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ASIA BEYOND THE GLOBAL ECONOMIC CRISIS

The Transmission Mechanism of Financial Shocks

Edited by
Satoshi Inomata

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Foreword

The book *Asia beyond the Global Economic Crisis*, produced by the
Institute of Developing Economies, offers an important contribution to
the empirics of the new trade economy. The analysis focuses on the impor-
tance of economic interactions in explaining the modern global economy,
and the role of international production networks.

In today's world, the complexity of productive and commercial rela-
tionships has dissociated the localization of final production units from
the location of the value added included in the final product. Global
manufacturing, characterized by the vertical integration of productive
processes and the off-shoring of industrial tasks, has led to an increase
of trade flows in intermediate goods, especially in the manufacturing
sector. The traditional notion of country of origin, so dear to tradi-
tional trade statisticians, is gradually becoming obsolete as various
operations from the design of a product to the manufacture of its
components, their assembly and related marketing have spread across
the world. Nowadays more products are *'Made in World'* rather than
'Made in' a specific country. This trade in parts, components and
accessories relates to the exchange of goods sent abroad for further
processing, or 'trade in tasks' that add value along the production
chain.

As the recent crisis indicates and the book illustrates compellingly, this
closer interdependency was also behind the fast and synchronized trans-
mission of shocks the world economy experienced after the financial crisis
of September 2008. It is also behind the strong recovery that international
trade has been experiencing in 2010, after the coordinated efforts from the
largest developed and developing economies to sustain demand when the
crisis was at its deepest.

Many analysts have been caught off guard by the speed and the syn-
chronization of the process. This is partly due to the lack of proper
statistical indicators to properly analyse trade and the creation of value
along the global supply chains. This volume offers an important contribu-
tion towards this aim, and represents one facet of the fruitful partnership
between IDE-JETRO and the WTO to measure vertical specialization and
trade in value added. Measuring accordingly the international chain of
value will provide relevant information on the new business model behind

global manufacturing, where trade in goods is progressively substituted by 'trade in tasks'.

Among all the interesting results presented by the various authors using the very technical point of view of input–output analysis, I wish to highlight one, which is of particular importance for policy makers: in the face of such a complex global production system, the appropriate counter-crisis policy should not isolate the national economies within some out-dated protectionist measures, but should look at devising systemic and cross-national programmes.

Pascal Lamy
Director-General
World Trade Organization
2011

Preface

The financial crisis from the United States, as triggered by the collapse of Lehman Brothers, has rapidly spread to the real side of the economies. Many advanced nations were trapped in persistent downward spirals and felt the painful cost of seeking an exit strategy. The story, of course, was not irrelevant to the emerging economies in Asia, despite the unprecedented growth they had enjoyed over the last decade or so. In particular, China, the 'Factory of the World', lost its foreign customers and currently faces the urgent need to redirect its products towards the domestic market.

For many, the term 'globalization' still remains a key concept in describing the world economy. The rapid development of cross-national production networks has significantly deepened economic interdependency in various parts of the globe. The production process has become fragmented and exchanged between countries according to the rule of comparative advantage, to facilitate the efficient division of labour and enhance resource allocation. There is no doubt that the expansion of international production chains, assisted by sophisticated management skills and advanced logistic technology, has played an important role in boosting the contemporary world economy. But then, what do we see today?

When we consider the nature of the recent crisis, we may refer to the close analogy of the conjuncture to the day-to-day problems that we face in the age of the Internet. The development of information technology and the worldwide web have undoubtedly improved the mode of communications, and the benefit of increased efficiency for global knowledge exchange is undeniable. Simultaneously, however, over-exposure to anonymous users has invited the immediate danger of cyber attacks and contagion, revealing the structural vulnerability of the system to which we belong. What has happened to the world economy over the past few years, from the Lehman shock to the Greek debt crisis, or even to the Tohoku Earthquake Disaster in Japan, presents a strong resemblance to such an intertwined cyberspace; an economic shock that occurs in one country is quickly and widely transmitted to the rest of the world through extensive cross-border supply chains. The rapid contraction of world trade and output is nothing but the negative outcome of such a complex global production system.

There *is* an important difference, however. While the antidote to a

computer virus infection is simply to disconnect the terminal from the Internet and individually give anti-virus treatment, the counter-crisis measure here, in contrast, is *not* to isolate the economy. History is supposed to have taught us this point, yet the recent protectionist movement is a frustrating, albeit somewhat predictable reaction of misguided countries.

What is required is internationally concerted action on the basis of a firm understanding of how the system works (or not, as the case may be) in times of crisis. The 'Economics of the crisis', therefore, entails a detailed examination of the mechanics of shock transmission, by probing the labyrinth of complex supply networks among the countries. This book investigates the nature of the global economic crisis from the perspective of cross-national production systems based on international input–output analyses, and aims to envisage the prospect of the post-crisis Asian economy.

On this occasion, I would like to express my sincere gratitude to the researchers of international organizations/academic institutions who have kindly offered us the opportunity to present the preliminary research results, in response to which we were able to receive invaluable feedback from specialists in various fields for the further elaboration of the study, including particularly, but by no means limited to the following: Ludovico Alcorta and Nobuya Haraguchi of the UN Industrial Development Organization (UNIDO), Carlo Filippini of Bocconi University, Jose M. Rueda-Cantuche of the IPTS European Commission, Masataka Fujita of the UN Conference on Trade and Development (UNCTAD), Tuomas Peltonen and Gabor Pula of the European Central Bank, Kiichiro Fukasaku of the Organisation for Economic Co-operation and Development (OECD), Michel Fouquin of Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), Machiko Nissanke of the School of Oriental and African Studies, University of London (SOAS), and Gabriele Suder of SKEMA Business School, while the ardent logistic support of Yutaka Hashimoto and Tomoharu Mochizuki is highly appreciated, without which the mission could not have been completed successfully.

We are also indebted to Yosuke Noda, who kindly assisted us in the laborious computation of numerous trade statistics.

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Director of the International Input–Output Project
IDE-JETRO
2011

Contents

Introduction

Satoshi Inomata

The characteristic feature of the recent global economic crisis is the speed and extent of the shock transmission. The rapid development of cross-national production networks over the past several decades has significantly deepened the economic interdependency between countries, and a shock that occurs in one region, whether positive or negative in nature, will be swiftly and widely transmitted to the rest of the globe. The sudden contraction of world trade and output was, indeed, a negative outcome of this intertwined global economic system.

The major focus of this book is directed at the analysis of 'triangular trade through China', which is considered to have formed the principal mechanism of shock transmission in the Asia-Pacific region under the crisis.

The USA, one of the main players of the 'triangular trade', has always been the largest customer for the products of the region. Its consumption demand, backed by enormous purchasing power, was a leading catalyst for regional output growth.

In the first decade of the twenty-first century, China became a major trade partner for the United States, and rapidly increased its exports of final consumption goods to US markets to meet their unlimited consumption demand. Here, China specialized in the final assembling stage of the production process, since its technical requirement is quite labour-intensive and hence advantageous for a country with a massive labour force.

The growth of China's manufacturing export is supported by the supply of intermediate inputs from other Asian countries. In contrast to China, other emerging economies in the region specialized in the production of parts and accessories, which usually require higher levels of technology and sophisticated management skills.

Therefore, the 'triangular trade through China' assumes a structure of product flows whereby: (1) Asian countries (including Japan) produce parts and accessories and export them to China; and (2) China assembles them into final goods; (3) which are further exported to the US markets for consumption (see Figure I.1).
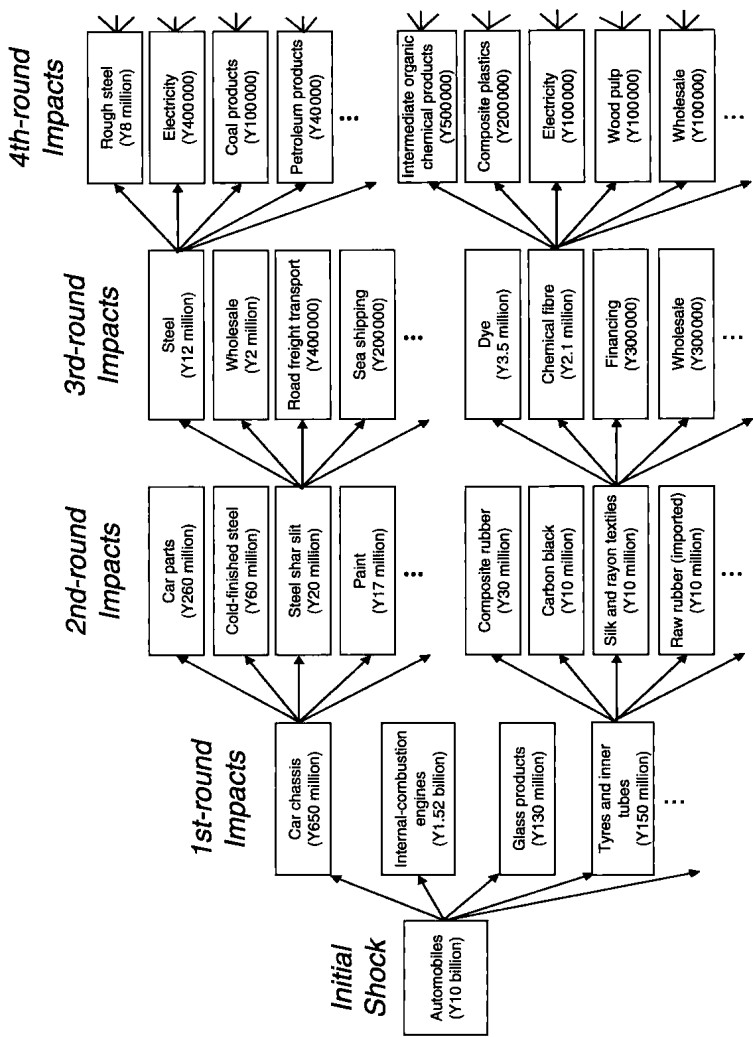
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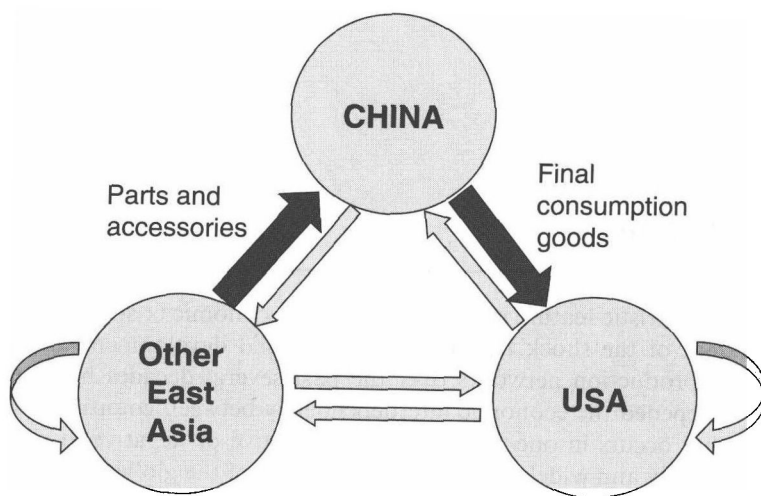
Source: Drawn by the author.

Figure I.1   Triangular trade through China

There is no doubt that the 'triangular trade through China' prevailed as a primary growth engine for the Asia-Pacific region. The opposite picture, however, is equally possible and valid. The collapse of US consumption demand under the crisis caused a significant decline of Chinese exports to the United States, which further reduced China's import demand for intermediate inputs from neighbouring Asian countries. The negative shock of the economic crisis propagated quickly and extensively through-out the region via complex production networks among countries, yet, on top of this, the 'triangular trade through China' is considered to have functioned as the US–Asia 'turnpike' for the shock transmission within the region.

The direct impact of the contraction of the US import demand can be measured by a simple reference to the change in trade statistics, but the entire effect of the impact on industries, both through direct and indirect channels, can be examined only by probing the intertwined production networks among the countries (see Figure I.2). The Asian International Input–Output Tables (AIO tables), constructed by the Institute of Developing Economies, JETRO, are used for this particular purpose, and they enable us to capture all recursive impacts of negative demand shock, both direct and indirect, on every industry of every country in the Asia-Pacific region.[1]

Initial Shock

Automobiles (Y10 billion)

1st-round Impacts

Car chassis (Y650 million)

Internal-combustion engines (Y1.52 billion)

Glass products (Y130 million)

Tyres and inner tubes (Y150 million) ...

2nd-round Impacts

Car parts (Y260 million)

Cold-finished steel (Y60 million)

Steel shar silt (Y20 million)

Paint (Y17 million) ...

Composite rubber (Y30 million)

Carbon black (Y10 million)

Silk and rayon textiles (Y10 million)

Raw rubber (imported) (Y10 million) ...

3rd-round Impacts

Steel (Y12 million)

Wholesale (Y2 million)

Road freight transport (Y400000)

Sea shipping (Y200000) ...

Dye (Y3.5 million)

Chemical fibre (Y2.1 million)

Financing (Y300000)

Wholesale (Y300000) ...

4th-round Impacts

Rough steel (Y8 million)

Electricity (Y400000)

Coal products (Y100000)

Petroleum products (Y40000) ...

Intermediate organic chemical products (Y500000)

Composite plastics (Y200000)

Electricity (Y100000)

Wood pulp (Y100000)

Wholesale (Y100000) ...

Figure I.2   Image of shock propagation

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CHAPTER 1: THE TRIANGULAR TRADE: THE SHOCK TRANSMISSION MECHANISM IN THE ASIA-PACIFIC REGION

Chapter 1 attempts to measure the impact of the crisis by a simple multiplier analysis using an orthodox international input–output model. A change or 'shock' that occurs in one industry in one country will be transmitted and amplified through complex cross-national production networks, and inflict a larger and wider impact on the rest of the region. This is called a multiplier effect. By decomposing the multiplier effect into three types according to the shock transmission channels (the domestic linkage channel, the 'triangular trade' channel, and other inter-country linkage channel), the chapter reveals that the shock delivered by the 'triangular trade through China' caused significant damage to the entire Asia-Pacific region.

For the analysis at the industrial level, it emerges that the output of manufacturing products with complex architecture, such as computer equipment and electrical appliances, was seriously affected by external shocks. The production of these goods is more prone to offshoring since its manufacturing process is separable into several stages and the parts and accessories are relatively compact and lightweight (and can hence be easily delivered across countries). Consequently, the production activities of these goods, extensively connected to regional production networks, became highly vulnerable to shocks coming from outside.

CHAPTER 2: IMPACT OF THE GLOBAL ECONOMIC CRISIS ON EMPLOYMENT IN THE ASIA-PACIFIC REGION

Chapter 2 continues the analytical focus of Chapter 1, yet shifts its attention to employment issues. It devises the indices of 'employment gain potential' and 'employment give-out potential', which present a balance sheet of employment opportunities for each country brought about by the engagement in international trade. The combination of both indices shows that, in the Asia-Pacific region, China is the biggest receiver of job opportunities, while the USA is the most benevolent provider. From 2000 to 2008, however, there was a marked structural change in the gain/give-out relationship of the region. China continues to benefit from the USA's strong demand for its exports, yet started to give out job opportunities to other neighbouring countries through the increase in its import demand for intermediate goods from the same. Here, the emergence of

'triangular trade through China' is observed again. What happened in the commodity markets was echoed in the labour markets in the Asia-Pacific region.

Chapter 2 also contributes to the analysis by calculating the impact of the crisis on regional employment. By using the same analytical framework as in Chapter 1 but extending the model of 'employment multipliers', the chapter simulates the potential number of job losses in each country for the years 2008 and 2009. A particular focus is placed on the 'transfer of unemployment' between countries, in which China is found to be the main transmission hub for Asian countries.

CHAPTER 3: INTERNATIONAL TRADE AND REAL TRANSMISSION CHANNELS OF FINANCIAL SHOCKS IN GLOBAL PRODUCTION NETWORKS: AN ASIAN–USA PERSPECTIVE

The analyses in the first two chapters are based on the demand-driven model, generally known as the 'Leontief model'. The contraction of final demand leads to a decline in the output of final goods, which reduces the demand for and thus the production of parts and accessories, which further induces the output decline of sub-parts and materials, and so on. The negative impact is transmitted 'backward' along production chains from downstream to upstream industries.

The impact can also propagate in the opposite direction. The change that occurs at a certain point in the vertical chain is recurrently transferred to the subsequent stages of the production process, moving 'forward' all the way down to the terminals of supply-demand circuits. The analytical model used to capture such transmission mechanism is of the supply-driven type, known as the 'Ghosh model', which forms a dual counterpart of the Leontief model.

Unlike the other studies conducted in this book, Chapter 3 deals uniquely with the price effect of the financial crisis by employing the supply-driven model. Its analytical focus is devoted to the impact of the credit crunch, the global conjuncture of the current state, which is anticipated to disrupt the smooth functioning of vertical production networks.

After the sub-prime shock, many small-scale manufacturers are finding it increasingly difficult to gain access to credit markets, and at some point may choose to shut down factories lacking operational finance. The sudden stop in the supply of key intermediate products will force downstream clients to seek other sources, yet switching from one supplier to another is a difficult task for the producers of differentiated products,

especially of high-tech industries, which use highly knowledge-intensive parts and components and require specific production technologies. Finding an appropriate alternative involves considerable costs (searching costs, transaction costs, training costs and so on). Consequently, the unit cost of production is bound to increase. The increase in production cost is a typical example of supply-side shocks, which will reverberate and propagate to other industries by cumulative price mark-ups along the vertical production chains.

Applying the supply-driven model to the AIO tables, the chapter simulates the mark-up effect of a price shock for the selected Asian countries in the face of the contagious credit crunch. By doing so, it attempts to bridge the real and monetary sides of the economies under the crisis.

The simulation results show that the relative size of the shock on the domestic economy depends on its degree of openness, and also on the relative size of the originating industrial sector in relation to the rest of the economy. As for the cross-national transmission of price shocks, Japan is found to be the largest exporter of potential inflation, while Malaysia and Thailand are the most vulnerable to such shocks, apparently due to the considerable foreign orientation of the manufacturing sector. From 2000 to 2008, China increased its influence as an exporter of the price shock, yet its vulnerability to imported shocks remained relatively stable.

CHAPTER 4: VERTICAL SPECIALIZATION AT THE TIME OF ECONOMIC CRISIS

The last few decades have been marked by the rapid development of vertical production networks within the Asia-Pacific region. Manufacturing goods are no longer produced in a single country. Production processes are fragmented into several stages, and countries specialize in each production stage according to their own comparative advantages.

Chapter 4 is devoted to investigating the impact of the crisis on the vertical production networks of the Asia-Pacific region, by adopting the Vertical Specialization (VS) index. The VS index measures a country's degree of participation in cross-national production networks by calculating the amount of 'imported inputs used for producing a good that is subsequently exported'. The chapter, however, extends the model by employing the AIO tables as principal data, the unique feature of which enables the VS index to be decomposed into two indices: 'VS_i' and 'VS_f'.

VS_i is the VS index of exports for intermediate usage in foreign countries, which shows the level of participation in the production of parts and components. VS_f, on the other hand, is the VS index of exports for

overseas final consumption, which is thus considered to indicate the degree of engagement in the final assembly process.

From the viewpoint of vertical production chains, whether a country is mainly exporting intermediate goods or final consumption goods is directly related to the country's technological profile within the international division of labour. It is generally considered that the production of parts and components requires sophisticated technology with qualified logistics management for just-in-time delivery. The assembly of components required to complete the final consumption goods, in contrast, entails relatively simple routines with low working skills. So, by comparing the values of VS_i and VS_f, one can profile the technological development of the countries concerned.

The calculation results show that the upstream production process of intermediate goods (as measured by the VS_i index) was relatively 'resistant' to the impact of the crisis, compared to the assembly process at the end of the production chains (as measured by the VS_f index), which was directly and immediately affected by the contraction of final demand.

The analysis also confirms the prevalence of the 'triangular trade through China', yet with a striking new finding. The 'triangular trade' presumed China's role to be a mere assembler of final products. The comparison of VS_i and VS_f indices of China, however, reveals that the country has already 'stepped up' the technological ladder and recently promoted its position within the regional production networks from a simple assembler of final goods to a producer of parts and components. The 'triangular trade through China' has undergone a significant qualitative change in recent years, and its contents are no longer the same as a decade ago.

CHAPTER 5: THE IMPACT OF THE FINANCIAL CRISIS ON FACTORY ASIA

Now, based on the VS analysis of Chapter 4, the importance of production networks for intermediate goods is very apparent. They determine the length of the vertical production chains and the complexity of supply–demand networks. In order to envisage the post-crisis production system in the Asia-Pacific region, there is a need for detailed analysis of the trade mechanism of intermediate goods.

Chapter 5 contributes to this subject. This chapter employs a conventional regression analysis with the Ordinary Least Squares method, in order to identify the determinants of trade in intermediate products. The design of the equation system is based on the popular gravity model, yet the originality and strength of the study resides in its treatment of datasets.