ODI and Home Country's Industrial Upgrading: Mechanism and preliminary evidence

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Abstract

Both the outward direct investment (ODI) from emerging market economies and industrial upgrading are new topics in economic research. Most research on these two topics has been done separately so far. China's emergence as a major ODI nation and urgent requirement for domestic industrial upgrading are increasingly bringing these together. With the hypothesis of the causal connection between the ODI and industrial upgrading, this paper tries to clarify the channel and mechanism that ODI spreads in terms of its effect on home countries' industries and to identify related evidence with a way of bringing knowledge in three research fields together: a) the historical experience of the ODI Pioneering countries; b) clues found from existing research and cases at sector level; c) evidence from China. Research shows that there are clear upgrading effects of the ODI in US and Japan's history when they emerged as ODI nations although they took different patterns. The pattern taken by the US was featured with efficiency priority, while that of Japan does so with structural adjustment priority. The mechanism and channels through which the ODI imposes effects on home industries' upgrading in China are more extensive than that of pioneer industrial countries. Besides, the empirical work done with the typical regions and typical industrial sectors gives clear support on the upgrading effects hypothesis in China.

Keywords: ODI, private enterprises, eclectic paradigm, and SIL model.

JEL Classification: F2; F21; F23; G34; O53

Ⅰ. **Introduction**

Promoting the upgrading of domestic industries is one of the main objectives of the "going-out for development strategy" launched by the Chinese government since 2000. This initiative has spurred both academic discussion among researchers in economics and management studies and the increasing demand for policy consultation from decision makers in China.

Academically, discussions around the issue actually need to bring the knowledge and studies existed separately in the two fields together. One is the knowledge on outward direct investment (ODI) and firm's internationalization, which is mainly done by economists in international economics; another, that on industrial upgrading, which is mainly explored by researchers in management studies, although economic research had paved some key bases indirectly with their theoretical framework on the issue.

In the case of the Chinese economy, academic discussion around this issue requires knowledge in addition to those already developed in above two fields. Two additional aspects of knowledge can not be absent out of several ones. One is that of the experiences made by pioneering industrial countries. As an emerging market economy (EME), China is the latter comer in the sense of both ODI flow and industrial upgrading during industrialization. It means that China can learn something useful from the pioneering countries, e.g. industrial countries, in making ODI. This requires an extensive study of the experiences made by industrial countries in their history of ODI flow and changes of their domestic industries. Another is that of Chinese realities, especially that of the ODI and their effects on home country's industry. Although the history the Chinese firms engaging in ODI and internationalization is quite short, being less than two decades, China has already been emerging as a major ODI nation and built up substantial overseas business so far. This means that there are still something that can be found from the preliminary ODI experience of itself.

Bringing academic knowledge being existed in multi research fields together with the core purpose of checking the upgrading effects of ODI on domestic industries in a specific country, e.g. China, shall be our main work here. This work can be organized in four key steps. Firstly, a general check on the studies already done around the two separate topics, ODI motives and industrial upgrading. Secondly, identify the main channels that carry and spread the effects onto home industries and draw out a chain model system on it in a synthetic way. Thirdly, seek evidence from the experience of industrial countries on the connection between the two processes. Fourthly, check empirically with the ODI experience that China has made in recent decades. The four steps correspond to four main sections of this paper, i.e. section 2 through section 5. Then in the last section, section 6, we shall draw out some interesting conclusion.

As matter of fact, earlier research of ours (Zhao et al. 2010) had already put some preliminary base connecting closely to this topic. Here we are going to expand this research.

. ODI and Industrial upgrading: a brief review of existing researches

As we said, this topic requires bringing knowledge in multi fields of academic research together, and one of the key issues around this topic is the connection between the two processes and two sets of related variables. The two processes are the process of ODI and that of industrial upgrading respectively. The two sets of variables are those which represent the activity of ODI and internationalization of firms as a whole in a specific country and those which indicate the industrial upgrading. Most researches relating to these issues have been made separately. Three clews can be drawn out with existing literature.

i. Industrial upgrading

The topic of industrial upgrading had been brought into academic consideration since later 1990s although it is no where to find who had created the term. It seems that the empirical study made by Gerefi (1999) from the view of international trade effects had attracted attention of researchers both in management study and in economics. Then it stimulated academic thinking in the both fields. The studies made so far are mostly separated although there is a clear trend that researchers in the two fields are prone to share some common knowledge and approaches recently. Two aspects around the issue have been touched so far.

A) Definition and forms of industrial upgrading

Researches made in management view usually either focus on the microeconomic factors from the perspective of business activities of firms or "value chain" a sector and even the whole industry a nation lies internationally. Gereffi's earlier research（1999）identified four types of industrial upgrading. 1) Process upgrading, referring to improvement of production quality and increasing flexibility of producers by introducing more efficient production methods and better technology. 2) Product upgrading, referring to moving to the production of more sophisticated and high-valued added products or services. 3) Functional upgrading is achieved in terms of acquiring new Functions with higher incomes or abandoning old functions generating lower incomes in the value chain. Inter-sector upgrading happens when a firm applies its acquired knowledge to move horizontally into new sectors. 4) Inter-sector upgrading, being achieved by applying knowledge acquired in the production chain in new areas. Late he (Gereffi, 2005) tried to define it from the view of value chain and gave a definition as this, "the process by which economic actors – nations, firms and workers – move from low-value to relatively high-value activities in global production networks".

Economists, nonetheless, see the topic more or less as a transfer process from micro-to-macro elements and believe it is an old issue being put into a new framework. They consider the sequential transfer of intensive production element as the foundation of industrial upgrade and structural change. This view can be traced back to Petty（Petty, W.，1676）till Clark (1957) and tied to so called "Petty-Clark law".[i] According to this "law", changes in average income in agriculture triggers labor mobility. Labor force in primary industry is pressured down to the secondary industry, then to the tertiary industry. As a result, the structure of whole industry of a nation changes in an evolutionary way.

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[i] The law seems popular in China and Japan but less known in western mainstream economists.

B) Measuring industrial upgrading

Three approaches have been used so far by researchers either in management studies and economics:

1) That relying on a single indicator. One of such indicators is Hoffman coefficient.[i] It is named after a German economist, W. G. Hoffmann (1931). Based on empirical study, he suggests that the changing ratio of consumer or light industry to production or heavy industry has clear implication for the efficiency change of the whole industry. Following Hoffman's way of thinking, some Chinese researchers (Lin, 2010, He et. al, 2010) suggest to adopt the approach.

2) That did via comparison. That is compares the industrial structure of a specific country or region with the average standard of other countries to measure the relative level of the industrial structure.

3) That did with certain coefficients. Using a specific country's industry structure as a standard, a similar coefficient is calculated for both the home and reference country to measure the level of home country's industrial upgrade.

ii. **connection between the two processes**

The current studies around the connection of these two processes can be grouped into two categories.

The first category touches upon the topic only indirectly rather than focuses on it. Most researches in this category concentrated on the experiences of developed countries', especially that of USA and Japan. Dunning (1958) and Raymond Vernon (1966) are the pioneers in this topic. Through the case study on the United States' ODI flows and outward industrial transfer, they asserted that outsourcing labor intensive manufacturing to developing countries in return catalyzed the readjustment of home countries' industrial structures towards a more technology and capital intensive pattern. Lewis Arthur (1984) also gets similar perspectives with the framework of development economics. Akamatsu Kaname (1936) proposed the "Flying Geese" Paradigm, aiming to explain the trend of industrial transfer in East Asian region but by looking Japan as the lead goose, the paradigm implied that the ODI process is inextricably linked to the industrial upgrading in the home country. The theory of marginal industry expansion as well, developed by Kiyoshi Kojima (1978) implies that ODI and outward industrial transfer can help industrial upgrading in home country. It suggests that in order to free up scarce resource for better development, ODI should start from industries in which the home manufacturers are losing comparative advantage. Terutomo Ozawa's empirical study (1979) further shows that, between 1960 and 1970, there had been a traceable relation between Japanese companies' ODI activities and the respective industries' transfers in Japan. He claims that the fast transformation of Japanese economic structure is linked to the quick factor transfer brought about by ODI flows. Research made by Cantwell & Tolentino (1990) based on cases of developing countries also got similar findings

The second category touches upon the topic directly although conclusions drawn out vary one from another

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[i] It is usually calculated with the equation as: h=Cg/Sg,. Here h is Hoffman coefficient, Cg is the net value added by the consumption industry and Sgis the net value added by the production industry.

significantly. Among those who conclude that ODI brings positive effect on optimizing industrial upgrading in home countries, Hiley(1999), Lipsey(2002) and Markusen(1997) are representatives. By observing Japanese enterprises' investment flows into ASEAN countries, Hiley (1999) believes that Japanese ODI had helped transferring the declining textile industry out of the borders, and accelerated the transfer of production factors to new industries at the same time domestically. Dowling (2000) uses data of 22 industries from different countries between 1970 and 1995, and reaches the conclusion that there is a positive correlation between industrial structure changes that happened during industrialization and ODI changes in developed countries. Lipsey (2002) asserts that a country can move production factors from old industries to new ones through ODI activities. His case studies show that some newly industrialized countries successfully transformed from export countries of raw materials and food to export countries of high-tech products through ODI activities, and has achieved industrial upgrading along the way. Markusen (1997), Blomström (2000), Markusen & Markus(2001) and Bernard (2002) also raised similar opinions.

However there are also some negative results that contradict the above conclusion. Some researchers even believe that ODI's effect on home countries' industrial upgrading is negative, causing related industries to decline. This point of view was originally raised by Minoru (1990) and has been called as "hollowing-out of industry saying" since then. Sekishita argues that ODI activities will lead to lack of investment in the related industries in the home countries' and consequently lead to a decline of domestic industries. He believes that although the overseas-bound expansion US based MNCs' benefit the world economy, they had probably resulted in an economic recession in the US, thereby "hollowing-out" the domestic economy. This theory became widely popular in Japan and even drew the government's attention. The official Economic White Paper (1994) described the hollowing-out phenomenon in Japan by highlighting that domestic production was gradually displaced by import and overseas production, and that the manufacturing industry has shrunk in proportion. However, few studies based on Japanese cases give support on this point of view.

As a simplified way, the main points of view on the upgrading effects of ODI on home country's industries can be summed up in a diagram as following.
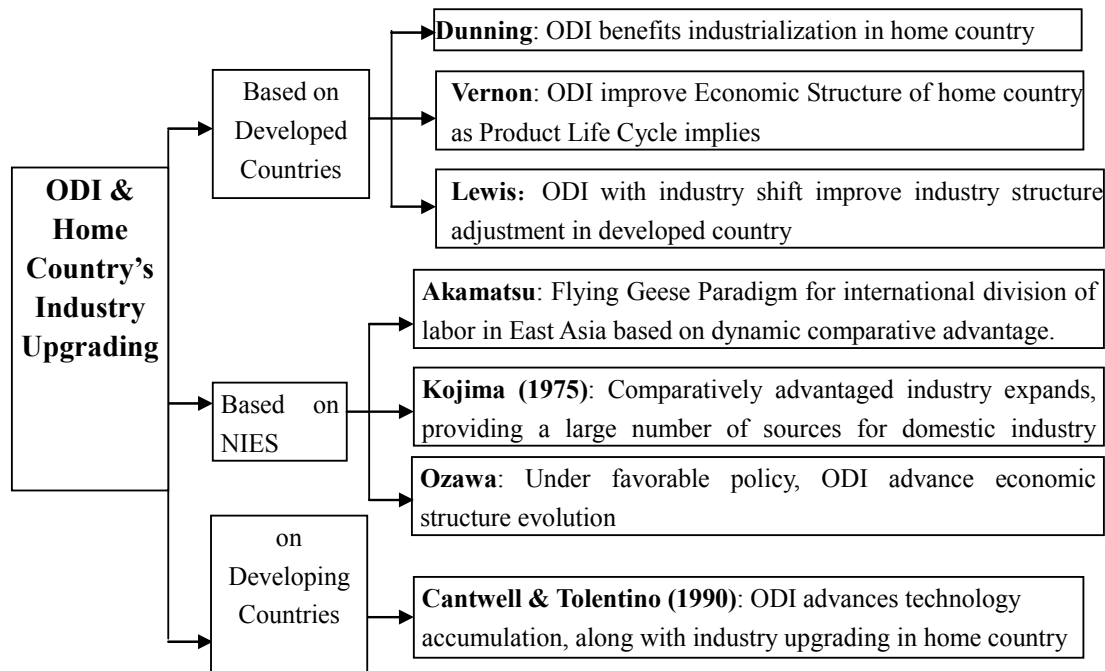
Fig. 1 ODI & Industry Upgrading of Home Country: a simplified summing up on current research

Source: Author's abstracting from related literature.

III. ODI and Industrial Upgrading in Home Country: Mechanism of causal link

In order for us to check the effects of ODI on home country's industrial upgrading, we have to know what channels that carry and transmit the forces or factors originated from ODI and firm's overseabound expansion to domestic industries. This involves the work of figuring out mechanism. As a preliminary step of this work, a clever choice is to start from summing up the findings already made but existed dispersedly in research literatures related to this topic directly or indirectly.

There are at least three points of view or findings got from empirical studies that are related to our issue here. They are that of industrial transfer, that of industrial linkage and that of intra-industry competition. Besides, there are some other findings made with alternative visual angles

i.   Industrial transfer.

Under this view, the earliest ODI activities occur in industries that are soon going to lose their comparative advantages; they are referred as the marginal industries (Kojima, 1978). As such industries move out, scarce domestic resources shall be freed up and become available to the industries with comparative advantages or new industries in their expansion and development. Along with this view, we can deduce that there is a reciprocal causal relation between the outward transfer of the "marginal industries" and the expansion of the industries that maintains comparative advantages or even brand new industries.

This argument has received increasing support from increasing number of empirical and case studies in recent decade. Specifically, a report from the International Bank for Reconstruction and Development

(IBRD) in 2003 shows that from 1950s, the trend of international industrial transfer has an obvious tendency of downward gradient, that is to say, a one-way transfer from the most developed countries to newly developed countries and then to developing countries. Furthermore, the main ODI sectors change along with time goes. Specifically, the transfer happened mainly from developed countries to developing countries and the main ODI industries were processing industry of primary products and primary material industry prior to the 1980s. But since 1990s, industries transferred expanded to include some high value-added one and service sectors. Through this sort of outward transfer via ODI, it releases increasing production factors that become scarce and expensive as well from "old industries", or "marginal industries" in Kojima's words. This allows for readjustment of domestically existing industries and promotes industrial upgrading. Typical cases are international transfers of textile and electronic manufacturing industries in East Asia. Large amount of researches suggest that Japan is the typical country in achieving industrial upgrading from textile-relied manufacture to electronic-relied one during 1960s. The initial upgrading was followed by a further advancement towards the semi-conductor products, household electrical appliances and automobile industries in the 1970s and 80s. Benefited from Japanese companies' overseas investments are economies such as Taiwan, Hong Kong and other newly industrialized economies, which followed similar course of ODI development.

ii.   **Industrial Linkage**

The Linkage idea among industrial sectors is a creation of Hirschman (1958). His theory of industrial linkage looks at the relationship among industrial sectors as a linear one and dual ways, involving both backward and forward linkages. This finding implies that changes in scale and technologies on a particular industry will have linear effect on its related industries. Specifically, taking the view of forward linkage, being referred to as a downstream-to-upstream relation driven by a change in downstream demand, a downstream industry expands its market and improves its technologies, upstream industries that provide input factors, such as raw materials, equipment and technologies will also expand or develop at the same pace. Similarly, looking from backward linkage, being referred to upstream to downstream relation driven by a change in supply, an upstream industry expands and improves technology will stimulate technology improvement of downstream industries.

In view of that, both forward linkage and backward linkage entail positive effects on home countries' industries. Considering ODI situation, firm's oversea-bound expansion will obviously benefit from the scale of its industry's overseas presence, and thereby trigger increased demand for the products of domestic upstream industries. Such increase in demand will drive expansion of the upstream industries' and bring about an improvement in technology. On the other hand, multinational companies which leverage ODI as a means to expand their international presence are usually faced with intensive international competitions, and will require higher quality input products from domestic upstream industries to remain competitive. The international competition pressure therefore forces more resource to be devoted to research and innovation by the upstream industries in order to improve product quality. Typical cases can be found from both developed countries and emerging market countries. Example from the developed countries is best

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represented by the Japanese household electrical appliance industry. According to many case studies, ODI in this industry concentrated in the manufacturing of low-end products and the manufacturing and assembling of non-core parts, while manufacturing of high-end products and core parts remain in Japan. Experience of Japan has shown that expansion of overseas manufacturing stimulated domestic technology innovation in high-end products and core parts such as refrigerator and HDTV among other innovations,. There are many cases from newly industrialized economies as well, especially from South Korea. Researches from Kogut and Chang (1991), and Branstetter (2001) show that South Korea's ODI to developed countries, for example Japan, promoted domestic investment, technology acquisition and R&D in industries such as electronics, watch, transportation facilities, precise instrument and chemical engineering, leading to industrial upgrading. On the enterprise level, Samsung's success was definitely the most typical case. It is generally thought that Samsung's ODI to Japan in the 1980s has improved its technology level in its domestic operation by feeding in new technologies from abroad.

Contrary to forward linkage, the industrial upgrading mechanism triggered by backward linkage conduction is reflected in the specialization effect within the industry mix. Upstream enterprises' use of ODI means that scarce resources of production can be employed in downstream industries, mainly the high-tech industries, and lead to a kind of industrial specialization. There are many cases that follow this pattern in the US and European developed countries. Through outsourcing and establishment of overseas subsidiaries, enterprises from these countries transferred their low-tech upstream industries to overseas and reengineer their domestic operation to specialize in high-end industries, which then allows further technological advancement.

iii.   **the intra-industry competition**

An important origination of this view is the diamond model (Porter, 1990) which stresses the importance of competition to efficiency improvement of a specific industry. Based on the case check of Germany chemical industry, Swiss pharmacy industry, The US and Japanese semiconductor industry, it proves that competitions will improve lateral interactions among enterprises and stimulate innovations. Reasoning along this line, ODI and internationalization of increasing number of firms in a specific industry would not only lead to intensified domestic competition, but also expose the whole industry to international competitions. Specifically, enterprises that benefited from ODI through access to oversea resources and technologies, can easily acquire a leadship position in domestic industrial competitions. These internationalized enterprises put pressure on other domestic enterprises and intensify competitions within that industry. Furthermore, the foregoing internationalized enterprises face international competitions themselves and will send home the impact of international competition. Both domestic and international competitions brought about by ODI can help improve efficiency in the industry and then achieve industrial upgrading. Typical examples that feature technology upgrading through this way can be easily find in China's home appliances industries. Haier[i], for example, undoubtedly is such a typical firm. Case studies

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[i] Haier Group is A Chinese POE originated MNE in manufacturing of home appliance. The information provided by the company's homepage shows that it is the world's 4th largest white-goods manufacturer and one of China's

reveal that, by introducing advanced technology and concept of "green products", Haier and some other foregoing internationalized enterprises improved their competitive advantages in both international and domestic markets after mid-1990s. The breakthrough triggered further domestic competitions in this industry, while breaking down barriers between domestic and international competitions. The change has registered a new standard for the household electrical appliances industry and led to upgrading in this and other related industries.

Bringing all these findings listed above together, we can draw a simple linkage system and depict the mechanism consisting of multi-channels that transfer the positive effects of ODI to a specific domestic industry. (Fig.2).
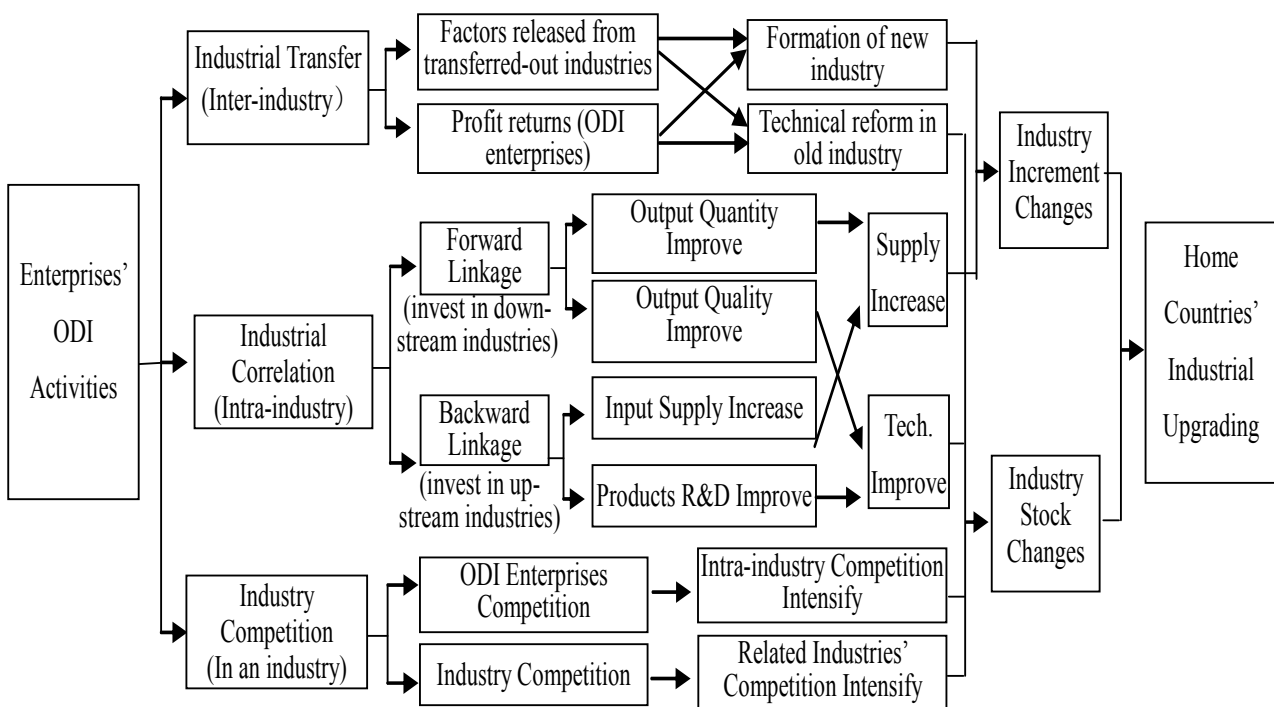
Fig. 1. a description of the mechanism of the upgrading effects ODI on domestic industries

iv.   an alternative view

Aside from the channels being identified from current research literature, there is another way of looking into the same issue from different visual angle. It involves tracing the connection between the driving forces for ODI at firm level following Dunning's way and changing characteristics of industries in home countries.

Dunning (1981) identified four main motives alluring or stimulating firms engaging in ODI and overseas-bound expansion. With this finding he grouped patterns of ODI at firm level into four categories.

✧ Resource seeking. Firm's main objective of ODI is seeking resources that are expensive in home countries. Resources being defined here including raw material, labor, and also human capital such as management and sales expertise.

✧ Market seeking. Firms leverage the ODI as a means to expand overseas market and maintain technical and operational edges that resemble a monopoly.

✧ Efficiency seeking. Firms take ODI as a way of improving efficiencies through benefits in economies of scale and economies of scope.

✧ Strategic asset seeking. Firms mainly seek such strategic assets as critical elements or intangible assets that are critical to the production process.

Our earlier research (Zhao & Jiang, 2010) based on the historical experience made by firms in several industrial ODI countries had made following findings:

✧ The four patterns emerge as the most popular motives among the firms with oversea-bound expansion in different stages of ODI and internationalization in a country. Specifically, the pattern of "resource seeking" ODI is usually popular in early stage of internationalization of an economy as a whole, which is then followed by that of "Market seeking" and that of "efficiency seeking" respectively. At the last stage, the pattern of "strategic asset seeking" ODI usually overshadows other patterns. Among the industrial economies, the ODI flows of the United States and Japan are most symbolic in that they generally follow this sequential pattern.

✧ Overlapping with this ODI sequential pattern shows a gradual evolutionary trend with the shifting dominant industrial sectors in home country. There are clear connection between the two evolutions, the evolution of the popular patterns of ODI at firm level and the shift of the dominant sectors in a country.

The empirical study supported the finding with the clear correlation between each of the four types of ODI and different trends of the expansion of industries in a specific country. Specifically, expansion of "resource seeking"-typed ODI echoes with the tide of expansion of the heavy and chemical industries. Expansion of "Market seeking" ODI echoes with the boom of domestic manufacturing industries. Expansion of "Efficiency seeking" ODI echoes with the wave readjustment of manufacturing industries. Expansion of "Strategic Asset seeking" ODI echoes with the process towards a high-tech manufacturing of an economy.

Our earlier research (Zhao & Jiang, 2010) with the historical data of the USA and Japan had found some evidence supporting the hypothesis of the connection between ODI flows and the shift of the dominant industrial sectors. They exhibit a clear time sequential pattern. Specifically, the four major transformations in the United States happened in the following times respectively: prior to the 1950s, 1950s to 1960s, 1970s to 1980s and after the 1980s. Japan started few decades later, but quickly caught up with those of the United States. (see fig.3)
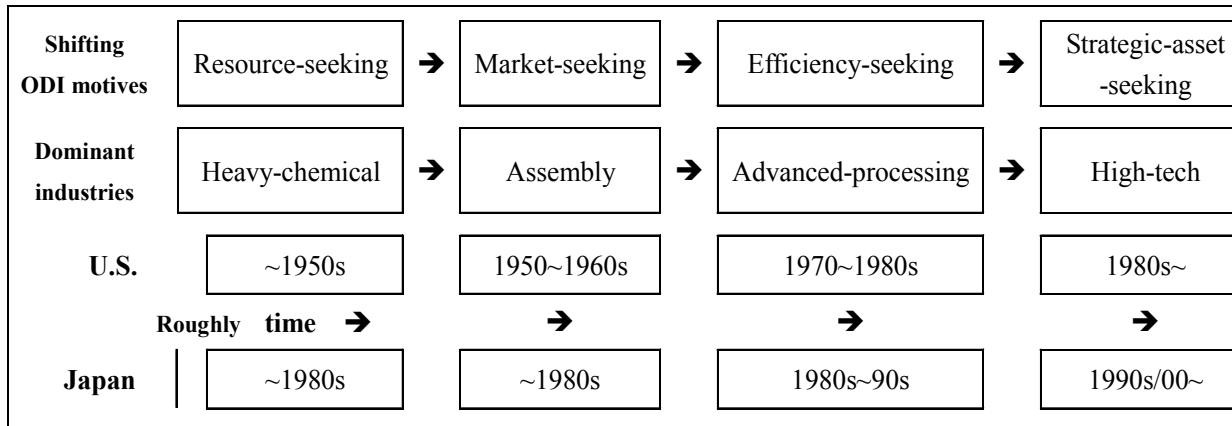
Shifting ODI motives	Resource-seeking	➜	Market-seeking	➜	Efficiency-seeking	➜	Strategic-asset-seeking
Dominant industries	Heavy-chemical	➜	Assembly	➜	Advanced-processing	➜	High-tech
U.S.	~1950s		1950~1960s		1970~1980s		1980s~
Roughly time ➜			➜		➜		➜
Japan	~1980s		~1980s		1980s~90s		1990s/00~

Fig. 3. ODI & Evolution of home country industry focus: A time series

IV.   ODI and Industrial upgrading: evidence from US and Japan

Out of all industrial countries, the US and Japan are undoubtedly two representative countries in terms of firms' ODI and internationalization. The typicality of the US as a major ODI nation originated from both its pioneering position and long term dominant position in worldwide ODI flow and MNEs. Japan's typicality comes from its peculiar status, as a dual-fold "catch-upper". It caught up the old industrial countries both in terms of industrialization and in terms of ODI and building up of MNEs as well. In this sense, these two industrial countries are the best examples for us to check the causal linkage between ODI flow and upgrading of domestic industries empirically

Logically, empirical evidences can be checked along with two clews on the side of industrial upgrading. One is structural change, another, efficiency improvement. Let us do this one by one.

i. ODI and industrial upgrading: a structural change view

There are two dimensions that we will explore in discussing the upgrading effects on industrial structure when examining the past ODI activities of advanced economies: Inter-industry and Intra-industry.

In the first dimension, previous studies have shown that the evolution of ODI industry follows first, by the initiation of primary industries (raw material seeking), then by the development of secondary industries (manufacturing) and finally extends to the enhancement of tertiary industries (service). Previous studies also believe that the United States is the only country hat has completed the whole evolution process among the industrialized economies. From 1914 to 1960, mineral and oil industries assumed the largest weight of The US ODI flows. From 1960 to 1985, manufacturing industries took over and become the largest ODI contributors. After that, the foreign direct investment of service industries expanded and in the 1990s, half of the total ODI flows were concentrated in various finance and non-finance aspects within the service industries. On the other hand, ODI by the manufacturing sector shrunk to about 30% , and less than 10% for ODI was carried out by mineral and oil industries. The ODI trend has mirrored the domestic industrial evolution in the United States.

In comparison, Japan's ODI evolution since the 70s only completed half of that of the United States - from

investments in basic energy to the structural change of the manufacturing sector which happened around 1980. The major ODI industry shifted to the manufacturing sector while ODI of other service industries such as commercial, insurance and banking also grew rapidly. However, the subsequent burst of the asset bubble and the economic stagnation has slowed down the process. Reflecting this ODI process domestically is the boom of heavy industry in the 50s and 60s, then the development of labor intensive industries in product assembly and processing in the 70s to 80s, and after the 80s, the rapid growth of the manufacturing sector and the subsequent emergence of capital and knowledge based industry economy.

In the second dimension, two measure instruments can be used. One is the Hoffmann coefficient, which reflects the degree of "heavy industrialization" within an industry. The formula is as follows:

$$HC = IVA_C/IVA_K$$

Here HC represents Hoffmann coefficient, IVA_C and IVA_K are industrial value-added of the consumer goods and that of the capital goods. Another is "industry processing level", which is generally taken as an important indicator reflecting the degree of high-tech processing to a high-tech approach. It can be calculated out with such a simple equation as,

$$IPL = VAHP/VALP$$

Here IPL represents Industry processing level; VAHP and VALP IVA_K are the value-added of highly processed goods and that of low-processed goods and raw materials. Using the above two measures, we can trace the path of structural change in the US and Japan respectively.

We found that both the US and Japan experienced a decline in terms of Hoffman coefficient in the post world war II period. In America, the drop was fast and short, which signaled that America has already realized "heavy industrialization" prior to the 50s. Subsequently, it entered into an adjustment stage and gradually became stable. In the case of Japan, the drop happened latter and relatively longer as well.
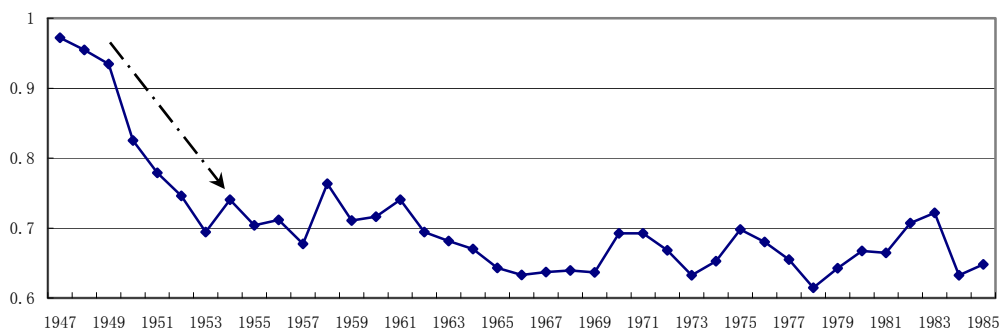
Fig. 4 Changing path of Hoffman coefficient in the US manufacturing industries (1946-1985)

Source: DOC related data bank: http://www.bea.gov

The critical stage of Japan's "heavy industrialization" happened in the 50s and 60s and in that period, the fraction of Japan's heavy industry increased rapidly and in the 60s, the fraction exceeded that of the light

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industry. Coming to the early 70s, Japan has in principle completed heavy industrialization and the relative Hoffmann coefficient dropped below 0.7and stabilized. During that period, more than half of Japanese ODI flew to developing countries. Minerals, oil and other resource-seeking investments were among the most important ODI areas, which synced with the domestic demand of the heavy industrialized industries.
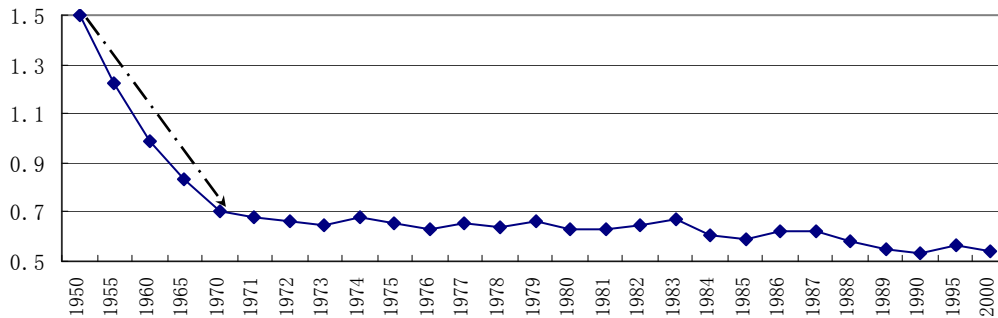
Fig. 5.   Changing path of Hoffman coefficient in the Japan's manufacturing industries（1950-2000）

Source: Authors' calculations based on various databases. http://www.rieti.go.jp

Let's move on to the second indicator. Our analysis shows that historically, both the US and Japan have seen an increase in this measure then became stabilized subsequently. The process of change between the two countries, however, has exhibited an obvious time difference. The US processing industry developed rapidly in the 50s and 60s, and the Industry processing level has shown a stable increase from less than 1.4 to around 2.2 in this period, implying that the industrial value added by the process was more than 2 times the industrial value of the raw materials. After experiencing some adjustment in the 70s, the measure stood at around 2.4. From that, we can infer the quality of The US refining process increased most rapidly 50s and 60s.
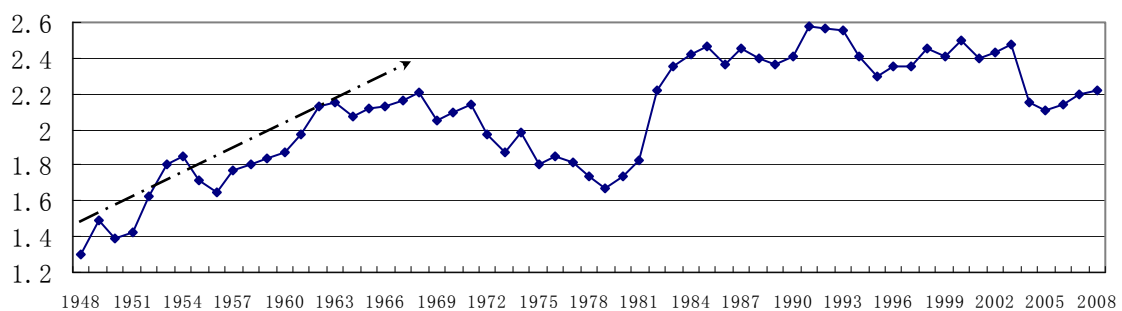
Fig.6 changing path of highly processing industries level in US (1948-2008)

Source: Authors' calculations based on databases: http://www.bea.gov

In comparison, Japan's Industry processing level increased the fastest in the 70s and 80s and towards the end of 80s, the industrial value added by the process also achieved two times as much as the industrial valued added by the raw materials. From the 90s onward, the measure stabilized at around 2. This phenomenon is heavily linked to the policy direction of the Japanese government. In the 80s, the administration policy has

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tilted in favor of technology-intensive industries and under this policy, domestic heavy industries start to outsource to other East Asia countries. The increase in manufacturing-related ODI (the period features an increase from 30% to 40%, and the speed only slowed until the 80s) echoed with this policy tilt.
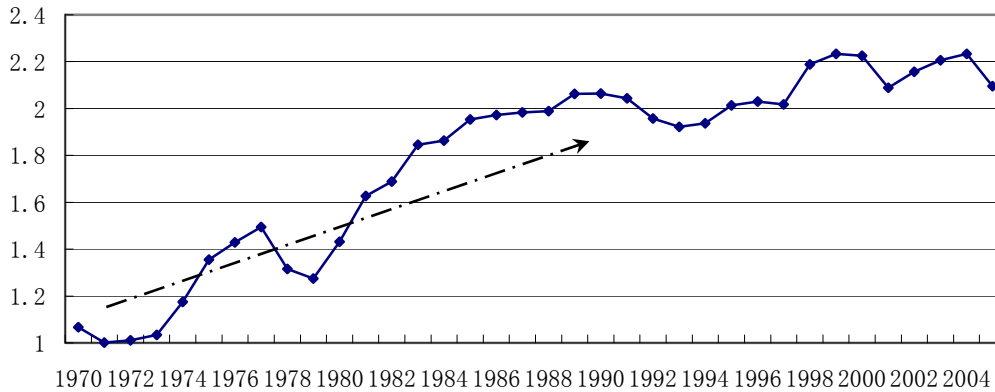
Graph. 7 changing path of highly processing industries level in US（1970-2005）

Source: calculated with data from the databases: JIP, http://www.rieti.go.jp; http://www.stat.go.jp）

Through the above analysis, we can see an intricate tie between the evolution of ODI flows and the host countries' industry inter-industry structural change and on top of that, the evolution of the intra-industry is also closely related with ODI flows. In fact, to a certain degree we can see the shift of ODI flows as a precursor of the upgrading of domestic industries.

ii. ODI and industrial upgrading: an efficiency improvement view

One of the basic driving forces for the growth of a specific industry or a specific economy is undoubtedly the improvement of efficiency. Same logics mean that one of most important indicators of industrial-upgrading is an improvement of production efficiency. While there are multiple ways of measuring production efficiency, the most popular one among them is measuring labor productivity. The enhancement of labour productivity, however, is mainly relying on technology progress. Therefore, in order for us to check the effects of ODI on domestic industries, we should pay special attention to the changes of production efficiency and improvement of technologies that ODI brought about.

If we define labor productivity as the number of units provided over the required labor, we have the following equation,

$$LP = GDP/L$$

where GDP is the industrial value added using the fixed price, and L is the actual number of workers employed in a particular industry t.

With regarding to the level of technology, previous study has calculated the change of the intensity of knowledge-based industries as a proxy of the measure. Formula is as follows:

Level of High Technology = industry value added by knowledge intensive industries/industry value added by manufacturing industries * 100%

Experiences of industrialized countries show that industry efficiency reflected by the above two indicators exhibits an obvious relation with the expansion of ODI. America's experiences reveal that ODI and the internationalization of enterprises have helped to bring about an enhancement of domestic production efficiency, and have supported further technological improvement in various ways. The outward relocation of labor-intensive industries in 1960s has supported an advance in technology level; Efficiency-seeking ODI in the 80s has promoted an increase in labor productivity; through oversea M&A activities in the 90s, The US businesses acquired significant amount of strategic assets, which then accelerated an increase of labor productivity as well as an improvement in technology. Although there is an obvious increase in labor productivity in all of the three periods above, relevant data has shown that the increase in productivity of the secondary and tertiary industries is a lot more stable than that of the primary industry. Furthermore, the increase on productivity of the secondary industry has seen largest growth and is the most stable among the three categories. Coming to the recent years, the increase in productivity of the primary industry has lost stability whereas that of the secondary and periphery industries has seen stable growth. This pattern is undoubtedly associated with the shift of The US ODI concentration towards secondary and periphery industries.

Since the mid-1990s, the shift towards high-technology based industry picked up some steam and showed signs of rapid growth. Since then there have been two adjustments, but both followed with a large increase in high-technology level. Parallel with the significant increase in high-technology level was the fact that during the fifth wave of global M&A that took place from 1990 to 2000, the US MNEs had been very active. The linkage between firms' M & A wave and a new round technology improvement is not difficult to be identified. (see fig. 8).
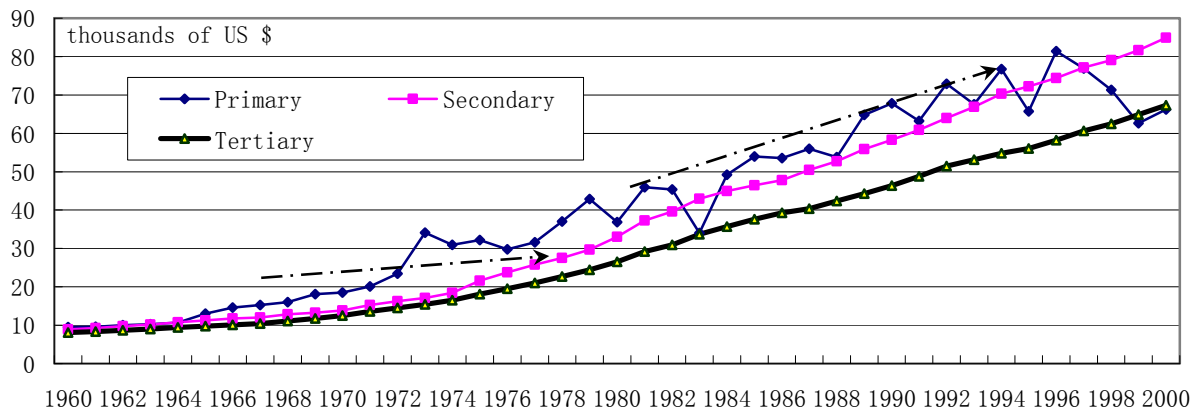
Fig. 8 Variation of output per labor in each industry U.S. 1960-2000

Source: Authors' calculations based on various databases. http://www.bea.gov

As a "dual fold" catch-up country, Japan's experience is perhaps even more symbolic. It is generally thought that ODI carried out by Japanese enterprises was concentrated in the industries that would soon lose their

comparative advantages. These marginal industries were linked to labor intensive industries in the post-war era. The overseas expansion of Japanese enterprise, especially ODI towards East Asia and emerging economies, has hitherto been directly associated with the rise of domestic labor cost, which correlates to the aging society in Japan. Also linked to this type of ODI is the continued increase in labor productivity of the domestic manufacturing industry. It is precisely in the 80s when ODI of Japanese enterprises significantly expanded that Japan experienced the biggest and most stable increase in labor productivity. (see fig. 9).
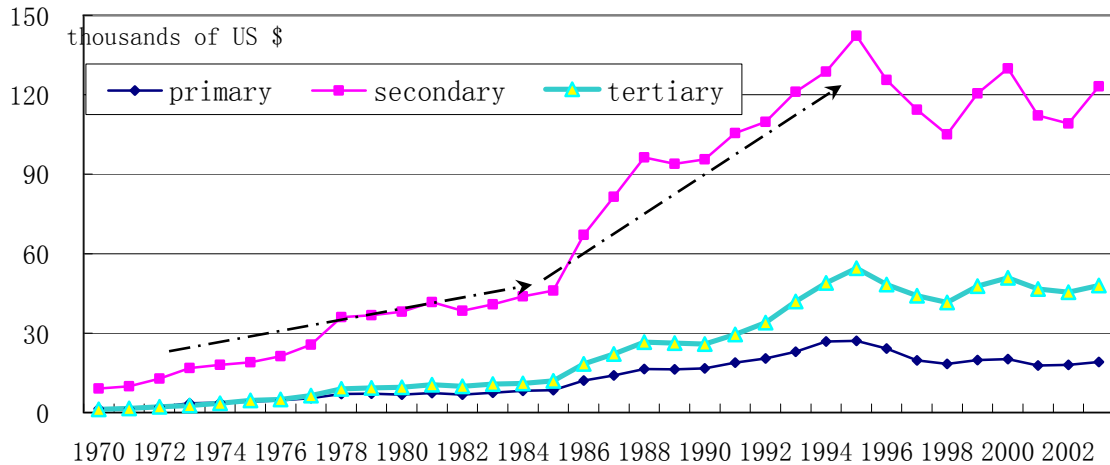
Fig. 9 changing labor productivities in three industries, Japan (1970~2003）

Source: being calculated with data from database: JIP, http://www.rieti.go.jp; http://www.stat.go.jp

A general view believes that during the most time of the post world war II the average technology in Japanese manufacturing industry was behind that of the US, then the technology improvement in Japan generally followed that in the US.. But there had been significant technology improvements in Japan since mid-1980s. All the three industries experienced quickening improvement waves during three periods: from 1985 to1989, from 1993 to 99 and from 2000 to 2004. (see fig. 10) Technology improvement during those periods obviously echoed the waves of the ODI flow, mainly to other East Asia economies, which implies the close connection between the two variables.
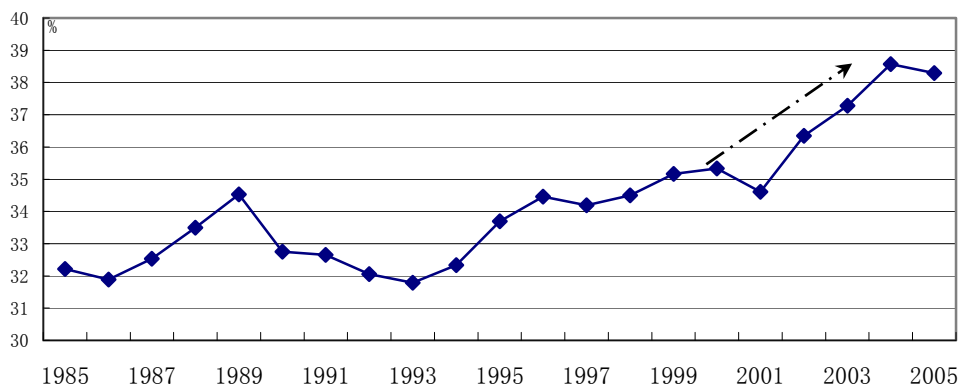
Fig.10: High-tech prone changes of Japanese manufacturing industries

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In examining the relation between ODI and its impact on industries in home country, the most noteworthy and most meaningful connection is arguably the evolution of ODI motive and the relative evolution of the core industry in the host economies. This connection implies that the evolution of ODI motive can be characterized by a upward-moving path from "elementary" to "advance", which translates to an upgrading of the domestic industrial structure. In more concrete terms, the motive of large-scale ODI activities can be characterized by the following evolution path: "Resource-seeking → Market Seeking → Efficiency Seeking → Strategic Asset Seeking". Mirroring this evolution path is the home country's own industrial upgrade -from the initial phrase of labor-intensive industry to knowledge and technology focused industries.

Experiences of the US and Japan also illustrate the difference in modes of industrial upgrading between industrialized countries and the subsequent ones. In America, the impact that ODI brought to domestic economy has a characteristic of "innovation" in both technology and product development whereas Japan's industrial upgrading has a characteristics of a "follower" - the emergence of new industries generally follows the footstep of America, and even Europe.

Further analysis reveals that the paths of ODI-driven industrial upgrading exhibit obvious difference between the two countries. ODI carried out by The US enterprises is largely motivated by the desire of cost reduction. Through outsourcing process that entails higher marginal production cost, domestic resource can be freed up to develop new products, which led to an upgrade of industry chain. At the same time, The US ODI was not limited to just marginal industries, allowing production to increase significantly across industries. The consequence was the high efficiency level achieved by the tertiary industry. ODI carried out by Japanese enterprises was mainly driven by desire of expanding trade volumes. In the initial stage, industrial upgrading was primarily completed by moving its junior industries and industries that lost comparative advantages in competition outside of border.

The above two divergences can be linked with some of the characteristics described previously. The graph below illustrates the linkage between the motivation, direction path, industry transformation and finally the upgrading of domestic industries brought about by ODI flows in the two economies. The industrial upgrading driven by ODI in America reflected an increase in internal efficiency and the ODI in Japan reflected more on the shifting of comparatively advantageous industries.

ODI & Industry Upgrading: U.S. pattern

```
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│ Cost-saving-     │──▶│ Worldwide high   │──▶│ Shed high-marginal-cost│   │ Total Factor     │──▶│ Intra-industry   │
│ oriented         │   │                  │   ├──────────────────────┤──▶│ input increase   │   │ efficiency       │
│ (Product level)  │   │ (developed       │   │ Retain low-marginal-cost│  │                  │   │                  │
│                  │   │  countries)      │   │                      │   │                  │   │                  │
└──────────────────┘   └──────────────────┘   └──────────────────────┘   └──────────────────┘   └──────────────────┘
```

ODI main-initiative   ODI main-outflow   Pattern of Industry   Upgrading Performance

```
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│ Trade-oriented   │──▶│ Flying-geese     │──▶│ Shed marginal industry│   │ Competitive      │──▶│ Industrial level │
│                  │   │ pattern          │   ├──────────────────────┤──▶│ Industries input │   │ advanced         │
│ (Industry level) │   │ (all countries)  │   │ Retain Comp-advantage│   │                  │   │                  │
└──────────────────┘   └──────────────────┘   └──────────────────────┘   └──────────────────┘   └──────────────────┘
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ODI & Industry Upgrading: Japanese pattern

Fig 11: Comparison between US & Japan ODI patterns

V.   ODI and Industrial Upgrading in China: a preliminary check

i. A mechanism adapting for Chinese realities

Coming back to China, a fast-growing emerging economy, the relative position of Chinese domestic industries on the global stage is undoubtedly lower than that of US or Japan when large-scale ODI flows happened in these countries. The US technology level was already leading the rest of the world whereas Japan had already completed "modernization" among its core industries when their respective ODI activities became active. Their domestic companies have acquired skills and management knowledge that put them atop of competitions. China is different, however. Although there is an increasing willingness to invest abroad by Chinese corporations, there remains a significant gap in knowledge and technology between Chinese enterprises and that of other advance economies. This economic reality will no doubt affect and limit ODI choices, and the following industrial-upgrading path is expected to differ from that of the advanced economies.

```
┌──────────────┐     ┌──────────────────┐    ┌──────────────────────┐   ┌──────────────────┐
│              │────▶│ State-owned      │───▶│ Resource Acquisition │──▶│ Backward Linkage │
│ Chinese      │     │ (policy-oriented)│    │ ODI                  │   └──────────────────┘   ┌──────────────┐
│ Enterprise   │     └──────────────────┘    ├──────────────────────┤   ┌──────────────────┐   │ China's      │
│ ODI          │     ┌──────────────────┐    │ Developing countries │──▶│ Industrial transfer│  │ Industrial   │
│              │────▶│ Private-owned    │───▶│ Efficiency-seeking ODI│  └──────────────────┘   │ Upgrading    │
│              │     │ (profit-oriented)│    ├──────────────────────┤   ┌──────────────────┐   │              │
└──────────────┘     └──────────────────┘    │ Developing countries │──▶│ Forward Linkage  │   └──────────────┘
                                             │ Technology           │   ├──────────────────┤
                                             │ Acquisition ODI      │──▶│ Industry         │
                                             │                      │   │ Competition      │
                                             └──────────────────────┘   └──────────────────┘
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Figure 12. ODI and China's industrial upgrading: a brief description of the mechanism

This is a simple chain model. It can be used as a basic analytical framework for studying effect of Chinese enterprises' ODI on domestic industrial upgrading.
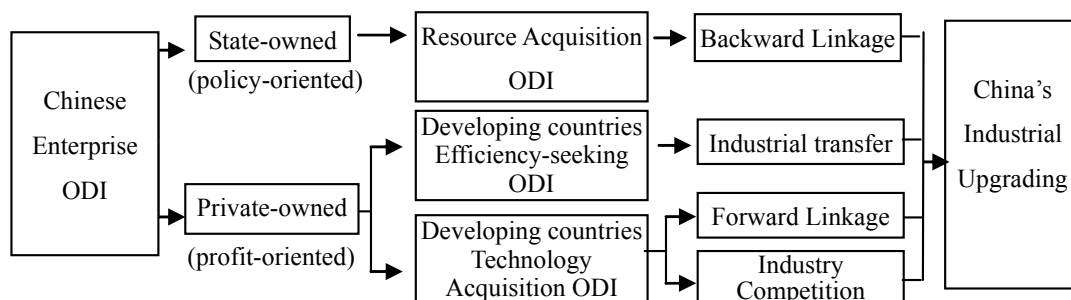
Previous research (Zhao, 2000) also shows that the initial stage of Chinese ODI covers three types of economies:

✧ Advance Industrialized Countries (America being the most popular);

✧ NIEs (newly industrialized economies)in East Asia and Latin America;

✧ Developing Countries such as countries among ASEAN and African nations.

Objectively speaking, both the level of modernization and technology in the first type of economies are much higher than that in China. They are slightly higher than that of China in the second type of economies. But they are lower in most economies grouped into third types than that of China. The ODI made in these three types of economies would have different effects on domestic industries in China. So shall be the upgrading effects. Here, nonetheless, we can not make such detailed work as both instrument and information are limited for such a study.

i. simple model for empirical research

Most researches in China are conducted based on past experiences of Japan, South Korea and other newly industrialized countries, using methods such as data analysis, index measurement and deduction. Some normative empirical researches use simple unitary linear regression model but the selection of variables tend to be simplified. Others use output or structure of tertiary industry as a measure of industrial upgrading, and use ODI flow or stock as the only independent variable. Such empirical studies have clear disadvantages. The most obvious two are: (1) though such models can reflect transitions in singular industries, changes in any particular industry cannot reflect comprehensively changes in the whole industrial structure; (2) Such analysis does not distinguish ODI from other factors that may affect industrial upgrading, for example, economic development level. That is to say, it does not filter out effect of ODI from other factors that may affect industrial upgrading. It is therefore not hard to notice that the void in empirical framework and models that describes the interaction between China's ODI and industrial upgrading.

Considering the defects mentioned above, we need to define the two most important causal factors and then chose a simple model for empirical work. The first one is industrial structure. We can adopt Chenery's (1975) concept of "standard structure" on this regard. The structure is applicable to different economic development level and was derived based on data analysis of 101 countries from 1950 to 1970, It can be used to explain the industrial structure changes accompanied by change in economic level and is an important indicator of the quality of economic growths among different countries and regions.

Following Chenery's definition of "standard structure", the model used to assess a country's industrial structure changes is as follows:

$$X = \alpha + \beta_1 \ln Y + \beta_2 (\ln Y)^2 + \gamma_1 (\ln N) + \gamma_2 (\ln N)^2 + \sum \delta_i T_i + \varepsilon F \qquad (1)$$

where X stands for an aspect of economic structure; Y stands for GNP per capita; N stands for population, which is taken into consideration because of scale economy during production and trading; F stands for net flow as a part of GNP such as, import, export, saving, investment, etc.; T stands for time trend, which is used to differentiate different time periods.

Another factor is ODI. We need to be able to include ODI into Chenery's standard structure model in order to conduct a quantitative study with inclusive results. An important assumption in Chenery's original model is that all countries are involved in international trade and are subject to capital flows, which implies that the model considers effects of international capital flows on a countries' industrial structure and has provided ample flexibility to include ODI. We therefore apply the following modifications in accord to the goal of our study:

◇ Expanding it to cover ODI variable. Factor F, a measure on effects to industrial structure by import, export, capital flows among other factors will be replaced by ODI. Considering there are lags in effects of ODI towards industrial structure, we will use stock ODI data; at the same time, to maintain the comparability among variables in the model, we use the percentage of ODI stock of GDP in our calculations.

◇ Redefining industrial upgrading variable with adapting to Chinese realities. According to Chinese enterprise's ODI distribution at the end of 2007, commercial services industry (25.9%), wholesale and retail industry (17.2%), finance industry (14.2%), mining industry (12.7%) and transportation/storage and mail business (10.2%) summed to about 80% of the total ODI investing industries in China,; In terms of investing subjects, manufacturing subjects take about 45.5%, followed by wholesale and retail industry (23.0%) and construction industry (5.2%). As Chinese ODI is spread across many different industries, domestic industrial upgrading effects may also appear in multiple industries. To account for that, we use industrial structure level coefficient as the dependent variable to measure ODI's upgrading effects. The industrial structure level coefficient is primarily used to measure changes on the regional industry level as a whole, which is derived as follows: Assuming there are n industries, denote q(j) as the industry proportion of industry j then rank them by size, so the industrial structure level coefficient is defined as $w = \sum_{i=1}^{n} \sum_{j=1}^{i} q(j)$.

◇ Eliminating the dummy variable. In the original equation, factor T is used to reflect effect of time trend. Considering the history of Chia's ODI is not very long, and data available has a limited time span (2003-1007), we can omit effects of time trend in the model by eliminating the dummy variable factor $\sum \delta_i T_i$. At the same time, as this research is based on panel data of a short time in the typical regions, effects of population changes can also be eliminated. So we eliminate the items $\gamma_1 (\ln N) + \gamma_2 (\ln N)^2$.

We therefore come up with the below two semi-log regressions to measure effects on industrial upgrading with and without ODI factor respectively:

$$W = \alpha + \beta_1 \ln Y + \beta_2 (\ln Y)^2 + \varepsilon_1 \qquad (2)$$

$$W = \alpha + \beta_1 \ln Y + \beta_2 (\ln Y)^2 + \gamma \, ODI + \varepsilon_2 \qquad (3)$$

Here W is regional industrial structure level coefficient, $W = \sum_{i=1}^{n} \sum_{j=1}^{i} q(j)$; Y is regional GDP per capital in dollar amount, in the form of logarithm; ODI is represented as the percentage it accounts for in regional GDP. By using percentage, we can eliminate effect of inflation and regional economic scale differences.

Ⅴ. **ODI and** Industrial **Upgrading in China: Data and Results**

We have to consider two important realities related to the Chinese originated ODI when make choice of data for empirical studies on our themes here. One is the background as an emerging ODI nation and emerging market economy as well. It means that ODI from China as a whole is still in the process of initial building up comparing to the industrial countries. Although Chinese enterprises started the ODI exploration from the early stage of economic transformation, the volume of ODI from China had been very small before 2000 when the Chinese central government launched the state strategy -- "the going out for development strategy". After that the ODI flow from China began to quickening up. The other one is the big disparity in terms of both income and ODI volume among domestic regions in China. Overwhelming share of the ODI are made by firms from the coastland areas that experienced much quicker economic growth than inland areas in the three decades up to 2008. Ten coastland provinces and municipalities actually dominant the ODI flow of the whole country.[i]

Considering the above two realities, we made two choices: 1) take a comparatively new and short time period, which is 2003-2007 in this research; 2) concentrate on data from the typical ODI regions and industries, and typical regions include the 10 provinces and cities mentioned above. Data of ODI can be found in national Commerce Department's annual Statistical Bulletin of China's Outward Foreign Direct Investment. Other data can be acquired from statistic yearbooks of related provinces or cities.

The panel data analysis is made with Eviews 6 programm. The Hausman test result is Chi-Sq.=2.9(P>0.4). Considering the common knowledge that individual effects are not related to independent variables, random effects models would be a good instrument in dealing with the data. In addition, the difference of factors that affect the industrial structure on provincial level is also considered. By analyzing panel data in random effects model, we get coefficients and testing statistics of the equations as shown in Table 1:

Table 1：Coefficients and Testing Statistics of the Equations

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[i] They are Zhejiang, Guangdong, Shandong, Fujian, Jiangsu, Heilongjiang, Jilin, Liaoning, Shanghai and Beijing.

Coefficients	C	β_1 (lnY)	β_2 $(lnY)^2$	γ(ODI)	F	R^2	Adj. R^2
Equation(2)	216.75	12.45	4.61	---	177.57	0.88	0.87
T	75.45[***]	3.94[***]	3.02[***]	---			
Equation(3)	216.33	13.59	3.24	1.88	121.40	0.89	0.88
t	73.3[***]	4.2[***]	1.7[**]	2.2[**]			

Note: [*] is at 10% significant level, [**] is at 5% significant level, [***] is at 1% significant level.

As shown in the above table, t-test results of coefficients in equation (2) are significant at level 1%, which means that logarithm of GDP per capital and its quadratic term has good explanatory power on China's industrial upgrading. Adjusted R^2 is 0.87, and F is 177.57. Both meet the significance tests. It means that after eliminating some items, Chenery's model still has good explanatory power. Then, in equation (3), after adding the ODI variable, t-test results of all coefficients are still significant. The coefficient of logarithm of GDP per capital remains significant at 1% level, while its quadratic term's coefficient is significant at 5% level, with a slight decline. The t-value of ODI coefficient is 2.2, which is also significant. Adjusted R^2 increases to 0.88, which means after including the ODI variable, goodness of fit also enhanced.

According to results above, we can reach two basic conclusions:

First, ODI has positive effects on industrial upgrading in the "typical regions", drawn from the results of equation (3). The result does not only demonstrate higher goodness of fit, but also a positive and significant coefficient on ODI (γ =1.88). We can therefore draw the initial conclusion that ODI is positive correlated with industrial upgrading in the "typical regions" in China.

Second, ODI is not the exclusive factor that helps explain regional industrial upgrading. We can go on using Chenery's model to laterally compare coefficients values of β_1, β_2 and γ in equation 3 with other countries. We can find that effect of ODI is relatively smaller in China because the scale of Chinese ODI remains small. Even in the "typical regions" with comparatively bigger scales, among factors that promote industrial upgrading, effect of ODI is still small.

. Concluding Remarks

Our work so far implies the following results:

✧ There is an obvious and traceable connection between ODI and the industrial upgrading of the host economies. In another words, ODI flows has helped catalyzing the industrial upgrading of the home countries. Experiences of America and Japan, however, reveal that there are different paths towards industrial-upgrading. The US ODI is characterized by "Efficiency-seeking", which positively correlates

with the enhancement of domestic efficiency. Japanese ODI, on the other hand, is propelled by motives of market or trade expansion, and ODI flows intersected with the domestic industry structural adjustment. However, we need to be careful that the mechanisms mentioned above are all based on previous experiences from industrialized countries, which have obvious differences with China's current situation. China is a newly emerging economy undergoing system transformation and its system has some distinct characteristics, most notably the existence of state-owning enterprises and substantial government involvement. There are two distinct features of Chinese ODI. The first is the diversity of enterprises, such as state-owned, private-owned and foreign-invested. The most influential ones are state-owned and private-owned enterprises. The other feature is the extensiveness of government interventions, particularly among state-owned enterprises. Even ODI carried out by private-owned enterprises are more or less influenced by government policy guidelines. These have led to some special features of ODI of Chinese enterprises: (1) ODI is dominated by state-owned enterprises. Currently, more than 80% ODI comes from state-owned enterprises (including state-holding enterprises) investment; (2) ODI target host countries and industries are different according to the nature of the enterprise: state-owned enterprises mostly invest in countries with rich energy resource and mineral, mainly the developing or less developed countries whereas private-owned enterprises mostly invest in manufacturing and commodity marketing in developed and newly industrialized countries.

✧ Existing literatures on ODI effect towards industrial upgrading in home countries can be generally divided into two categories: positive effect theory and negative effect theory. Positive effect theory believes that ODI can help improve home countries' resource using efficiency, thereby promoting industrial upgrade and transformation. Negative effect theory believes that ODI will lead to lack of investment and failure in some industries in the home country. The former theory is supported by different viewpoints and evidences while among the supporters of the latter theory, hollowing-out of industry is the most influential. Most recent studies support the positive effect theory, and cast doubts on the theory of hollowing-out of industry.

✧ According to existing literatures and typical case studies, we can build a systematic framework in analyzing ODI's industrial effects on home countries. This system consists of three mechanisms: mechanism of industrial transfer, mechanism of industrial correlation and mechanism of intra-industry competition. These three mechanisms can also be seen as three transmission channels of ODI effect on industrial upgrading. A lot of case studies support these transmission channels in different aspects and degrees. Among them, industrial transfer effect and backward linkage effects are mainly supported by studies on developed countries whereas forward linkage effects are mostly supported by cases of emerging economies.

✧ As China is an emerging economy undergoing institutional transformation, there are many aspects that differ from both developed industrialized countries and NIES. We revise the system of mechanisms because of that and incorporate two factors into consideration: the first is the extensive government involvement and intervention; the second is the differences in enterprise system, which consists of

state-owned and private-owned enterprises, and ODI is dominated by state-owned enterprises.

✧ Preliminary empirical work shows that in China, ODI and regional industrial upgrading in typical regions are positively corelated and the relation depends on the size of ODI. As China's ODI is still in its primary stage in both scale and level, even coastal regions which opened up earlier than the other regions such as Guangdong, Shanghai, Shandong and Zhejiang, , their ODI accounts for less than 1% of the total economic aggregate. As a result, ODI has a comparatively smaller effect in promoting industrial upgrading among all related factors, which is also supported by our results.

As everything in this world, however, there is no perfect around us. So is our research of this. Two defects have to be mentioned here. One concerned with the empirical check of the two industrial countries. Our attention is mainly given to the changes of domestic industries and taking ODI flow as a background only, in stead of connecting two processes and check causal linkage of the two variables.

Another, owing to data unavailability and other limitations, the empirical check of China is carried with dropping several key issues. It basically belongs to an one-way check, only did it form ODI to home country and dropped the reverse effect. In fact, industrial upgrading will undoubtedly stimulate enterprises' ODI activities. Second, analysis based only on Chenery's model is not sufficient. The model only reflects relation between economic growth and industrial upgrading, but cannot include other factors that may affect industrial upgrading. Beside, although panel data analysis has its advantages, it is easy to lead to some misjudgment owing to data limitation.

All the defects and deficiencies shall be our main concern of the continued research in the next step.

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Appendices

Table 1 Global Distribution of China's ODI flows & stocks, 2003-2009

(mill.   US $)

Flows	2003	2004	2005	2006	2007	2008	2009

Asia	1505.03	3013.99	4484.17	7663.25	16593.15	43547.5	40407.59
Africa	74.81	317.43	391.68	519.86	1574.31	5490.55	1438.87
Europe	145.03	157.21	395.49	597.71	1540.43	875.79	3352.72
Latin America	1038.15	1762.72	6466.16	8468.74	4902.41	3677.25	7327.9
North America	57.75	126.49	320.84	258.05	1125.71	364.21	1521.93
Oceania	33.88	120.15	202.83	126.36	770.08	1951.87	2479.98
TOTAL	2854.65	5497.99	12261.17	17633.97	26506.09	55907.17	56528.99
Stocks	2003	2004	2005	2006	2007	2008	2009
Asia	26603.46	33479.55	40954.31	47978.04	79217.93	131316.99	185547.2
Africa	491.22	899.55	1595.25	2556.82	4461.83	7803.83	9332.27
Europe	487.45	676.65	1272.93	2269.82	4458.54	5133.96	8676.78
Latin America	4619.32	8268.37	11469.61	19694.37	24700.91	32240.15	30595.48
North America	548.5	909.21	1263.23	1587.02	3240.89	3659.78	5184.7
Oceania	472.26	543.94	650.29	939.48	1830.4	3816	6418.95
TOTAL	33222.22	44777.26	57205.62	75025.55	117910.5	183970.71	245755.38

Source: 2009 Statistical Bulletin of China's Outward Foreign Direct Investment, MOFCOM.

Table 2 China's ODI flows & stocks into ASEAN countries, 2005-2009

(millions of US $)

Country/ Region	Flows					Stocks				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Brunei	1.5	-	1.18	1.82	5.81	1.90	1.90	4.38	6.51	17.37
Myanmar	11.54	12.64	92.31	232.53	376.7	23.59	163.12	261.77	499.71	929.88
Cambodia	5.15	9.81	64.45	204.64	215.83	76.84	103.66	168.11	390.66	633.26
Indonesia	11.84	56.94	99.09	173.98	226.09	140.93	225.51	679.48	543.33	799.06
Laos PDR	20.58	48.04	154.35	87.00	203.24	32.87	96.07	302.22	305.19	535.67

Malaysia	56.72	75.1	-32.82	34.43	53.78	186.83	196.96	274.63	361.20	479.89
Philippines	4.51	9.30	4.50	33.69	40.24	19.35	21.85	43.04	86.73	142.59
Singapore	20.33	132/15	397.73	1550.95	1414.25	325.48	468.01	1443.93	3334.77	4857.32
Thailand	4.77	15.84	76.41	45.47	49.77	219.18	232.67	378.62	437.16	447.88
Vietnam	20.77	43.52	110.88	119.84	112.39	229.18	253.63	396.99	521.73	728.5
TOTAL	157.71	335.75	968.08	2484.35	2698.1	1256.15	1763.38	3953.17	6486.99	9571.42

Source: 2009 Statistical Bulletin of China's Outward Foreign Direct Investment, MOFCOM.

Table 3 China's outward FDI flows & stocks into EU countries, 2005-2009

(millions of US $)

Country/ Region	Flows					Stocks				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Austria	--	0.04	0.08	--	--	0.07	0.32	4.04	4.04	1.55
Belgium	--	0.13	4.91	--	23.62	2.34	2.67	33.98	33.30	56.91
Bulgaria	1.72	--	0.00	--	-2.43	2.99	4.74	4.74	4.74	2.31
Cyprus	--	--	0.30	--	--	1.06	1.06	1.36	1.36	1.36
Czech Rep	--	9.10	4.97	12.79	15.60	1.38	14.67	19.64	32.43	49.34
Denmark	10.79	-58.91	0.27	1.33	2.64	96.59	36.48	36.75	38.08	40.79
Estonian	--	--	0.00	--	--	1.26	1.26	1.26	1.26	7.50
Finland	--	--	0.01	2.66	1.11	0.90	0.93	0.94	3.59	9.04
France	6.09	5.60	9.62	31.05	45.19	33.82	44.88	126.81	167.13	221.03
Germany	128.74	76.72	238.66	183.41	179.21	268.35	472.03	845.41	845.50	1082.24
Greece	--	--	0.03	0.12	--	0.35	0.35	0.38	1.68	1.68
Hungary	0.65	0.37	8.63	2.15	8.21	2.81	53.65	78.17	88.75	97.41
Ireland	--	25.29	0.20	42.33	-0.95	0.04	25.30	29.23	107.77	106.82
Italy	7.46	7.63	8.10	5.00	46.05	21.60	74.41	127.13	133.60	191.68
Lativia	--	--	-1.74	--	-0.03	1.61	2.31	0.57	0.57	0.54
Lithuania	--	--	0.00	--	--	3.93	3.93	3.93	3.93	3.93

Luxemburg	--	--	4.19	42.13	2270.49	--	--	67.02	122.83	2484.38
Malta	--	0.10	-0.10	0.47	0.22	1.37	1.97	1.87	4.81	5.03
Netherlands	3.84	5.31	106.75	91.97	101.45	14.95	20.43	138.76	234.42	335.87
Poland	0.13	--	11.75	10.70	10.37	12.39	87.18	98.93	109.93	120.30
Portugal	--	--	0.00	--	--	--	0.20	1.71	1.71	5.02
Romania	2.87	9.63	6.80	11.98	5.29	39.43	65.63	72.88	85.66	93.34
Slovak Rep	--	--	0.00	--	0.26	0.10	0.10	5.10	5.10	9.36
Slovenia	--	--	0.00	--	--	0.12	1.40	1.40	1.40	5.00
Spain	1.47	7.30	6.09	1.16	59.86	130.12	136.72	142.85	145.01	205.23
Sweden	1.00	5.30	68.06	10.66	8.10	22.46	20.02	146.93	157.59	111.89
Britain	24.78	35.12	566.54	16.71	192.17	107.97	201.87	950.31	837.66	1028.28
Total	189.54	128.73	1044.12	466.62	2966.43	768.01	1274.51	2942.10	3173.85	6277.83

Source: 2009 Statistical Bulletin of China's Outward Foreign Direct Investment, MOFCOM.

Table4. China's outward FDI flows by province, 2003-2009(Non-Finance Part)

(millions of US $)

Province	2003	2004	2005	2006	2007	2008	2009
Central total	2097.51	4525.17	10203.69	15236.92	21252.68	35982.84	38192.75
Provincial total	757.14	972.82	2057.48	2397.05	5253.41	5876.33	9602.5
Beijing	300.54	157.39	113.06	56.12	152.95	472.99	451.85
Tianjin	5.44	17.54	18.87	28.08	79.93	82.00	209.92
Hebei	1.10	12.86	85.38	48.80	53.94	53.63	219.93
Shanxi	45.62	4.11	5.62	18.49	83.47	27.02	332.95
Inner Mongolia	2.20	6.67	21.81	25.22	42.35	61.90	155.47
Liaoning	8.47	41.41	30.19	97.01	128.33	106.00	757.86
Dalian	6.46	35.54	11.44	67.48	--	44.27	463.84
Jilin	1.63	28.87	10.83	29.48	83.22	106.73	298.14
Heilongjiang	7.44	56.45	166.43	217.96	178.51	227.97	121.31

Shanghai	52.24	205.64	666.80	448.63	522.66	337.14	1208.69
Jiangsu	24.90	57.33	108.28	124.03	518.99	493.84	850.61
Zhejiang	36.65	72.25	158.17	215.28	403.46	387.68	702.26
Ningbo	6.59	24.81	32.85	36.74	--	225.15	210.97
Anhui	2.00	6.14	19.02	34.12	50.79	60.51	57.82
Fujian	61.62	15.91	42.53	95.84	368.47	161.69	365.82
Xiamen	4.77	7.95	6.23	0.90	--	41.59	123.89
Jiangxi	3.20	0.93	6.54	0.48	15.36	25.87	22.65
Shandong	88.83	75.23	159.04	126.66	189.28	474.78	704.41
Qingdao	3.92	0.18	8.64	22.37	--	15.47	104.72
Henan	6.07	4.69	85.38	7.63	70.36	131.28	120.75
Hubei	1.76	1.31	4.85	2.86	9.03	3.50	41.16
Hunan	2.55	2.96	30.67	59.21	140.88	254.46	1005.68
Guangdong	95.55	138.93	207.08	629.97	1141.01	1242.51	922.98
Shenzhen	88.21	150.63	92.00	452.88	--	763.75	414.47
Guangxi	2.08	4.50	3.21	3.90	26.20	38.44	81.69
Hainan	--	--	0.06	3.43	1.22	0.82	60.72
Chongqing	--	9.85	5.90	16.91	87.13	104.48	47.47
Sichuan	1.47	5.06	26.66	28.31	291.20	81.07	107.4
Guizhou	--	--	--	--	0.51	0.25	5.22
Yunnan	2.51	4.91	20.72	29.07	136.41	284.67	270.08
Tibet	--	--	--	--	--	--	--
Province	2003	2004	2005	2006	2007	2008	2009
Shanxi	0.21	2.34	3.02	1.15	20.58	140.63	224.62
Gansu	0.83	3.17	37.70	20.87	153.64	358.08	18.52
Qinghai	1.02	--	1.00	0.80	1.10	2.02	2.09
Ningxia	--	1.37	1.09	18.18	5.69	5.02	15.09

Xinjiang	0.27	2.16	8.61	1.72	85.35	69.34	180.57
Xinjiang PCG*	0.94	32.84	8.96	6.84	211.39	79.99	38.77
Total	2854.65	5497.99	12261.17	17633.97	26506.09	41859.17	47795.25

Note: *Xinjiang PCG is abbreviation of Xinjiang Production and Construction Group, a state owned pa-military farming group.

Source: 2009 Statistical Bulletin of China's Outward Foreign Direct Investment, MOFCOM.