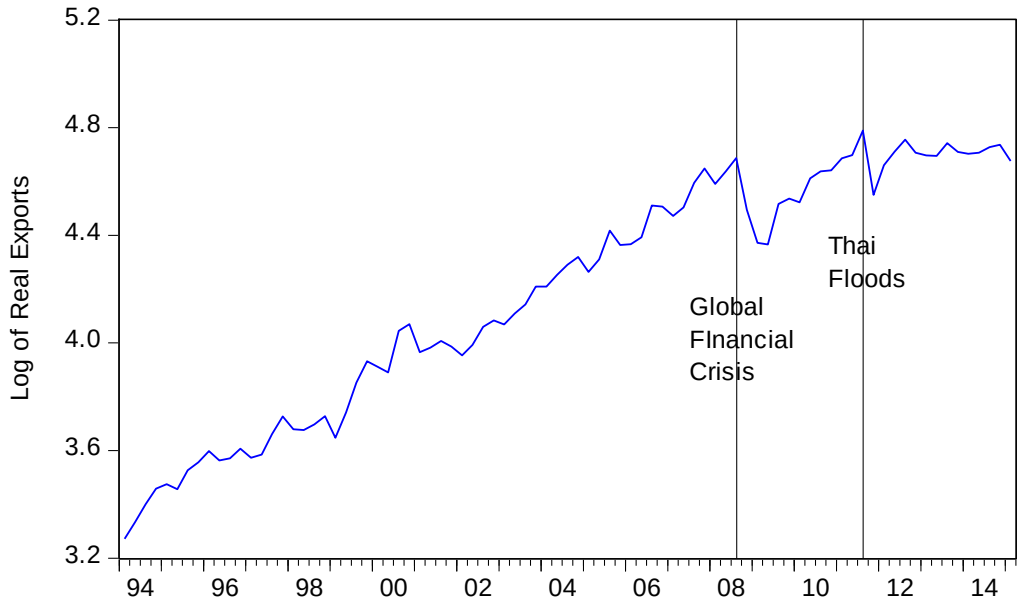
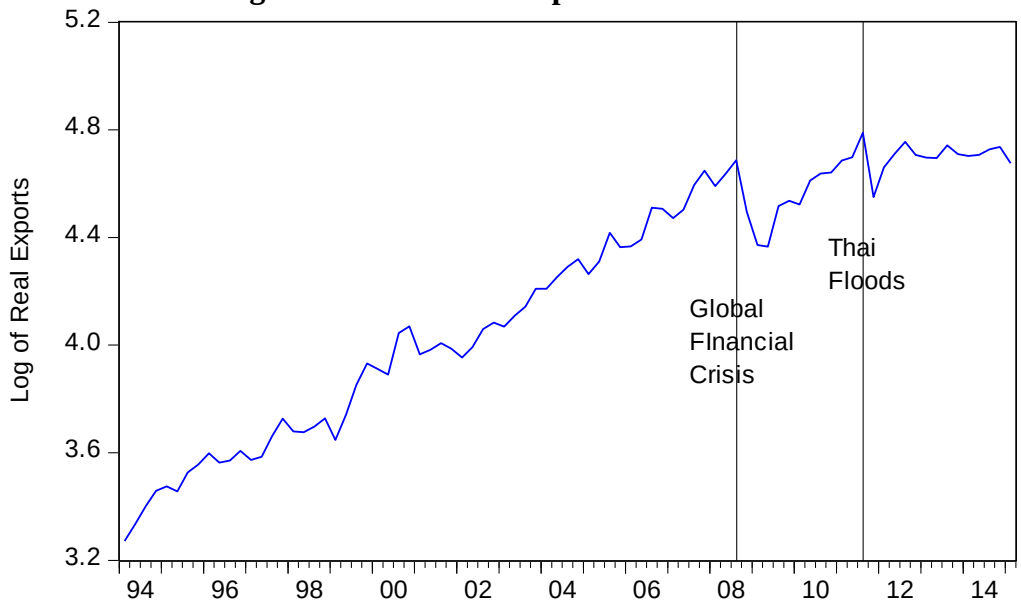


Figure 1b: Thai Real Exports to the World



Source: CEIC Database.

Figure 2a: Japanese Real Semiconductor Exports to the World

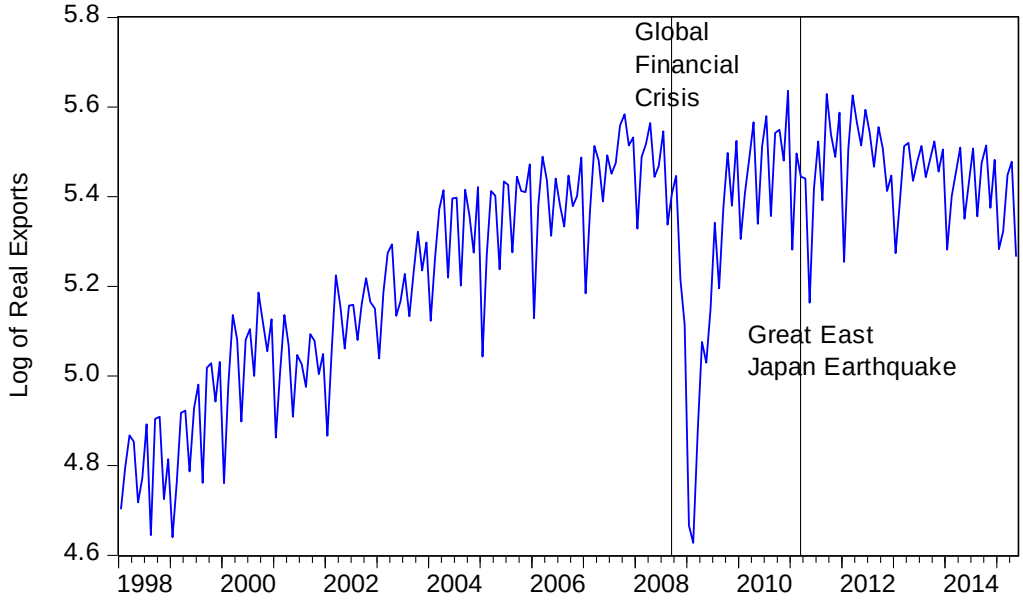
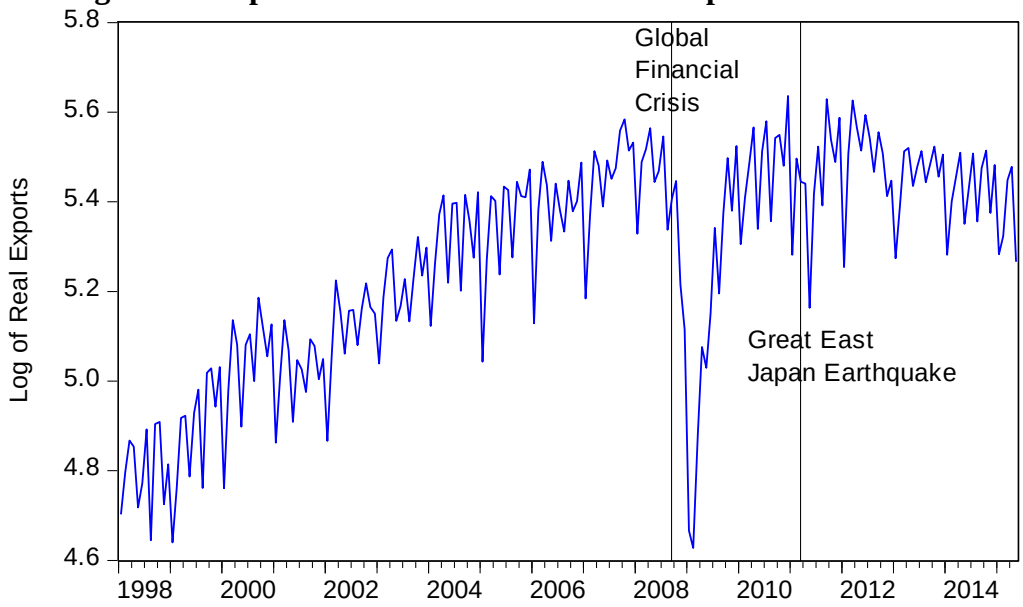
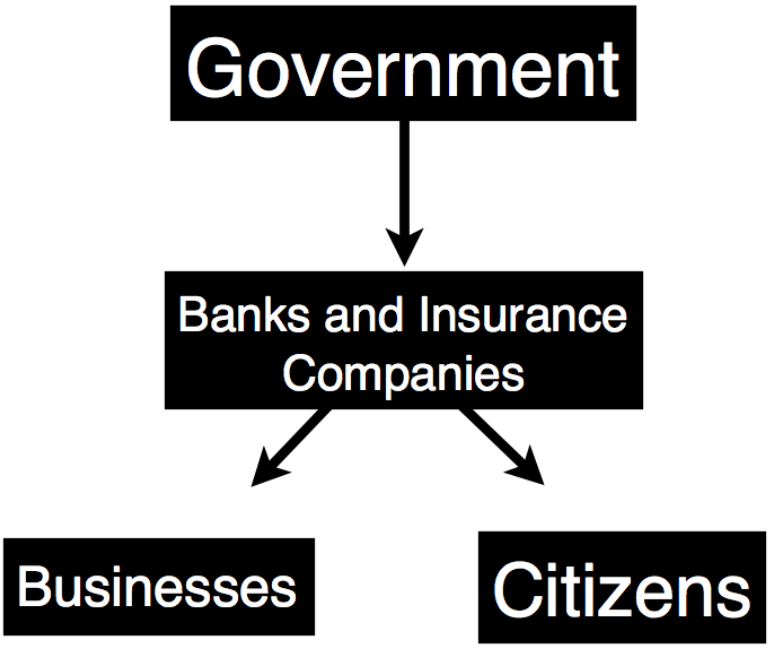


Figure 2b: Japanese Real Automobile Parts Exports to the World



Source: CEIC Database.

Figure 3: Business Continuity in Financial Services



Source: Author's construction.

Figure 4a: Actual and Predicted Expenditures on Non-life Insurance in the Philippines

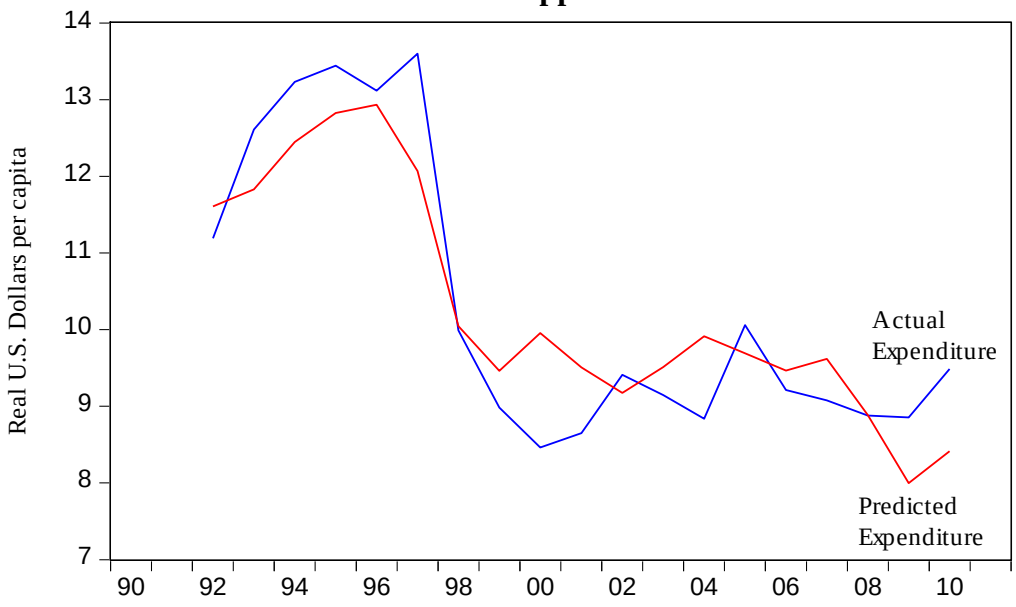


Figure 4b: Actual and Predicted Expenditures on Non-life Insurance in Indonesia

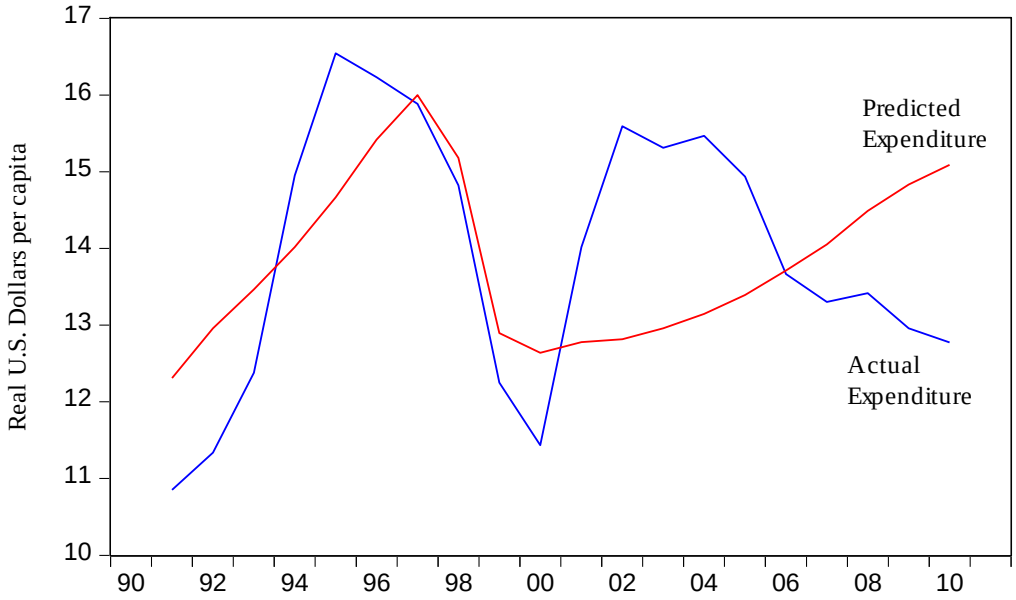


Figure 4c: Actual and Predicted Expenditures on Non-life Insurance in Malaysia

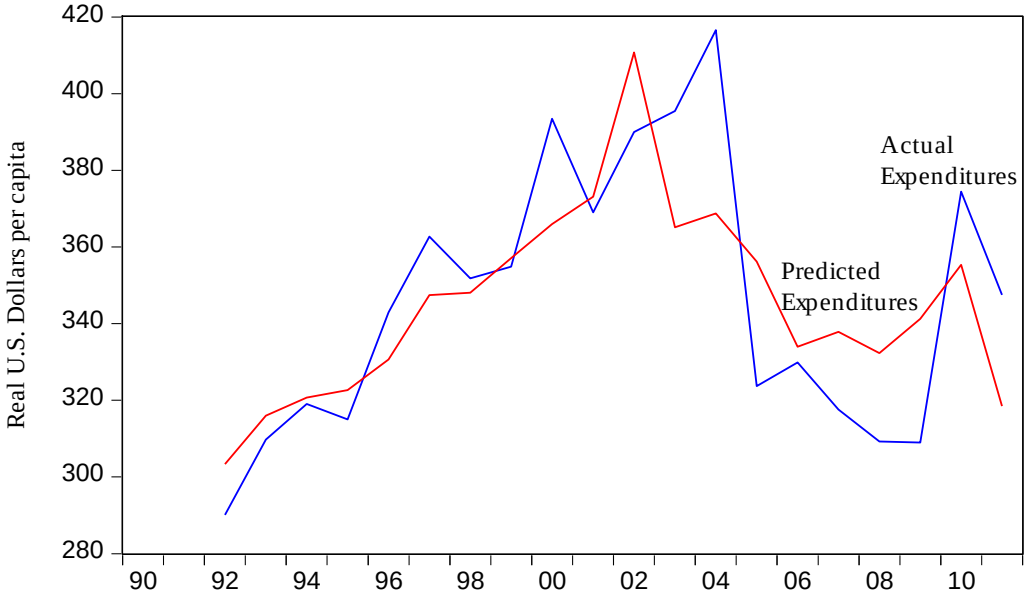
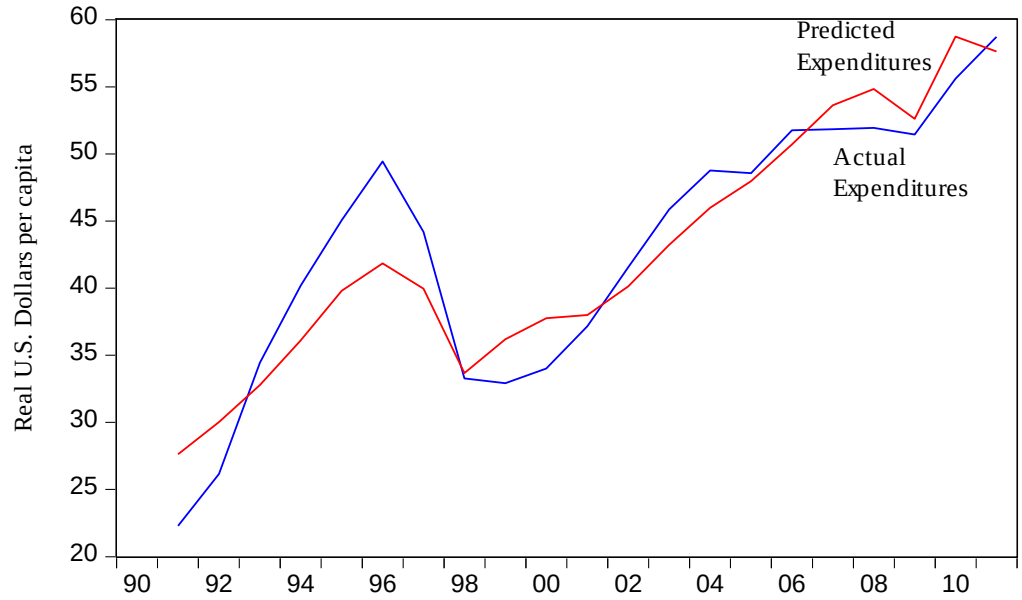


Figure 4d: Actual and Predicted Expenditures on Non-life Insurance in Thailand



Note: The figure presents the difference between actual and predicted values of non-life insurance payments as measured in real US dollars per capita. Actual values are calculated by multiplying data on non-life insurance coverage by each country's GDP as measured in real US dollars. This product is then divided by each country's population. Predicted values are calculated based on the model presented in Table 3.
Source: World Bank Global Financial Development Database, CEPII-CHELEM Database, and calculations by the author.

Table 1: Johansen's Maximum Likelihood Estimates for Japanese and Thai Multilateral Exports

	Number of cointe-grating Vectors	Number of obser-vations	Real effective exchange rate	Income	Earth-quake dummy variable	Thai floods	Error correction coefficients:		
							Exports	Real effective exchange rate	Income
Japanese Exports	1,1	136	-0.61***	7.40***			-0.08*	-0.01	0.01*
			-0.17	-1.49			-0.04	-0.03	-0.01
(Lags: 0; Sample: 1980:II-2014:I; Trend in data)									
Japanese Exports	1,1	136	-0.61***	7.40***	-0.08		-0.08*	0	0.01*
			-0.17	-1.49	-0.07		-0.04	-0.03	-0.01
(Lags: 0; Sample: 1980:II-2014:I; Trend in data)									
Thai Exports	1,1	79	-1.49**	1.66***			-0.04**	0.01	0.01***
			-0.66	-0.25			-0.02	-0.01	0
(Lags: 1; Sample: 1994:III-2014:I; Seasonal dummies for the first, second, and third quarters included)									
Thai Exports	1,1	79	-1.68**	1.77***		-0.24***	-0.02	0.01	0.01***
			-0.86	-0.32		-0.05	-0.01	-0.01	0
(Lags: 1; Sample: 1994:III-2014:I; Seasonal dummies for the first, second, and third quarters included)									

Note: Number of Co-integrating Vectors indicates the number of co-integrating relations accordingto the trace and maximum eigenvalue test using 5% asymptotic critical values.
*** (**)[*] denotes significance at the 1% (5%) [10%] level.

Table 2a: Non-Life Insurance Penetration in Real US Dollars

	Philippines	Indonesia	China	Thailand	Malaysia	Japan	Korea
1990	10.12	10.77		20.08	241.39	486.19	183.66
1991	10.09	10.85		22.29	265.43	495.47	217.44
1992	11.19	11.34	5.87	26.15	290.09	732.80	244.45
1993	12.61	12.38	6.46	34.44	309.74	773.84	255.29
1994	13.23	14.95	7.50	40.21	319.07	760.89	287.64
1995	13.44	16.54	7.93	45.05	315.01	785.75	347.25
1996	13.12	16.23	8.98	49.45	342.90	820.97	402.65
1997	13.60	15.89	9.49	44.18	362.72	791.78	466.72
1998	9.99	14.82	10.07	33.29	351.79	736.45	379.28
1999	8.98	12.25	10.60	32.92	354.84	724.25	387.33
2000	8.46	11.43	11.99	34.02	393.47	717.65	356.44
2001	8.65	14.02	13.25	37.17	369.02	696.49	462.15
2002	9.41	15.59	14.65	41.56	389.97	721.20	489.66
2003	9.15	15.31	15.87	45.87	395.47	719.45	489.89
2004	8.84	15.47	18.60	48.76	416.58	722.66	514.82
2005	10.06	14.94	20.10	48.56	323.70	721.50	562.09
2006	9.21	13.67	23.60	51.75	329.90	724.53	641.92
2007	9.08	13.30	28.84	51.83	317.55	710.43	721.88
2008	8.88	13.42	31.16	51.94	309.23	691.65	772.11
2009	8.86	12.96	38.41	51.43	308.98	677.72	874.85
2010	9.49	12.77	48.53	55.61	374.46	690.30	1005.31
2011	11.41		53.28	58.72	347.49	721.24	1152.72

Note: To obtain these values, data on non-life insurance coverage are multiplied by each country's GDP as measured in real US dollars. This product is then divided by the population in each country.

Source: World Bank Global Financial Development Database, CEPII-CHELEM Database, and calculations by the author.

Table 2b. Non-Life Insurance Penetration in PPP Dollars

	Philippines	Indonesia	China	Thailand	Malaysia	Japan	Korea
1990	24.54	26.20		49.49	311.06	361.10	238.18
1991	24.47	26.39		54.93	342.04	367.99	281.99
1992	27.15	27.57	10.82	64.46	373.82	544.25	317.02
1993	30.59	30.11	11.91	84.89	399.13	574.73	331.08
1994	32.10	36.35	13.82	99.10	411.16	565.12	373.03
1995	32.62	40.23	14.61	111.05	405.92	583.58	450.34
1996	31.83	39.47	16.56	121.89	441.86	609.74	522.19
1997	32.99	38.63	17.50	108.91	467.41	588.06	605.28
1998	24.23	36.05	18.57	82.05	453.33	546.97	491.87
1999	21.79	29.79	19.54	81.15	457.25	537.91	502.32
2000	20.53	27.81	22.10	83.85	507.03	533.00	462.25
2001	20.99	34.09	24.42	91.63	475.53	517.29	599.35
2002	22.83	37.92	27.01	102.45	502.52	535.64	635.02
2003	22.19	37.23	29.26	113.07	509.61	534.34	635.33
2004	21.44	37.61	34.28	120.19	536.81	536.73	667.66
2005	24.41	36.32	37.04	119.69	417.12	535.87	728.95
2006	22.35	33.23	43.50	127.56	425.12	538.11	832.49
2007	22.02	32.35	53.15	127.76	409.20	527.64	936.19
2008	21.54	32.63	57.43	128.03	398.48	513.69	1001.33
2009	21.48	31.51	70.81	126.78	398.15	503.35	1134.57
2010	23.02	31.06	89.44	137.07	482.54	512.69	1303.76
2011	27.68		98.20	144.75	447.78	535.67	1494.93

Note: To obtain these values, data on non-life insurance coverage are multiplied by each country's GDP as measured in PPP. This product is then divided by the population in each country.

Source: World Bank Global Financial Development Database, CEPII-CHELEM Database, and calculations by the author.

Table 3: Panel DOLS's Estimates of the Income Elasticity of Non-life Insurance

	(1)	(2)
Real GDP per capita	1.22***	
	(0.07)	
PPP GDP per capita		1.22***
		(0.07)
Cross-section Fixed Effects	Yes	Yes
Heterogeneous Linear Trend	Yes	Yes
Adjusted R^2	0.998	0.997
Sample Period	1991-2011	1991-2011
No. of Countries	81	81
No. of Observations	1636	1636

DOL = dynamic ordinary least squares.
Source: Author's calculations.

Table 4a: Difference between Actual and Predicted Non-Life Insurance Penetration in Real US Dollars

	Philippines	**Indonesia**	**China**	**Thailand**	**Malaysia**	**Japan**	**Korea**
1990							
1991		-1.46		-5.34		-214.75	-5.05
1992	-0.42	-1.62	0.40	-3.88	-13.24	11.34	-0.93
1993	0.78	-1.09	0.21	1.65	-6.23	53.25	-0.78
1994	0.79	0.93	0.38	4.09	-1.67	42.36	10.76
1995	0.62	1.88	0.12	5.26	-7.66	64.02	34.83
1996	0.19	0.81	0.33	7.60	12.23	94.48	51.89
1997	1.53	-0.12	-0.01	4.23	15.30	67.82	32.70
1998	-0.06	-0.36	-0.10	-0.40	3.75	8.47	3.41
1999	-0.48	-0.65	-0.49	-3.27	-2.25	9.17	14.77
2000	-1.49	-1.21	-0.35	-3.74	27.49	14.33	-84.55
2001	-0.86	1.24	-0.25	-0.82	-4.06	-13.38	-6.87
2002	0.24	2.78	-0.49	1.42	-20.77	11.60	-35.40
2003	-0.37	2.35	-1.28	2.64	30.38	9.61	-67.38
2004	-1.07	2.32	-0.62	2.77	47.81	8.79	-73.94
2005	0.37	1.54	-2.11	0.59	-32.45	-5.09	-59.00
2006	-0.25	-0.05	-2.43	1.05	-4.04	-9.45	-14.51
2007	-0.54	-0.75	-2.21	-1.80	-20.33	-20.54	-4.15
2008	-0.01	-1.07	-1.39	-2.90	-23.05	-26.64	-19.33
2009	0.86	-1.88	1.99	-1.19	-32.27	-54.21	108.21
2010	1.07	-2.31	6.71	-3.14	19.13	10.28	189.27
2011			7.57	1.09	29.01		

Note: The table presents the difference between actual and predicted values of non-life insurance payments as measured in real US dollars per capita. Actual values are calculated by multiplying data on non-life insurance coverage by each country's GDP measured in real US

dollars. This product is then divided by each country's population. Predicted values are calculated based on the model presented in Table 3.
Source: World Bank Global Financial Development Database, CEPII-CHELEM Database, and calculations by the author.

Table 4b: Difference Between Actual and Predicted Non-Life Insurance Penetration in PPP US Dollars

	Philippines	Indonesia	China	Thailand	Malaysia	Japan	Korea
1990							
1991		-3.55		-13.16		-159.50	-6.56
1992	-1.01	-3.94	0.73	-9.56	-17.06	8.42	-1.21
1993	1.89	-2.64	0.39	4.08	-8.03	39.55	-1.01
1994	1.91	2.26	0.69	10.08	-2.15	31.46	13.95
1995	1.50	4.56	0.21	12.96	-9.88	47.55	45.17
1996	0.45	1.98	0.61	18.74	15.76	70.17	67.29
1997	3.72	-0.28	-0.02	10.41	19.71	50.36	42.41
1998	-0.14	-0.86	-0.19	-0.98	4.84	6.29	4.42
1999	-1.17	-1.57	-0.90	-8.06	-2.90	6.81	19.16
2000	-3.61	-2.93	-0.64	-9.23	35.42	10.64	-109.65
2001	-2.08	3.02	-0.46	-2.01	-5.23	-9.94	-8.91
2002	0.57	6.76	-0.89	3.50	-26.76	8.62	-45.91
2003	-0.88	5.72	-2.36	6.50	39.14	7.14	-87.38
2004	-2.60	5.64	-1.14	6.83	61.61	6.53	-95.89
2005	0.90	3.75	-3.89	1.44	-41.81	-3.78	-76.52
2006	-0.61	-0.11	-4.48	2.58	-5.21	-7.02	-18.82
2007	-1.32	-1.82	-4.07	-4.45	-26.20	-15.26	-5.38
2008	-0.02	-2.61	-2.56	-7.14	-29.71	-19.79	-25.07
2009	2.08	-4.56	3.66	-2.92	-41.57	-40.26	140.34
2010	2.60	-5.63	12.36	-7.74	24.65	7.63	245.46
2011			13.95	2.70	37.38		

Note: The table presents the difference between actual and predicted values of non-life insurance payments as measured in PPP US dollars per capita. Actual values are calculated by multiplying data on non-life insurance coverage by each country's GDP measured in PPP. This product is then divided by each country's population. Predicted values are calculated based on the model presented in Table 3
Source: World Bank Global Financial Development Database, CEPII-CHELEM Database, and calculations by the author.

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Appendix. Countries Used in the Estimation in Section 4

Algeria, Argentina, Australia, Austria, Bahamas, Bahrain, Bangladesh, Barbados, Bolivia, Cameroon, Canada, Cape Verde, Chile, China, Costa Rica, Cyprus, Denmark, Dominican Republic, Ecuador, El Salvador, Ethiopia, Fiji, Finland, France, Gabon, Germany, Ghana
Guatemala, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Kenya, Kuwait, Luxembourg, Madagascar, Malaysia, Malta,
Mauritius, Mexico, Morocco, Myanmar, Nepal, Netherlands, New Zealand, Nigeria, Norway,
Oman, Pakistan, Panama, Paraguay, Philippines, Portugal, Russian Federation, Singapore,
Slovenia, South Africa, Korea, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, United Kingdom, Venezuela, Yemen, Zambia.

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