Study on Foreign Dependencies of East Asian Countries under the Global Value Chain System

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Abstract—**From the perspective of global value chain, this paper divides the East Asian region's dependencies in the global production division network into "upstream dependencies" and "final demand dependencies" according to Koopman's GVC decomposition principle. We use OECD database to build two index systems of "relevance degree" and "final demand contribution rate" for empirical analysis. The analysis finds that in the "upstream dependence" level, the degree of internal dependency in East Asia as a whole is higher than external dependence. The economic links within the East Asian region within the global value chain are increasingly closer. China's status as an upstream supplier in East Asia is rising, and Japan is declining. At the "end demand dependency" level, the East Asian region still has a certain degree of dependence on external Europe and the United States. However, this dependency relationship has shown a tendency of rising first and then decreasing. At the same time, China's economic dependence on Japan and South Korea is decreasing, and Japan's and South Korea's economic dependence on China is deepening. This also means that China's final demand has contributed to the economic growth of Japan and South Korea.**

Keywords—East Asia; upstream dependence; final demand dependence; internal dependence; external dependence

I. INTRODUCTION

After World War II, economic development in East Asia region has always been strongly dependent on external markets. Since 1960s, Asian economies taking off one after another after Japan and such phenomenon is called the "flying geese paradigm". Its main characteristic is that the developed economies gradually transfer the eliminated industry to the underdeveloped economies, thus realizing the succession of the industrial structure in the region.

Under this development mode, the East Asian region has achieved a sustained growth of more than thirty years, which is reputed as the "East Asian miracle" by the World Bank.

During this period, the exuberant market demand of Europe and the United States promoted the rapid growth of the export scale of all East Asian economies, and played an irreplaceable role in ensuring the rapid economic development of East Asia.

After the 1990s, along with the increase in cross-border direct investment (FDI), international production cooperation, and trade in intermediate products, the vertical specialization within products has rapidly expanded in East Asia, and the pattern of the "flying geese" has gradually become blurred in East Asia.

In the new regional division of labor system, the assembly and processing capabilities of most of the developing economies in East Asia (such as China) have been steadily increasing, and they have developed a "triangular trade" pattern with Japan, Europe and the United States characterized by vertical division of labor between industries [10]. The pattern is that the East Asian economies often exhibit a continuously expanding deficit in the trade of intermediate products. On the other hand, the trade surplus of finished products with developed countries such as Europe, the United States, Japan, etc. continues to grow [2]. This shows that most of the developing economies in East Asia are faced with the so-called "two outer" production and trade pattern, that is, a dual dependence on the import of intermediate goods and the export of manufactured goods.

The dependence of East Asian countries on external markets indicates the vulnerability of East Asian economies under the impact of external markets. This was clearly demonstrated during the 2008 financial crisis. After the financial crisis in 2008, the impact of major European and American markets on the exports of East Asia caused many researchers to question the development model of overreliance on external markets in East Asia [5][6].

In the late 1990s, the economic development rate in East Asia was much higher than that in Europe and America over a long period of time. This phenomenon caused researchers to discuss the "Decoupling" of the East Asian economy, that is, whether the synchronization of East Asian economic cycle and external economic cycle is weakening [1][7]. The Asian Development Bank define "decoupling" as follows: The fluctuations in the economic cycle are relatively independent of world demand trends and are mainly influenced by changes in internal demand (ADB, 2007).

Generally, there are three reasons accounting for the "Decoupling" of the East Asian economy: First, according to official trade statistics, trade links between East Asia and other regions like Europe, Japan, and especially the United States are weakening. Secondly, with the increase of production efficiency or revenue in the region, the purchasing power in

East Asia has been continuously enhanced. In particularly, there are countries like China in the region with a rapid growth, large population and giant size whose booming volume of domestic demand contributes to the "Decoupling". Finally, East Asian countries currently have stronger capabilities to withstand external economic fluctuations. Current account surpluses, large amounts of foreign exchange reserves and ample budgets all leave sufficient room for policy implementation [9].

Two views above point to two opposite directions respectively, so how is East Asian countries' dependence relationship in the global division of labor is a problem worth further researching. The purpose of this paper is to analyze the dependence of East Asian countries on the economies within and outside the region from the perspective of backward linkage and final demand based on value added.

Specifically, this article will answer the following questions:

1. What is the degree of backward linkage and whether inner linkage is higher than outer linkage. Whether outer linkage declines as inner linkage significantly improves.

2. What is the degree of dependence of final demand and whether inner dependence is higher than outer dependence. Whether inner dependence significantly improves.

Generally, researches about East Asian countries' dependence relationship in the global economy mostly adopt import and export trade statistics based on traditional statistical method. Vertical specialization with products result in repeated import and export between different countries, so traditional import and export trade statistics contain a proportion of "Double Counting". The traditional import and export method cannot reflect the status and real benefits of each country in the trade system [3] while the calculation method of "value added" can effectively avoid "double counting" and thus obtain a clearer recognition of the status and real benefits of different countries in the trade system [4].

Few researches study the problem of trade dependence in the method of "value added": Wang et al.(2009)employed Asian International Input-Output (AIO) provided by IDE (Institute of Development Economies) to analyze Asian countries' position in the global division of labor through improved indexes of vertical specialization [8].

Pula and Peltonen (2009) also used AIO to analyze East Asian countries' dependence on outer economies. The focus is on analyzing the dependence of Asian developing countries on parts, components and final demand in Europe, the United States and Japan. The results indicate East Asian counties don't have a significant "decoupling" phenomenon. In the contrast, the linkage between East Asian countries and other countries are deepening no matter regionally or globally [9].

Papers above provides meaningful conclusion to the problem of East Asian countries' dependency on outer economies, but they also have limitations. The databases they use only include a few Asian countries and countries outside, and the time is short. So it is difficult to analyze its trend.

Zhongli Liu and Ying Zhao (2014) construct an index to measure East Asian countries' "forward linkage" and "final demand dependent". The result shows that, from the angle of "forward linkage", East Asian countries' inner linkage is higher than outer linkage and from the angle of "final demand dependent", East Asian countries have a degree of dependence on Europe and the United States. But the database they use is an older version TiVA database by OECD whose data is comparatively out of date so it's difficult to use them to predict the trend of the index.

Compared with references, the contributions of this paper are reflected in the following aspects.

First, the text employed the latest TiVA database by OECD which covers a wider range of countries so we can analyze the real situation of various economies more truly and concretely. Second, this paper tries to analyze the process, trend and possible causes of the change through the analysis of more years' data. Finally, the text extends the analysis scope to RCEP(Regional Comprehensive Economic Partnership) countries compared with existing literatures. Although the inner trade linkage of East Asian counties has reached the level of EU and NAFTA, no institutional framework for cooperation is built in this region. There have been several alternative institutional frameworks for different scopes and levels of cooperation in East Asia (i.e. TPP and APEC), but RCEP is the only one under negotiation now and is most likely to complete and become the basic framework of economic integration in East Asia. The text considers adopting RCEP as the scope of East Asian region to judge the economic dependence within and outside.

The structure of the content of the body part is as follows: Chapter Two is the introduction of theory; Chapter Three is the analysis; Chapter Four is the conclusion.

II. INTRODUCTION OF THEORY

With the development of economic globalization, trade activities between countries and regions all over the world are becoming more frequent and trade links are closer. Under this background, the phenomenon of international division of labor and production separation began to appear in the global trading network. At the same time, the trade of intermediate products has also developed rapidly. East Asian Region is one of the most important trade areas around the world, so both volume and growth of trade of intermediate goods exceed that of finished goods. Traditional statistical method used now ignores the existence of intermediate goods so the repeated calculation causes the inflation of trade value. It is obvious that traditional statistical method cannot measure East Asian countries' trade position precisely.

In 1995, Krugman raised the concept of global value chain (GVC) where different stages of production process are located across different countries and the profits are allocated according to the value created by each country. The proposal of GVC enables the tracing of the source of value added. We can study the dependence relationship with East Asian countries by decomposing GVC to quantify the real contribution of each country to the production division network.

In 2010, Krugman and others proposed the detailed principle of GVC decomposition. They decompose the gross export of a country into five Parts: Part one is domestic value

added in final exports, namely FDV; Part two is domestic value added in intermediate exports absorbed by direct importer, namely NDV; Part three is domestic value added in intermediate exports sent to first importer and then re-exported to third country, namely TDV; Part four is Domestic value added first exported then returned home, namely RDV; Part five is Foreign value added, namely FV. Part one, two, three and four add up to be total domestic value added in one country's exports, namely DV. Part two, three and four are further decomposition of domestic value added based on the purpose of use of importers. It has to be pointed out that only part one, two and three are truly absorbed by importers while part four returns home after international circulation and is absorbed home finally. Besides, the sum of part one and two are directly exported domestic value added, namely DDA while part three is indirectly exported domestic value added.
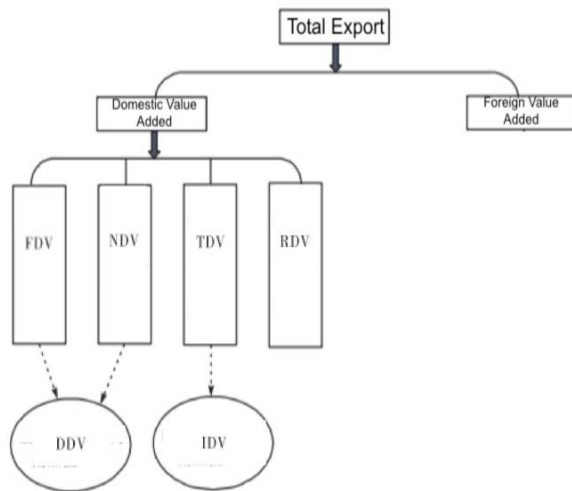

Fig. 1. Decomposition of the total export

III. ANALYTICAL FRAMEWORK AND CONSTRUCTION OF INDEXES

A. The Framework of Analysis

In the past, scholars mainly focused on the final demand when studying the trade position and dependence of the East Asian region.

With the development of trade in intermediate products, trade relations among countries are reflected in the aspects of upstream and downstream in addition to the final demand.

In order to facilitate the research, the text studies East Asian countries' dependence relationship in the GVC from aspects of "upstream dependence" and "final demand dependent", as follows:

(1) Once a country put imported intermediate goods into production, then its exports will contain value added of one or more upstream countries, namely FV. This is the "upstream dependence" of upstream suppliers to the upstream suppliers in the production chain, which is the backward linkage in the vertical integration of GVC. The greater the proportion of imported intermediate goods included in a country's exports, the greater the "upstream dependence" of that country on other countries. It should be noted that the "upstream dependence" in

the text refers only to the backward linkage existing in the production of export products.

(2) FDV, NDV and TDV form the "final demand dependent" of one country to its target countries. We analyze the final demand dependencies among countries from the perspective of final products. In essence, "final demand dependent" calculates the actual export of a country to other countries more accurately from the perspective of value added. Since export growth has a positive relationship with the growth of a country's GDP, "final demand dependent" can reflect the economic dependence between two countries to some extent. The more value added a country absorbs from other countries, the greater its contribution to the economic growth in other countries, and the greater other countries depend on it.

Finally, in order to further study the relationships between economies, the text will analyze from both external and internal angles. From the angle of "upstream dependence", if the economy's dependence on the region inside is greater than outside, it means that the economy has a higher degree of "internal dependence" in the production specialization in the GVC, and the internal linkages of the economy are closer. From the angle of "final demand dependent", if the economy's dependence on the region (i.e. RCEP) inside is greater than outside, it shows that the economic dependence within the region is relatively high, and the motivation of economic growth comes largely from within.

B. Establishment of Index

For the convenience of empirical analysis, "backward linkage (FV_{ij_share})" and "final demand contribution rate (FD_{ij_c})" are introduced to study the degrees of upstream dependence and final demand dependent.

1) Backward linkage (FV_{ij_share}):

Decompose foreign value added contained in the export of country i into $FV_{i1}, FV_{i2}, \cdots, FV_{ij}, \ldots, FV_{in}$. FV_{ij} means foreign value added of country j contained in the export of country I, which indicates country i's dependence on country j as a downstream producer in the GVC. The backward linkage of country i to country j is $FV_{ij\_share} = \frac{FV_{ij}}{EX_i}$, which means the proportion of value added from country j contained in the export of country i, indicating country j's influence on country i as a upstream producer in the GVC. The greater FV_{ij_share} is, the greater value added from country j contained in the export of country i, and the greater country i's dependence on country j in the GVC. If an economy's extra-region FV_{ij_share} is greater than intra-region FV_{ij_share}, its "upstream dependence" outside the region is relatively high and the region relies more on the outside upstream supplier. Otherwise, the export of the economy contains more intermediate goods imported from intra-region which illustrates a deep degree of labor division and economic integration within the region.

2) Final demand contribution rate FD_{ij_c}:

According to Krugman's theory of GVC, domestic value contained in one country's export would not be fully absorbed by foreign final demands, among which the part of RDV will return home after international circulations and finally be

absorbed by home. So, only the sum of FDV, NDV and TDV will be fully absorbed by other countries.

Final demand contribution rate is $FD_{ij\_c} = \frac{DVFF_{ij}}{GDP_i}$. $DVFF_{ij}$ represents domestic value added created by country i and contained in the final demands of country j. GDP_i represents gross domestic product of country i during the same period.

Final demand contribution rate FD_{ij_c} illustrates the proportion country i's domestic value added contained in country j's final demand takes in the GDP of country i, namely, the dependence of the economic development of country i on the final demand of country j or the contribution of country j's final demand to the economic growth of country i.

FD_{ij_c} reflects country i's real economic dependence on country j in the GVC. The greater FD_{ij_c}, the greater "final demand dependent" of country i to country j, and the greater contribution of country j's final demand to the economic growth of country i.

Further, if an economy's intra-region FD_{ij_c} is greater than extra-region FD_{ij_c}, its economic growth is not excessively dependent on the demand from outside the region and countries within the region have closer economic ties.

IV. EMPIRICAL ANALYSIS BASED ON DATA FROM TiVA

In the part of empirical analysis, we will calculate and sort out RCEP countries' "backward linkage" and "final demand contribution rate" to study the "upstream dependence" and "final demand dependence" of Asian region and draw conclusions.

We will use TiVA database in OECD database to calculate indexes. The reason we choose OECD database is it nearly covers all East Asian countries and industries such as agriculture, manufacturing and service from 2000 to 2011.

A. Analysis of "upstream dependence"

We calculate and sort out backward linkages within and outside RCEP countries of 2000, 2005, 2008 and 2011 to analyze the degree of "upstream dependence" within and outside East Asian region. The results are showed in TABLE I.

The 17 economies in the first column are exporters and the US, EU15, Europe and America, RCEP are sources of value added. In order to make dynamic comparison, four years' data are included. Europe and America includes the US and EU15. Europe and America play an important role in the world economy, besides; they have close trade ties with RCEP countries, so we calculate "backward linkages" of RCEP countries to Europe and America to show the external dependence of RCEP countries. Meanwhile, we calculate "backward linkages" of RCEP countries to China, Japan, Korea, ZASI and ASEAN to show the internal dependence of RCEP countries.

TABLE I. THE INTERNAL AND EXTERNAL BACKWARD CORRELATION DEGREE OF EAST ASIAN COUNTRIES FROM 2002 TO 2011(%)

2002	Sources of Value Added				
Exporters	*US*	*EU15*	*US+EU15*	*East Asia*	*RCEP*
East Asia	6.9	3.52	10.42	5.91	9.5
JPN	2.24	1.03	3.27	2.6	2.79
KOR	5.83	3.26	9.1	11	11.8
BN	0.95	0.29	1.24	3.19	3.96
KH	22.45	8.40	30.85	5.49	5.65
CHN	12.49	6.01	18.5	9.29	10.28
IDA	2.49	1.80	4.30	6.81	7.86
MYA	12.98	5.42	18.40	16.51	18.43
PH	10.28	4.21	14.49	15.93	16.43
SG	5.74	4.46	10.21	17.36	20.05
THI	6.52	4.23	10.74	13.16	14.56
VNM	4.52	5.83	10.35	10.62	12.52

2005	*US*	*EU15*	*US+EU15*	*East Asia*	*RCEP*
East Asia	6.77	4.19	10.97	10.25	11.66
JPN	3.86	3.06	6.92	4.19	4.57
KOR	8.81	12.37	21.18	15.2	16.34
BN	0.94	1.64	2.58	2.73	3.2
KH	31.23	3.3	34.53	6.15	6.52
CHN	17.99	6.68	24.67	8.8	10.26
IDA	4.26	5.07	9.33	7.76	8.91
MYA	15.48	12.99	28.47	18.66	21.55
PH	8.69	18.18	26.87	23.56	24.12
SG	9.76	8.65	18.41	18.45	22.88
THI	10.05	10.26	20.31	16.79	19.27
VNM	11.72	7.43	19.15	11.84	14.09

2008	*US*	*EU15*	*US+EU15*	*East Asia*	*RCEP*
East Asia	5.34	4.21	9.55	10.48	12.2
JPN	4.31	4.7	9.01	6.43	7.23
KOR	9.52	14.89	24.41	19.37	21.39
BN	0.81	1.32	2.13	2.14	2.54
KH	29.4	2.69	32.09	5.43	5.76
CHN	13.26	4.92	18.18	6.85	8.41
IDA	3.2	4.76	7.96	7.08	8.02
MYA	10.74	13.05	23.79	18.86	21.51
PH	5.96	16.36	22.32	20.41	21.08
SG	8.51	7.57	16.08	16.1	20.85
THI	8.72	11.19	19.91	17.81	21.29
VNM	12.07	9	21.07	14.47	16.55

2011	*US*	*EU15*	*US+EU15*	*East Asia*	*RCEP*
East Asia	5.34	4.21	9.55	10.48	12.2
JPN	4.31	4.7	9.01	6.43	7.23
KOR	9.52	14.89	24.41	19.37	21.39
BN	0.81	1.32	2.13	2.14	2.54
KH	29.4	2.69	32.09	5.43	5.76
CHN	13.26	4.92	18.18	6.85	8.41
IDA	3.2	4.76	7.96	7.08	8.02
MYA	10.74	13.05	23.79	18.86	21.51
PH	5.96	16.36	22.32	20.41	21.08
SG	8.51	7.57	16.08	16.1	20.85
THI	8.72	11.19	19.91	17.81	21.29
VNM	12.07	9	21.07	14.47	16.55

1) External dependence of the economy

As can be seen from Fig. 1, RCEP countries' upstream dependence in the region is higher than outside, which means the upstream suppliers of RCEP mainly come from inside. It also reveals RCEP countries have developed close ties in regional division of labor.

From a dynamic point of view, more specifically, from 2002 to 2005, RCEP countries' backward linkages with Europe

and the United States increased by 0.44 percent while intra-regional backward linkages increased by 1.8 percent.

From 2005 to 2008, RCEP countries' backward linkages with Europe and the United States increased by 12.83 percent while intra-regional backward linkages increased by 17.58 percent. From 2008 to 2011, RCEP countries' backward linkages with Europe and the United States decreased by 15.18 percent while intra-regional backward linkages decreased by 15.74 percent.

From 2002 to 2008, both intra-regional and extra-regional upstream dependence of RCEP countries rose significantly which corresponded with the trade statistic of RCEP countries' intermediate import structure.

From 2002 to 2008, the proportion of RCEP countries' intermediate goods imported from Europe and the US decreased while internal import ratio increased. This shows that while importing intermediate products from Europe and the United States, RCEP countries also imports large quantities of intermediate products from inside. There was a significant decline in both internal and external dependence from 2008 to 2011.

Although RCEP countries' upstream dependence on the US and Europe's is lower than that of inside, it does not mean that Europe and the United States are not important.

In addition to Australia, Japan, Hong Kong, Brunei, and Indonesia, other countries' backward linkages with Europe and the United States are more than 5% in the four years, among which Cambodia ranked first for over 20% every year.

Despite the decline in China's upstream dependence on Europe and America in the four years, China's overall backward linkage with the west all exceeded 10% in the four years in absolute terms, explaining that China, as a large country with international influence, is inseparable from the economic ties with Europe and the United States and such ties will not be weakened in the short term.

It can be drawn from the first column of Fig. 1 that, most RCEP countries' intra-regional backward linkages rose by varying degrees from 2002 to 2008, among which Taiwan raised the most for 14.61%. It's a signal that the economic ties and vertical integration within the region are strengthening.

However, China's internal backward linkage dropped slightly by 1.01%. In recent years, China's internal and external upstream dependence has been declining, so it can be detected China's domestic intermediate goods supply has increased to some extent.

2) Internal dependence of the economy

After a general understanding of the level of upstream dependence within the RCEP economies, we specifically examine the backward linkages among the various countries in order to gain a deeper understanding of the links within the RCEP economies in the production and distribution networks.

China, Japan, and South Korea are the core countries in this economy as they play a decisive role in the international division of production, so they are listed separately.

Australia and New Zealand both belong to Oceania and their trade and export patterns are similar. Therefore, they are combined as a new economy ANZ to study.

As a country with large population and giant economic size, India is of unique research value.

ZASI represents East Asia and Southeast Asia, ASEAN means the Association of Southeast Asian Nations. We calculate their backward linkages separately and the result is shown in TABLE II: The first column is the exporter and the first row is upstream country.

TABLE II. INTERNAL BACKWARD CORRELATION IN EAST ASIA(%)

2002	Upstream Countries					
Exporters	**CHN**	**JPN**	**KOR**	**ANZ**	**IDN**	**ASEAN**
JPN	1.09	0	0.65	0.15	0.04	0.86
KOR	5.13	3.15	0	0.55	0.26	2.72
BN	0.28	1.42	0.47	0.76	0.01	1.01
KH	0.54	1.89	0.19	0.06	0.09	2.87
CHN	0	5.59	1.69	0.68	0.31	2.01
IDA	1.17	2.54	0.85	0.83	0.22	2.25
MYA	4.89	4.41	1.84	1.23	0.69	5.36
PH	3.63	5.83	2.01	0.33	0.16	4.47
SG	2.75	2.94	1.54	2.07	0.62	10.12
THI	2.8	4.79	0.87	1.04	0.36	4.69
VNM	1.65	4.33	1.18	1.84	0.06	3.47

2005	CHN	JPN	KOR	ANZ	IDN	ASEAN
JPN	2.06	0	1	0.3	0.07	1.13
KOR	9.13	3.24	0	0.54	0.6	2.83
BN	0.15	1.09	0.39	0.46	0.01	1.1
KH	0.85	2.12	0.33	0.17	0.2	2.85
CHN	0	4.77	1.91	0.86	0.61	2.12
IDA	1.39	2.86	0.82	0.63	0.52	2.69
MYA	7.59	3.66	1.74	1.76	1.12	5.67
PH	11.49	5	1.68	0.33	0.23	5.38
SG	4.08	2.97	1.61	3.2	1.22	9.8
THI	4.28	5.11	0.87	1.79	0.69	6.53
VNM	2.06	4.53	0.83	2.12	0.13	4.41

2008	CHN	JPN	KOR	ANZ	IDN	ASEAN
JPN	3.37	0	1.33	0.6	0.2	1.73
KOR	11.48	3.41	0	1.01	1.01	4.47
BN	0.21	0.78	0.33	0.34	0.06	0.82
KH	0.83	1.49	0.37	0.15	0.18	2.74
CHN	0	3.1	1.82	0.66	0.89	1.93
IDA	1.36	2.5	0.9	0.48	0.46	2.32
MYA	8.44	3.18	1.43	1.47	1.17	5.81
PH	11.02	3.69	1.65	0.35	0.32	4.04
SG	3.32	2.62	1.63	3.06	1.68	8.53
THI	5.59	4.73	0.88	2.46	1.02	6.62
VNM	2.45	5.02	1.53	1.85	0.24	5.47

2011	CHN	JPN	KOR	ANZ	IDN	ASEAN
JPN	3.79	0	1.35	0.61	0.25	1.82
KOR	13.1	3.63	0	0.91	1.15	4.91
BN	0.37	1.08	0.39	0.48	0.19	0.7
KH	1.39	1.99	0.46	0.25	0.46	2.98
CHN	0	3.28	1.7	0.92	1.05	2.33
IDA	1.56	1.68	0.73	0.54	0.61	2.16
MYA	12.43	2.99	1.36	1.54	1.41	6.27
PH	5.72	2.77	1.28	0.26	0.93	3.98
SG	5.06	2.15	1.56	3.5	2.38	10.33
THI	6.69	3.84	1	2.31	1.45	7.18
VNM	5	4.3	2.13	1.07	0.86	5.51

As we can see from TABLE II: Firstly, other countries upstream dependence on China is strengthening from 2002 to 2011. Among them, Malaysia's backward linkage with China has grown fastest from 4.89% to 12.43%, namely 7.54% over the nine years. South Korea and Taiwan are also highly dependent on China's upstream supply for their upstream dependence all increased over 5% from 2002 to 2011.The calculation results are consistent with the increasing proportion of RCEP countries' imports from China in recent years. This can also explain to a certain extent that China not only serves as an export platform and engages in low-value-added downstream manufacturing activities, but also as a rising upstream supplier of RCEP economies.

Secondly, Japan's status as an upstream provider went down in the region, because the backward linkages of other countries to Japan all decreased from 2002 to 2011 except South Korea, Cambodia and India, among which Philippines and China had the largest declines of 3.06% and 2.31% respectively.

However, in 2002, China and Philippines' backward linkages with Japan were all greater than 5%, and Malaysia, Thailand, and Vietnam's backward linkages with Japan were all greater than 5%, indicating that Japan had a certain status as an upstream supplier at that time.

On the other hand, Japan's backward linkages with China, South Korea, Australia and New Zealand, India, ZASI and ASEAN have increased from 2002 to 2011, which indicates that Japan has begun to shift its role from upstream supplier to the downstream demander in the production and distribution network.

The backward linkages of other countries to South Korea had ups and downs: Australia, Brunei, Indonesia, Malaysia and the Philippines' backward linkages with South Korea dropped, while Japan, New Zealand, Cambodia, India, Singapore, Thailand and Vietnam's increased. China's backward linkages with South Korea first increased and then decreased and generally increased by 0.01%.

Thirdly, most countries have a slight upward trend in the degree of backward linkage with Australia and New Zealand while the internal backward linkages of Australia and New Zealand kept declining. This shows that the two countries have weakened their mutual connections in upstream dependencies and are more dependent on countries outside Oceania in the division of labor. While other countries' backward linkages with India were all increasing, showing that India's role as an upstream supplier steadily improved.

Finally, the backward linkages of other countries to ZASI and ASEAN had ups and downs, but the dependence on ZASI was higher than ASEAN generally. In a word, as the degree of RCEP economies' participation in the production and distribution network in GVC gradually deepens and the "upstream dependence" within the region tightens, the economic integration process of RCEP is guaranteed.

B. Analysis of "final demand dependent"

In order to analyze "final demand dependent" of RCEP countries, we compiled the relevant data in the TiVA database

according to the calculation formula of "final demand contribution rate", and obtained the "final demand" of RCEP economies caused by export value added. The results are shown in TABLE III.

TABLE III.   FINAL DEMAND CONTRIBUTION RATE INSIDE AND OUTSIDE OF EAST AISA(%)

2002	Final Demand Countries						
Country	Total	ASEAN	CHN	JPN	KOR	AUS	IDN
East Asia	5.15	13.72	3.74	2.1	6.46	6.94	2.01
CHN	1.08	2.32	0	0.81	2.24	1.13	0.37
JPN	1.81	5.65	2.32	0	2.72	3.08	0.52
KOR	0.77	1.57	0.72	0.56	0	1.06	0.32
ASEAN	1.49	4.18	0.71	0.73	1.5	1.66	0.81
AUZ	0.56	1.72	0.34	0.22	0.41	0.76	0.18
IDN	0.21	0.64	0.16	0.06	0.26	0.37	0
RCEP	5.92	16.07	4.24	2.38	7.13	8.07	2.2
US+EU15	7.88	14.26	7.01	5.04	9.91	5.58	5.83
US	5.1	8.81	4.57	3.52	6.44	2.85	3.19
EU15	2.78	5.45	2.44	1.52	3.47	2.73	2.64

2005	Total	ASEAN	CHN	JPN	KOR	AUS	IDN
East Asia	6.34	14.54	4.66	2.82	7.2	8.3	2.65
CHN	1.61	3	0	1.27	3.37	1.91	0.81
JPN	2.07	5.29	2.73	0	2.51	3.67	0.57
KOR	0.9	1.5	0.96	0.69	0	1.13	0.33
ASEAN	1.76	4.75	0.96	0.86	1.32	1.59	0.94
AUZ	0.8	2.15	0.59	0.36	0.49	0.84	0.29
IDN	0.44	1.14	0.36	0.12	0.51	0.88	0
RCEP	7.59	17.82	5.61	3.3	8.2	10.02	2.94
US+EU15	9.08	13.78	10.27	5.53	9.78	5.05	7.71
US	5.37	8.02	6.19	3.57	5.71	2.38	3.45
EU15	3.7	5.76	4.09	1.96	4.07	2.67	4.26

2008	Total	ASEAN	CHN	JPN	KOR	AUS	IDN
East Asia	7.15	14.14	4.08	3.59	8.46	9.09	3.61
CHN	1.93	3.38	0	1.79	4.12	2.72	1.07
JPN	2.15	4.7	2.06	0	2.36	3.63	0.66
KOR	0.96	1.39	0.93	0.68	0	1.1	0.57
ASEAN	2.11	4.66	1.09	1.12	1.99	1.65	1.31
AUZ	0.79	1.78	0.52	0.41	0.52	0.57	0.29
IDN	0.66	1.3	0.55	0.23	0.71	1.05	0
RCEP	8.61	17.22	5.15	4.23	9.69	10.72	3.9
US+EU15	9.08	13.78	10.27	5.53	9.78	5.05	7.71
US	5.37	8.02	6.19	3.57	5.71	2.38	3.45
EU15	3.7	5.76	4.09	1.96	4.07	2.67	4.26

2011	Total	ASEAN	CHN	JPN	KOR	AUS	IDN
East Asia	7.34	14.68	3.39	3.92	10.43	10.79	3.67
CHN	2.44	4.67	0	2.18	5.71	4.51	1.34
JPN	1.96	4.09	1.72	0	2.38	3.37	0.6
KOR	0.84	1.39	0.64	0.63	0	1.08	0.4
ASEAN	2.09	4.53	1.03	1.12	2.34	1.83	1.34
AUZ	0.81	1.81	0.52	0.4	0.65	0.47	0.38
IDN	0.84	1.79	0.62	0.28	0.91	1.22	0
RCEP	8.99	18.27	4.53	4.6	11.98	12.48	4.05
US+EU15	6.96	8.71	6.7	3.82	8.06	3.44	7.8
US	3.84	4.61	3.72	2.45	4.99	1.76	3.37
EU15	3.12	4.1	2.98	1.38	3.07	1.68	4.43

In order to facilitate the dynamic analysis, we calculate the "final demand contribution rate" of 2002, 2005, 2008 and 2011.

The first row is exporter and we have selected several important economies in RCEP region: ASEAN, China, Japan, Korea, Australia, India, and the general (ASEAN, China, Japan, Korea, Australia, and India). The first column is demander,

which is divided into intra-region (China, Japan, South Korea, ASEAN) and extra-region (the US and EU15). On this basis, we deeply analyze the final demand dependent of RCEP economies on the internal and external areas.

1) Intra-regional and extra-regional dependent: Firstly, from the results shown in TABLE III, in 2002, 2005, and 2008, the final demand contribution rate of Europe and the United States to each economy was higher than that of the region. It can be roughly estimated that from 2002 to 2008, the final demand dependent of the RCEP economies on Europe and the United States is higher than that within the region, reflecting a certain degree of "external dependence."

However, from 2008 to 2011, the final demand contribution rate of the region was higher than that of Europe and the United States, indicating the region was gradually easing itself from the final demand dependent on Europe and the United States.

On the other hand, from 2002 to 2011, the final demand contribution rate of the region to each economy showed and upward trend, while that of Europe and the United States first rose and then declined. It illustrates that the "external dependence" of the RCEP economies has gradually shifted to "internal dependence", and linkages between the RCEP economies in terms of final demand have been strengthened.

Secondly, looking at the performances of countries in the region, China's contribution to the final demand of the region has seen the largest increase by 1.36% from 2002 to 2011. The final demand contribution rates of other economies in the region have ups and downs in these phases, but it has seen a slight increase from 2002 to 2011. This also shows that China's rapid development has not squeezed out the final demand dependent of other countries in the region.

Finally, we make an analysis from the final demand contribution of the United States and EU15 to each economy. In terms of absolute value, the contribution made by the United States were higher that of EU15 in the four years. But In terms of variation trend, both contribution rates of the U.S. and EU15 rose first and then dropped, but the contribution rate of the U.S. declined by 1.26% from 2002 to 2008 while that of EU15 rose by 0.34%, and the status of EU15 to the RCEP region is more and more close to the U.S., which also corresponds with the trading data from RCEP to the U.S. and EU15. From 2002 to 2011, the proportion of final products exported from the RCEP region to the U.S. declined while that to EU15 increased. This shows that RCEP economies' trading gravity on the United States is weakening and gradually shifting to other markets such as Europe.

2) Internal comparison of RCEP economies: From the perspective of final demand contribution rate of each economy, the dependent of ASEAN, China, Japan, South Korea, Australia, and India on Europe and the U.S. had a downward trend after the first increase. Besides, the demand dependencies of each economy on its demanders vary from each other.

Firstly, china's final demand dependent contribution rate gradually increased from 2.32% in 2002 to 4.67% in 2011. On the contrary, the final demand contribution rates of Japan and South Korea to ASEAN have been declining respectively from 5.65% and 1.57% in 2002 to 4.09% and 1.39% in 2011. This shows that ASEAN's reliance on the Chinese market continued to increase while its dependence on the Japanese and Korean markets weakened. The contribution rate within ASEAN remained stable. Then we take a look at the U.S. and EU15's contribution rates to ASEAN. The external dependent of ASEAN on the U.S. declined from 8.81% in 2002 to 4.61% in 2011 while that on EU15 declined by 1.35% from 2002 to 2011.

Secondly, according to TABLE III, China's dependence on European and American market is greater than that within the region, but from 2002 to 2011, the contribution rate of European and American market to China's final demand has slightly decreased. Judging from the comparison between China, Japan, and South Korea, the contribution rates of Japan and South Korea to China all declined, while China's contribution to Japan and South Korea increased.

The results show that at the final demand level, China's economic dependence on Japan and South Korea is decreasing, while Japan and South Korea's economic dependence on China is deepening. It also means that China's final demand contributes to the economic growth of Japan and South Korea, while Japan and South Korea have no corresponding impact on Chinese economy. This result is also consistent with the result of above analysis of the "upstream dependence" relationship between China and Japan.

As a comprehensive analysis, the asymmetrical changes in the dependencies between China, Japan and South Korea reflect China's growing economic strength and rising status in the region.

However, in terms of absolute value, China's contribution to the final demand of Japan and India is relatively small. It also shows that China doesn't fully play its role as an intra-regional market, and there is room for further improvement in its purchasing power.

V. CONCLUSIONS

With the deepening of global value chain where different countries play different roles and rely on each other, those dependencies cannot be split from the economic development of the countries. In the GVC, intermediate products flow between countries directly and indirectly as the carrier of dependencies. When one country's export value added flow into another, it forms "upstream dependence" and "final demand dependence".

In this paper we re-analyze the real dependencies among East Asian countries' production and distribution network from the perspective of GVC and establish two indexes "backward linkage" and "final demand contribution rate" based on the GVC decomposition principle proposed by Koopman et al measuring the dependence on upstream and final demand respectively to do empirical analysis. In the empirical study, we select 16 RCEP economies (including Hong Kong and Taiwan) and the United States, EU15 through the OECD-TiVA database. Focusing on the internal and external dependencies of the region, the following main conclusions were drawn:

1. RCEP countries' upstream dependence in the region is higher than outside, which means the upstream suppliers of RCEP mainly come from inside. It also reveals RCEP countries have developed close ties in regional division of labor.

2. However, it doesn't mean that Europe and America were not important as the upstream supplier of RCEP economies. Although China's "upstream dependence" on the west decreased in the four years, its backward linkages with the west were high, explaining that China's dependence on the west will not be weakened in the short term.

3. China's status as an upstream supplier of RCEP economies constantly arose and RCEP economies' upstream and downstream relationships with China gradually deepened. Besides, Japan's status as an upstream supplier of RCEP economies decreased, and it has begun to shift its role from upstream supplier to the downstream demander in the production and distribution network. Finally, the "upstream dependence" within the region tightens.

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