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and China's Development Path

Bei Jin
Qizi Zhang *Editors*

The New Trend of Global Industrial Division of Labor and China's Responses

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Research Series on the Chinese Dream and China's Development Path

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Editors

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Chapter 1
Historical Evolution of the Pattern of International Division of Labor

Weifu Zhou

International division of labor is not a static state but a dynamic process with constant development and changes. It reflects not only the development level of productivity, but also relations between countries. The pattern of international division of labor, besides being a static system of labor division, can also determine relations between countries taking part in the division of labor as well as benefits they obtain during the process. With time going by, it will experience more complex changes and alternation.

Large-scale international trade, which started after the opening of new sea-routes in 15th century, is the prerequisite for creating the pattern of international division of labor. The initial international trade happened between Europe, South America and Africa. However, the pattern of international division of labor changed correspondingly with the beginning of the Industrial Revolution in 18th century. England, the birthplace of the Industrial Revolution, was the major beneficiary. In the period with a rapid development of productivity, British economists represented by Adam Smith and David Ricardo proposed theories of liberalistic economics that were completely different from Mercantilism. In the 18th century, the liberalistic economics occupied a dominant position in theories related to the international division of labor. According to the Theory of Comparative Advantage, first-mover industrial countries have plentiful reasons to develop their industries and export manufactured products to other countries, while late-mover countries must produce agricultural products and industrial raw materials.

As a result, first-mover capitalist countries represented by England became leaders of the international division of labor in 19th century.

After that, the Second Industrial Revolution occurring mainly in Germany and the USA ushered in a profound change of the pattern of international division of labor. In the second revolution of science and technology, the development of new technologies such as electric power, chemistry and internal combustion engine changed

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the pattern of productivity, and posed certain impacts on the pattern of international division of labor. New emerging countries such as the USA and Germany occupied monopoly positions in the new pattern, replacing England's dominant position in the old one.

The new pattern taking in shape under the condition of the new technological revolution had its distinct characteristics, one of which was the involvement of almost all countries in the world. After the end of the 2nd World War, especially after the Cold War, almost all countries in the world involved in the pattern of international division of labor, which was an unprecedented phenomenon. With more countries participating in the international division of labor, new changes occurred in the pattern. One of the significant changes was the emerging of new industrialized countries dominated by East Asian countries. Such change drove the gradual disintegration of the traditional international system of vertical inter-industry division of labor. Thus, the pattern in which the intra-industry and intra-product international division of labor take the dominant position was gradually established.

Since 2008, the global economy has been running under the background of the deepening financial crisis. In this context, trade frictions and industrial policies between countries have profoundly changed the existing pattern of international division of labor. Countries in the world have established stimulus policies and supportive policies for emerging industries to get rid of the crisis. As a result, the international economic situation has been changed progressively, which deserves our further attention.

1.1 Connotations and Types of International Division of Labor

Research on the history and reality of the pattern of international division of labor is based on how to view its formative reasons. Most scholars have agreed productivity as the major driver pushing forward the change of the pattern of international division of labor. Meanwhile, the deepening of economic globalization has played a key role in the changes of the pattern. Zhang (2003) argued that Ricardo's Comparative Cost Theory marks the establishment of the general system of international trade theory. This theory is also called the "unshakable basis of international trade". However, with the deepening of international division of labor, these theories were also questioned during their development. For example, Nobuo Minabe (1989) pointed out that if considering from the perspective of effects of scale economies, the international division of labor based on the Heckscher-Ohlin Theory couldn't definitely guarantee the best allocation of resources, while the division of labor based on mutual agreements is the best choice.

Due to different relative development levels of productivity, the international division of labor has presented various forms, among which, the vertical division of labor has always been an important one. The vertical division of labor is the one led by

developed countries while developing countries are in a subordinate position (Gu 2003). On one hand, this type of division of labor can bring about some benefits to developing countries. Taking China as an example, Guo et al. (2011), through their empirical research, argued that the vertical specialization plays a greater role in driving economic growth than that of a common trade model. Furthermore, it can better promote a long-term economic growth. Meanwhile, it can also increase the average level of salary. That is, the degree of the vertical specialization in manufacturing and per capita labor productivity all play active roles in promoting industrial income, while the former has a larger positive role in increasing industrial income in capital-intensive industry than that in labor-intensive industry (Yin 2012). On the other hand, it is possible that this type of division of labor may result in a crisis in developing countries as developing countries are positioned at a lower level of the vertical specialization and in a disadvantage in factor returns (Feng 2004). Hu (1990) pointed out in his research on the relationship between the vertical specialization and the economic crisis occurring in Southeast Asia that the vertical specialization may make countries in this region heavily rely on foreign capital. Under this circumstance, national capital of developing countries has no way for a healthy development.

Another important type is the horizontal division of labor. Yang (2001) elaborated the concrete form of realizing the horizontal division of labor. He argued that this type of division of labor usually happens among countries with comparatively similar economic development levels, and multinational enterprises are the major forces in realizing this type of division of labor while equity merge and acquisition is the major method. The horizontal division of labor is comparatively equal to all countries, and will help all participants develop their economies.

From another direction, the international division of labor can be categorized into inter-industry, inter-product and intra-product division of labor. In the current era with a rapid development of productivity, the intra-product labor division has become one of the major forms. The phenomenon of intra-product international division of labor can be described as "slicing up the value chain", which refers to the form of different countries in a same value chain participating in the division of labor. With regard to the reasons for the occurrence of the intra-product international division of labor, Zhang (2007) thought that it is still the comparative advantage of a specific working procedure and process possessed by different countries that determines the division of labor in different working procedures and processes. Meanwhile, the decrease of transaction cost is also a condition for the emergence of intra-product international division of labor. With regard to its effect, Hu (2007), through her empirical research, argued that the intra-product international division of labor will improve a country's labor productivity, and the active role will be more significant in capital-intensive industry and export-intensive industry. As for its impact on income distribution, Sun and Pei (2012) argued that the impact in a short term tends to be gradually expanded, but from a long-term point of view, it will tend to be contracted. When reaching a critical value, the intra-product international division of labor will slow down the worsening of income distribution.

The current pattern of international division of labor with the intra-product vertical specialization as its main form has been confronted with changes. With the deepening

of the financial crisis, the East Asian model that heavily relies on external demand has also been confronted with a certain degree of crisis. As a result, many studies agree that China shall adjust the export mix of its processing trade, promote industrial upgrading and actively participate in international competition in upstream value chains. (Hou 2009). This kind of industrial upgrading is also regarded as a task which needs a dual support from country and market for its completion.

I. Connotations of International Division of Labor

Tracing the development history of international division of labor, it is found that when productivity has been developed enough to support human's oceangoing voyage, trade will break through boundaries of continents and lands, and become international trade between countries. However, as it is impossible for every country to produce every kind of products, trading with other countries must be carried out to realize complementary advantages. Amid such pattern of international division of labor, each participant is economically connected with others while having different division of labor. In today's economic globalization, it is fair to say that no country can carry out economic activities alone, and all shall take part in international trade and be a component of the pattern of international division of labor. Therefore, the pattern has become more increasingly important.

The international division of labor refers to labor division among countries in the world. It is the basis of international trade and economic connections among countries. Furthermore, it is also related to the international pattern. The pattern of international division of labor, as an affiliated product of international economic and political pattern, cannot exist independently.

The international division of labor is the further effort of social division of labor. The development of productivity has always been a key factor impacting the change of labor division forms in history. Every frog-leap development of productivity always leads to a change of the pattern of international division of labor. In the transition history of the pattern of international division of labor, three technological revolutions have played significant roles. New-type production equipment and new modes of production brought by the technological revolutions have changed the pattern of international division of labor. Presently, the Internet of Things and 3D printing, as the representatives of the technological revolution, have been changing human's mode of production. These new technologies as representatives of new productivity will be the technological foundation for the establishment of new pattern of international division of labor.

Improving productivity is the prerequisite for the development of division of labor; on the contrary, the division of labor benefits the increase of working proficiency and the improvement of technology and labor efficiency. The two have a relation of mutual enhancement. This is the reason why the social division of labor is deepened more obviously in capitalist social formation. With the industrialization brought by the industrial revolutions and the improvement of productivity, the social division of labor has finally developed into the international division of labor.

On the whole, when a country serves as a participant of international trade and international division of labor, the progress of productivity leads to a result that the

production capacity or production process of some industries need to stride over the territorial limit of a country, and become a kind of production process in which many countries simultaneously provide raw materials and markets. In another word, when what a country already has cannot fully satisfy its need for production, it requires the production process extended from the social division of labor within the country to the international range. Meanwhile, the technological progress and the improvement of labor productivity also lead to the result that large numbers of products cannot be absorbed by its domestic markets due to the increased productivity capacity, which requires the demand from overseas markets. Thus, cheaper products need to be sold into world markets to fully satisfy the needs of markets.

The international division of labor is also caused by enterprises, the micro-units in economies, in their efforts for acquiring more profits. As the result of the development of productivity, enterprises, when expanding productions for pursuing more economic benefits, do not necessarily limit themselves within national borders in searching for demand and supply. For the purpose of pursuing maximum benefits at minimum costs, an enterprise usually regards all regions worldwide as its source of markets and raw materials, which also drives the formation of the pattern of international division of labor to a certain degree. Currently, multinational enterprises, as the backbone element of economic globalization, all have regarded the whole world as their original places of raw materials and sales markets. This is also an important reason for the formation of the pattern of international division of labor.

II. Types of International Division of Labor

As productivity has developed and the international division of labor and social division of labor have been furthered, the pattern of international division of labor has undergone various changes. Under the condition of certain productivity and the depth of division of labor, the corresponding pattern of international division of labor will appear. Undoubtedly, the motive mechanisms for changing the pattern of international division of labor are the productivity and the depth of social division of labor. However, at the same time point, different industries at various districts will present distinct types of the pattern of international division of labor due to the discrepancy of productivity and of the depth of labor division. That is, the pattern of international division of labor in A industry is the vertical specialization, while that in B industry is the horizontal specialization. Besides, the pattern of international division of labor will have different types from different observation angles.

Vertical, Horizontal and Mixed Division of Labor

(1) Vertical Division of Labor

The conditions for the emergence of vertical division of labor include that developing countries possess almost infinite supplies of labor and plentiful natural resources due to the existing disguised unemployment, and that developed countries monopolize production technologies of manufactured products. In this type of labor division, developed countries realize their goals of cutting production costs through

their investment in developing countries without transferring technologies to developing countries. Simple and unskilled labor also can participate in the production of technology-intensive products, but only limited to low value-added procedures. One of reasons for that capital recipient countries are always in the position of engaging in low value-added production is the existence of man-made obstacles for technology transferring and diffusing, and the technological monopoly in technology transactions caused by non-marketized systems.

After the end of the Second World War, the vertical division of labor transferred gradually from the inter-industry form to the intra-industry and intra-product ones. As a result, developed countries transformed from producing manufactured products to conducting production at the top of industrial chains. Developing countries conducted production of primary products such as agricultural and mineral products, while developed countries engaged in the production of manufactured products. Thus, the vertical labor division among different industries was formed. That is, the vertical division of labor between resource-based primary products and the industrial manufactured products.

With the further development of productivity, the intra-industry vertical labor division gradually transformed to the intra-product one, which mainly manifests in that in the industrial chain of a product, developed countries mainly have engaged in technology-intensive procedures of the production while developing countries in labor-intensive procedures. Therefore, in the production procedures of a same product, a pattern of labor division in which the labor-intensive and the technology-intensive procedures of a same product have been distributed to different countries took in shape. The technology-intensive procedures have been left within developed countries such as the development of new technologies and the design of styles, while the labor-intensive procedures have been completed in developing countries. This is the current pattern of international division of labor, in which assembly procedures are in developing countries, while R&D procedures are in developed countries. It is also the new pattern of labor division of unskilled labor exchanging for technologies. As shown in Fig. 1.1, through the concrete calculations of vertical specialization indexes of various industries in China, the vertical specialization levels of most industrial manufactured products in China already exceeded 20%, and the indexes were much higher especially in capital-intensive industries. As shown in Fig. 1.2, during the process of advancing economic globalization, the average vertical specialization level of various industries in China, as an important part of the vertical division of labor, realized comparatively large improvement during the period from 1992 to 2009.

To a certain degree, the vertical division of labor has driven the economic growth of developing countries. The most typical example is the well-known “East Asian Model”, in which Singapore is the most successful example. Singapore, through the chance of the vertical labor division, developed its industrial structure dominated by labor-intensive industries into the one dominated by technology-intensive and capital-intensive industries. Meanwhile, the government has insisted on budget surpluses for a long time so as to have plentiful foreign exchange reserves. At the end

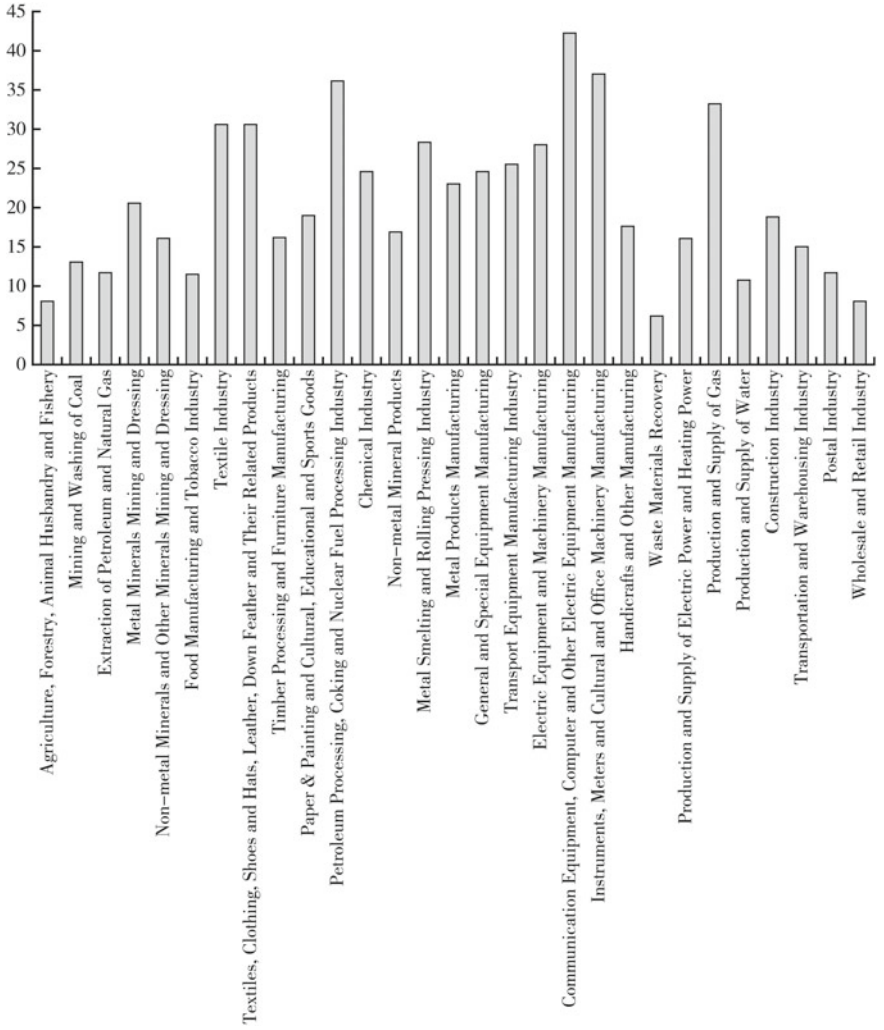

Fig. 1.1 VSS value of China's each industry in 2009

of 1997 when the Asian Financial Crisis broke out, Singapore's foreign exchange reserves reached up to $83.6 billion, which was equal to the GDP of that year.

Besides, it has a completed financial system and regulatory mechanism, and the opening up of its financial markets started after the mid-1970s. It is the country with the earliest financial liberalization and the soundest financial regulation in Southeast Asia.

The main active impacts of the vertical labor division on developing countries include three aspects: technology spillover, economy of scale and industry upgrading.

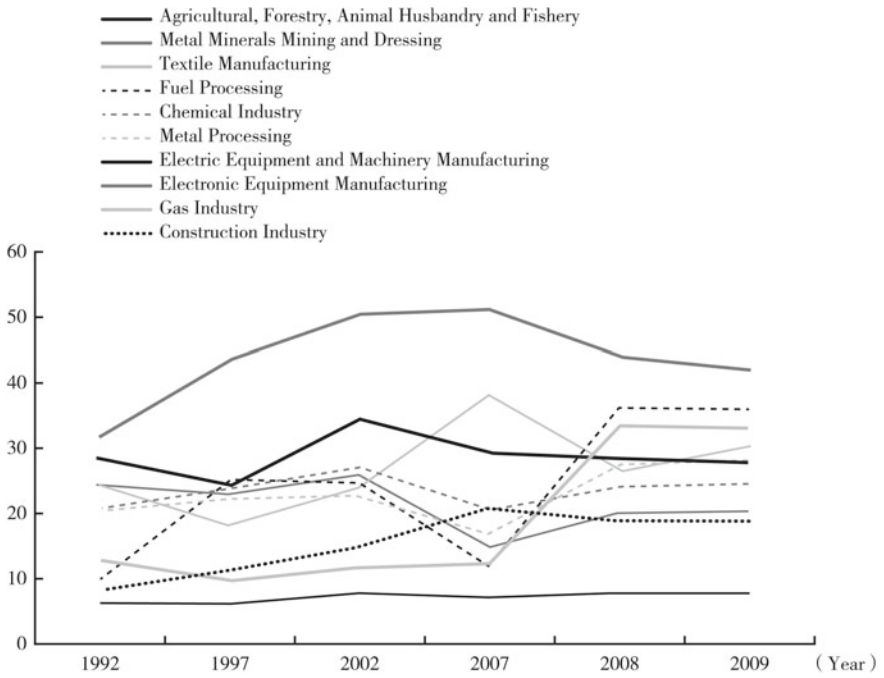

Fig. 1.2 Changes of VSS value of China's main industries from 1992 to 2009

Guo (2011) holds the view that the influence factor showing the impact of the proportion of international vertical specialization on technological progress is significantly positive, reaching 0.90. Meanwhile, importing can promote technological progress with the influence factor of 0.18. That is, importing has a remarkable effect of technology spillover. Additionally, domestic R&D can improve a country's technology absorptive capacity, and the supporting level of domestic industrial technologies can create effective synergies with the vertical specialization so as to promote the technological progress of its domestic enterprises.

Taking China as an example, due to its lower productivity compared with developed countries, China took part in the vertical labor division to develop its trade. As shown in Fig. 1.3, from 1980 to 2010, the ratio of primary products to all exports from China has been continuously lowered from 50.3% in 1980 to 5.2% in 2010, while the ratio of manufactured products increased from 49.7 to 94.8%. This shows that China, in the process of participating in the vertical labor division, realized the industry upgrading to a certain degree as the proportion of the export of primary products and the export of manufactured products were continuously decreased and increased respectively.

Apart from this, developing countries can get direct trade gains from the vertical division of labor. According to the calculation of Wang and Liang (2011), the trade in value added of China's industries joining in the vertical specialization had a

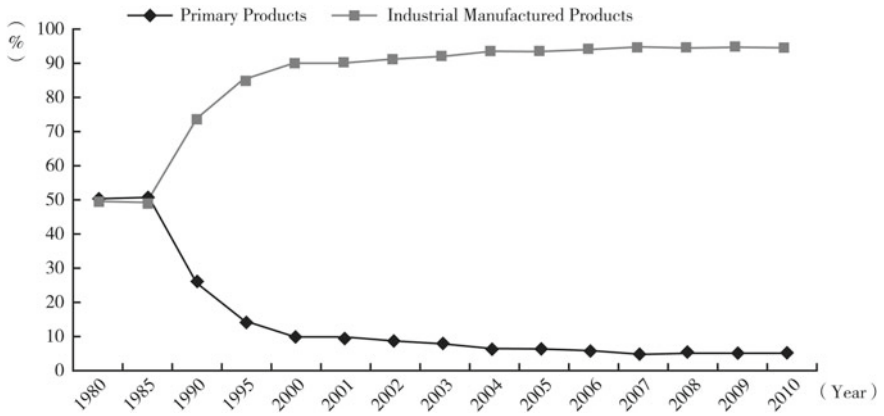

Fig. 1.3 Proportion of China's exports of primary products and industrial manufactured products in total exports (1980–2010)

prominent increase during the period from 1990 to 2007. As for specific industries, the absolute value of trade benefits of capital (technology)-intensive industries had comparatively remarkable promotion, but for industries taking part in the vertical specialization with a comparatively lower degree, the absolute value of their trade benefits had comparatively slow promotion. Furthermore, the vertical labor division can decrease the labor cost of per unit of output, and labor-intensive industries can enjoy a higher degree of such decrease (Wang 2010). The reason for this is that in the vertical labor division, the import of advanced technologies and management practices can improve the production efficiency so as to reduce the labor cost of per unit of output. As there are more skilled workers in technology-intensive industries, therefore, the decline of the labor cost is less.

The vertical international division of labor has also played certain active roles in economic growth of developing countries because developing countries will involve in international trade in the vertical specialization. This is the theory proposed by Robertson that foreign trade is the "engine for growth". He argued that foreign trade, particularly the increase of export, could facilitate economic growth domestically. The analyzing results of China's economic data from 1981 to 2009 show that both the export of processing trade and general trade could promote China's economic growth.

Each 1% increase of processing trade and general trade will promote an economic growth by 3.89% and 1.87% respectively. The promoting effects of the two had a difference of nearly 2% (Guo et al. 2011). The reason is that the international vertical specialization has posed stronger and long-term impacts on economic growth through technology spillover, industry upgrading and the effect of scale economy.

However, the vertical division of labor also has a certain degree of risks on developing countries. In this type of labor division, the production processes of products are separated apart. Developed countries carry out vertical investment in developing countries for the purpose of utilizing their cheaper labor to reduce the cost of

technology-intensive products. Therefore, the main industries of developing countries are still limited in assembling and processing. It is hard for developing countries to master advanced technologies of developed countries as core technologies are under control of developed countries.

The calculations of Wang and Liang (2011) also show that at least two-thirds of the value of China's industrial export products was acquired by other countries in the pattern of vertical international division of labor, which means China did not get the corresponding actual benefits from its huge trade surplus. The growth rate of the proportion of China's trade in value added was far lower than that of its trade volume and trade surplus. Furthermore, China is not the exception in developing countries. Most developing countries are in the same situation as China. They generally possess obvious comparative advantages in labor costs, so they have adopted the way of processing trade to take part in the vertical international labor division. Although they have optimized their export mix to a certain degree in the long-term development, quite large parts of products in processing trade are still the labor-intensive products with low technology, and the proportion of the export volume of high-tech products is still low.

For developing countries, the vertical division of labor often leads to the fact that enterprises will pass their costs through to society. Developing countries who have participated in the vertical division of labor all are confronted with the cost pass-through which is the best choice for enterprises in developing countries when their primary factor-intensive products have joined in international price competition under the system of the vertical division of labor. Such kind of cost pass-through from enterprises to society also can increase foreign exchange earnings and trade surpluses as well as increasing the employment level (Han 2011). Therefore, most of developing countries have selected the cost pass-through to society, which results in many internal problems such as their economic growth tending to immiserization, workers' salary keeping at a low level for a long term and the limits on the improvement of productivity. This is an important cause for the discrepancy of labor costs shown in Table 1.1.

Table 1.1 Labor cost comparison between developed and developing countries

	Wage rate (A)	Labor productivity (B)	Comparative labor cost (A/B*100)
The USA	100	100	100
Japan	62.6	67.8	92.3
South Korea	27	43.9	61.5
Philippines	8.6	15.9	53.8
Indonesia	4.6	6.6	69.2
India	3.1	2.9	107.7
China	2.1	2.7	76.9

Data Source Li Shumei, "Industrial Upgrading of Manufacture under the Vertical Specialization" [J] *Social Scientist*, 2009 (12)

If we consider the investment motives of enterprises in developed countries under the vertical specialization, we will find out some problems of the vertical labor division. Their motives for investing in developing countries are usually for occupying local markets. For example, Japan External Trade Organization conducted an investigation on overseas investment motives of Japanese enterprises in 1990. 35.7% of the total 384 enterprises considered their motives were "selling products at local markets and occupying local markets", 21.4% for "occupying overseas markets for production bases" and 21.6% for "finding local places for their assembling bases of products".[1] It is thus clear that developed countries' major motives are to occupy developing countries' markets through the vertical labor division. In such kind of markets, the enterprises of developing countries have no way to obtain good space for development.

Under the condition of narrow market space and the scarcity of core technologies, except for developing labor-intensive industries, enterprises in developing countries are only left to enter virtual industries such as capital markets and real estate markets. The only approach to develop the economy is to ensure capital yields through capital operations. The emergence and development of virtual industries under the vertical labor division is the problem worthy of special attention.

Generally speaking, developing countries only possess the capacity of developing labor-intensive industries at their initial phase of industrialization. Thus, the supply elasticity of labor-intensive products is high as countries possessing the capacity of supplying labor-intensive products are quite a lot. But the demand elasticity of these products is low. As a result, the situation of oversupply and vicious competition occur easily in labor-intensive industries. Meanwhile, various products in major markets of developing countries are not strong enough for competition. Thus, the rate of profits is reduced infinitely. Under such condition, developing countries have to enter virtual industries, which may lead to bubble economies.

Such kind of examples is frequently seen in developing countries. One of the major reasons for the Asian Financial Crisis in 1997–1998 is the overinflated investment in virtual industries including real estate markets and securities markets. Generally, capital with the nature of pursuing profits will not select to enter virtual industries for profits when it can get enough profits from the real economy. This explains why the capital operation of virtual economies is comparatively inactive, even in developed countries, when manufactured products are competitive and the real economy can gain a comparatively high earning rate; only when the profit rate falls to an intolerable degree due to overcapacity, and the chance for investment entering the real economy is rare, capital will begin to enter the field of virtual economies which only rely on capital operations to win profits, while having comparatively high risks. The result of this is the formation of economic bubbles to a certain degree. Although a certain degree of economic bubbles is not always a bad thing, it may develop into an important unstable factor threating a country's economic safety when virtual economies are overdeveloped and disjointed with the development degree of the real economy. A very obvious example is the Japanese Bubble Economy. Before the 1980s, Japan had

[1] Hu (1990).

always been the most important manufacturing factory in the world with an advanced real economy. In this period, various commodities manufactured in Japan were sold well. Its domestic capital obtained enough profits through investment in the real economy, therefore there were little capital selecting to enter securities markets and real estate markets. However, after the 1980s, Japan's manufacturing experienced the surplus of capital and lost its capacity to develop new products. Meanwhile, the signing of the Plaza Accord between the USA and Japan led to the rise of the exchange rate of yen, which made Japanese products losing competitiveness in international markets. Furthermore, the USA frequently aimed at Japan to initiate trade frictions and disputes. Under the joint action of these factors, Japanese capital, after being unable to acquire the same profits as before, began to enter the virtual economies and pushed the prices of virtual assets to a high level, which ended up with a tremendous economic bubble and the "lost ten years" of Japan's economy in the 1990s.

In the case of Asia Financial Crisis in the 1990s, the economic bubbles of virtual economies which led to serious problems in economic operations are the results of insufficient impetus for the development of real economies of countries in Southeast Asia. As countries in Southeast Asia were situated in a subordinate position in the vertical international division of labor which was dominated by developed countries, their main industries and economic growth heavily relied on investment from developed countries and vertical technology transfers, which limited economic development space as well as the stability and the further increase of the profit rate of real economies. As a result, domestic capital of these countries had to enter virtual asset markets for pursuing a higher profit rate.

Another negative impact the vertical labor division could possibly bring about is the widening of income gap. As in the vertical labor division, all countries, both developed and developing, have reduced their non-technology and labor-intensive production activities, thus the earning rate of skilled workers has increased compared with unskilled workers, which means that the income gap is widened. The result of the econometric analysis on China's industries conducted by Guo (2011) shows that the improvement of the degree of vertical international specialization surely widened the income gap between skilled and unskilled workers in China's industries. The influence factor reached a very obvious level of 1.412. Thus, although China's industries took part in the international vertical specialization with the comparative advantage of labor, the income gap could be increasingly widened.

(2) Horizontal Division of Labor

The horizontal division of labor is another type different from the vertical division of labor. It is the labor division in the production of manufactured products among countries with an equal or similar economic development level (such as developed countries and a part of newly industrialized countries), while the vertical division of labor usually happens among countries with quite different economic development levels. Mutual trade among contemporary advanced countries is mainly established on the basis of the horizontal division of labor. It can be divided into the intra-industry and inter-industry division of labor. The former is also called as the "division of labor of differentiated products", which means that although products within a

same industry manufactured by different manufactures have an equal or similar technological level, the appearance design, internal quality, specifications, types, brands, grades or prices are different so that the labor division and mutual exchanges are generated. It reflects the competition among oligopoly enterprises, and various and subdivided requirements of consumer preferences. With the development of science, technology and economy, the degree of specialized production within an industry has become increasingly high.

Economy of scale is viewed as the main reason for the formation of the horizontal division of labor which leads to the intra-industry trade. The so-called internal economy of scale refers to the inverse relation between per unit of output and per unit cost of individual manufacturers. A manufacturer's average cost curve is a U-shaped line which goes down firstly and then goes up. When its cost is reduced along with its output, what the manufacturer realized is the internal economy of scale; when its cost is increased with its output, it means the internal diseconomy of scale of the manufacturer. The output corresponding to the lowest point of the average cost curve is called the effective scale. In imperfectly competitive markets, there exists differentiation among the same type of products. If different enterprises in different countries are arranged to produce products what they are good at, then the returns to scale can be better realized. Even if there is no differentiation between products, manufacturers' production scale can be effectively improved through connecting different countries in a way of labor division and trading so as to reduce the average cost of products. Take the manufacturing industry of electronic products as an example. Under the condition of no intra-industry horizontal division of labor, the USA and European countries all produce notebooks and tablet PCs to meet different needs of domestic consumers. As limited by the quantity of demand in domestic markets, the quantities of notebooks and tablet PCs produced by manufacturers in both areas are possibly in the internal economy of scale, but not reaching the effective scale. If the two sides conduct the intra-industry horizontal division of labor, in which European factories produce tablet PCs and export to the USA, while American factories specifically produce notebooks and export to Japan, then the quantity of demand is increased for factories in both areas and the average cost will stand at the lowest point of the curve where is the effective scale.

In the horizontal division of labor, unlike the vertical labor division, every country has the similar industrial structure and technological level. The reason for their participations in the horizontal labor division lies in that they can realize specialized production according to each procedure or product they are good at so as to save costs and improve profits. The comparatively typical example of the horizontal labor division is the specialized coordination among developed countries when producing products of certain industries, especially in high-tech industries, such as the aircraft manufacturing industry. No matter which developed country holds the brand of aircrafts, all parts and components are possibly produced by dozens of countries in the world. Developing countries also can realize this type of labor division, which benefits developing countries in mutually utilizing each other's advantageous industries and

resources as well as helping them get rid of the vertical division of labor which is mainly led by developed countries.

The vertical division of labor pursues the comparative cost and comparative profit. The resulting international trade of commodities, production factors and labor services are the initial stage of economic connections among countries. The flow of international capital without the involvement of ownership changes just realizes the international division of labor on a superficial level, while only international direct investment led by multinational enterprises with the characteristic of controlling ownership further deepens the international division of labor. The horizontal one is mainly realized through two forms which are equity merger & acquisition (M&A) and non-equity multinational strategic alliance. Through this kind of approaches, developed countries and multinational enterprises can improve their international competitiveness, and put themselves in a comparatively advantageous position so as to realize the equity M&A and non-equity multinational strategic alliance.[2] This is a further development of the horizontal division of labor in the pattern of international division of labor.

Commonly speaking, the horizontal division of labor takes in shape in competition and frictions. The reason for its emergence does not lie in whether economic factors are plentiful or not, or the level of productivity is high or low, but in the result of competition of enterprises with a certain market power in the international division of labor. As every enterprise has products with a certain degree of differentiation in monopolistic competition markets, so every enterprise has the power to determine market demand.

Multinational enterprises are the important forces in realizing the horizontal division of labor. The horizontal division of labor has already been realized in worldwide distributed multinational enterprises. Thus, the original international trade and international division of labor become the internal labor division of a multinational enterprise. The internalization of transactions reduces the cost of enterprises and realizes the division of labor within enterprises.

Although the majority of vertical division of labor is the result of direct investment, the direct investment also possibly leads to the horizontal division of labor. Developed countries invest not only in developing countries, but also in developed countries to realize the horizontal division of labor with complementary advantages. Such horizontal division of labor will take specialized production and coordination as the core part, and is not under the precondition that a country dominates another one. In the horizontal division of labor, all countries have a relationship of dependency, not the dominance and dominated relationship in production. They accomplish economic cooperation and collaboration based on the division of labor. Therefore, their status is equal.

(3) Mixed Division of Labor

Mixed division of labor is a blend of the vertical and horizontal division of labor. From the individual country perspective, it refers to the situation in which a country

[2] Yang (2001).

both takes part in the vertical and the horizontal division of international labor. For example, Germany is a representative of this type as for developing countries, it is the vertical type, while for developed countries, it is the horizontal type.

Due to the unbalanced development of productivity and the level of labor division, a country can possibly take part in both the two types. Generally, developing countries will take part in the vertical type with developed countries and be in a subordinate position. Meanwhile, they will also take part in the horizontal type with other developing countries that have the similar economic development level; developed countries, in addition to take part in the vertical type with developing countries, will also take part in the horizontal type with other developed countries.

Differences in the relative economic development level of a country usually lead to a mixed division of labor. When the relative economic development level of a country is lower or higher compared with other countries, it is possible for the country to select the vertical division of labor as its form of participating in international division of labor. When the relative economic development level is similar with other countries, the country tends to take part in the horizontal division of labor. As a country's relative economic development level is uncertain, therefore, both developed and developing countries have a chance to participate in the vertical and horizontal division of labor. Actually, most countries in the world are participating in the mixed type, not pure vertical or horizontal type.

2. Inter-industry, Intra-industry and Intra-product Division of Labor

(1) Inter-industry Division of Labor

It refers to the specialized division of labor among sectors of different industries, or can be further understood as the labor division among the labor-intensive industry, the capital-intensive heavy chemical industry and the technology-intensive industry. Commonly, the inter-industry economic division of labor refers to the phenomenon in which products of the same industrial sector in a country or district during a certain period of time are only for export or import. In the pattern of such labor division, the direction of product flow in a same industry is basically unidirectional.

The inter-industry division of labor is established on three important bases: first, products in markets are homogeneous without differences in specification, model and quality; second, under the condition of the product homogeneity, there is no difference in consumer preferences; third, the economy of scale does not exist in every industry that takes part in the inter-industry labor division. It is suitable for adopting the most traditional theories of international division of labor for its explanation.

The inter-industry division of labor is generally the vertical labor division. Due to the different development level of productivity, different countries possess comparative advantages in different industries. The economic theories guiding the inter-industry division of labor developed from the Theory of Absolute Advantage of Adam Smith to the Theory of Comparative Advantage of Ricardo, then to the Factor Endowment Theory further developed by the neoclassical economists—Heckscher and Ohlin. The Heckscher-Ohlin theory explains whether the production factors each country possesses are abundant or meagre. Factor endowment refers to the situation

of production factors possessed by each country. When the production factors of a country are abundant, then the prices of these factors will be lower. On the contrary, the prices will be higher if these factors are meagre. When different factor endowment ratios exist, the comparative cost of different industries in a country will be varied. Then the country shall export products with a comparatively low cost as these products are mainly produced with the use of comparatively abundant factors; on the other side, the country shall import foreign products with a comparatively low cost as these products are mainly produced with the use of comparative meagre factors of the country.

Both Ricardo's theory and the Heckscher-Ohlin theory essentially support the formation of the inter-industry division of labor in the international division of labor. However, as the economic development level and labor productivity are various in different countries due to the existence of first-mover advantage, a certain degree of inequality exists in the inter-industry division of labor. Commonly, developed countries can obtain more profits from this type of labor division while developing countries could fall into the so-called "trap of comparative advantage". Countries in Latin America, as their earlier entries into the pattern of international division of labor, are the worst-hit regions of the "trap of comparative advantage".

The so-called "trap of comparative advantage" means that countries mainly exporting the labor-intensive and natural resources-intensive products are always in disadvantage in the trade of labor-intensive and technology-intensive products. The trap can be divided into two types-the comparative advantage trap of primary products and of manufactured products. The former refers to the situation in which developing countries, considering their comparative advantages in plentiful labor and natural resources, only use these advantages to join in the international division of labor. However, they are generally in a dominated position and obtain less profit from international trade. This is because the added value of labor-intensive and natural resource-intensive products is comparatively low, while the finished products manufactured by developed countries are highly value-added. The price scissors of added value between industrial and agricultural products have placed developing countries in disadvantages. Furthermore, major exported primary products from developing countries have low demand elasticity and are easy to be affected by various changes in international markets, which result in the reduction of national revenues.

As is shown in Fig. 1.4, from 2000 to 2006, countries in Latin America recorded a certain degree of increase in the amount of the export of major primary products, and the increase of crude oil, mineral ore and copper was sped up. After two centuries of joining in the international division of labor, the industrial structure and commodity export mix of countries in Latin America were not improved, but further enhanced.

The comparative advantage trap of manufactured products refers to the situation in which developing countries adopt the import substitution strategy and substitute the import of manufactured products in the past by establishing and developing their own manufacturing and other industries so as to promote their economic growth and national revenues, and realize domestic industrialization and the upgrading of industrial structures with the expectation of balancing their international accounts. But as core technologies are under the control of developed countries, they have to

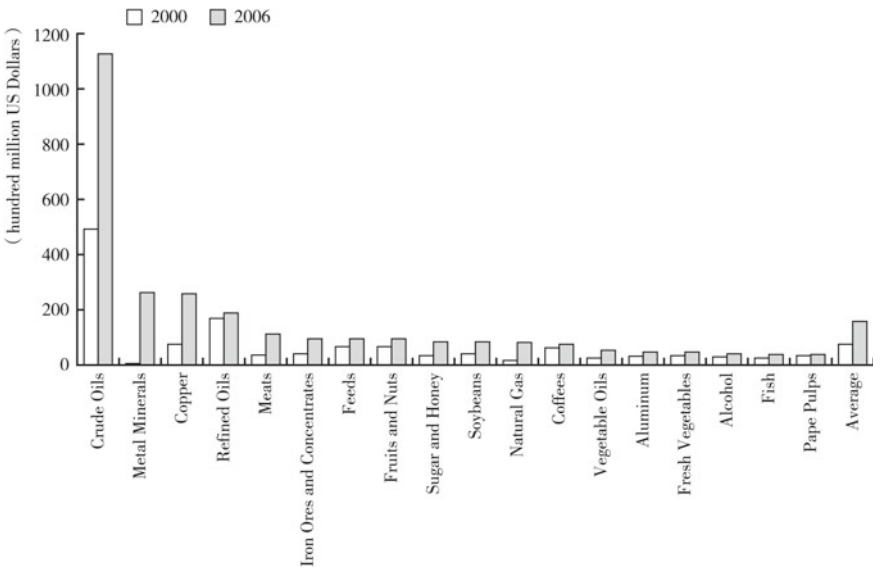

Fig. 1.4 Volumes of main exports of Latin American countries (hundred million US dollars)

rely on imitating technologies to improve their positions in the international division of labor. Generally, the import substitution strategy has no way to reverse their subordinated positions, but only let them heavily rely on technology imports. Thus, their independent innovative capabilities remain the same as before and they are unable to bring the late-mover advantage into play. This is the so-called comparative advantage trap of manufactured products.

Although having plentiful theory bases, the inter-industry division of labor is generally beneficial to developed countries, not developing countries. This fact shall be considered by any developing country before joining in the inter-industry division of labor.

(2) **Intra-Industry Division of Labor**

In the inter-industry division of labor, the direction of product flow in the same industry of a country is basically unidirectional, and a country imports or exports products of an industry; in the intra-industry type, it is bidirectional. That is, a country both imports and exports products of the same industry. The intra-industry division of labor usually happens among different products of a same industry.

The traditional inter-industry division of labor is completed through the labor division of enterprises located in different countries, while the necessary exchanges in the intra-industry division of labor are completed through the internal and external markets. The internal markets refer to markets inside an enterprise while the external markets are markets outside an enterprise. As multinational enterprises have played increasingly important roles, the main manifestation of the internal markets is the internal transaction mechanism of multinational enterprises. Correspondingly, the

markets in which buyer and sellers independently conduct transactions are the external markets.

Take the intra-industry vertical division of labor as an example for a specific analysis. When the vertical labor division exists, every participating factory will select its corresponding effective scale on the average cost curve, or the lowest point on the curve, to conduct production, thus the production cost of the whole product will reach the lowest level, and the scale economy effect of each procedure of the product is fully embodied. If a factory in a country is responsible for accomplishing all production procedures, then the factory only can select the efficient scale of a procedure to organize production. Thus, other production procedures will deviate from the efficient scale and subsequently the production cost will be increased. If it is possible for conducting the intra-industry vertical division of labor, then the factory will obtain potential profits.

Products made through the intra-industry division of labor have various characteristics. Among these products, some are labor-intensive products, some are capital-intensive ones; some are standard technology products, and some are high-tech products.

But these products have to satisfy two conditions. One is that these products have certain substitutability in utility. The other is that the input of comparatively similar factors of production is necessary when producing these products. Such products can realize the international division of labor through the form of intra-industry division of labor.

(3) **Intra-product Division of Labor**

The intra-product division of labor results from the vertical specialization. The emergence of the vertical specialization is the result of advanced science and technology which provides the possibility for its emergence and reduces its cost. As technologies and processes of a specific product have a certain degree of separability, technology progress makes production processes of a product more segmented. A part or a procedure of a product can achieve standard production at the same time, no matter where the production place is. As a result, for the purpose of reducing the production cost, the procedures of products will be allotted to different countries according to their different factors endowment. The outstanding characteristic of the vertical specialization is that a country imports intermediate products from another country as the inputs of its own products, then processes the imported intermediate products and exports to a third country; the third country takes the imported products again as its inputs; such process will last constantly till final products are exported to destinations.

The intra-product division of labor makes “different procedures of production processes of a specific product are extended through spatial decentralization into cross-regional or cross-country production chains or systems” so that more enterprises in different countries and regions can integrate into the system of international division of labor and further go deep into the process of economic globalization. Compared with the inter-industry and the intra-industry division of labor,

the intra-product division of labor has a deep effort, which will be beneficial for different countries in using their comparative advantages. It is a special process of economic internationalization or a structure of labor division. Its core contents lie in that different procedures and blocks of production processes of specific products are spatially dispersed and allocated to different regions. Every country is specialized in a specific segment of the value chains of product production, so a cross-regional or cross-country system of production chains is finally formed. Its complexity degree is also related to product technologies. The more complex the production procedure of a product is, the more likely the intra-product division of labor appears.

The intra-product division of labor itself is the product of the Comparative Advantage Theory and economy of scale. In the intra-product international division of labor, developed and developing countries' roles in the value chain of international division of labor are different. The comparative advantage of capital and technologies enable developed countries to occupy favorable positions in the integration of global resources. Meanwhile, they have transferred major manufacturing processes to developing countries. This is the reason that developing countries have taken the processing trade as their major form in the intra-product division of labor. The geographical concentrations of production procedures helps enterprises in different places of value chains create economic profits of large-scale production. This is the driving force of economic laws to the intra-product division of labor. The intra-product division of labor is very popular in Asia. Based on the data of 1992, the total amount of parts and components exported in 2006 within the area increased by 6.91 times.[3] The rise of trade within Asia mainly benefited from the trade of parts and components between developed countries and developing countries.

The intra-product division of labor has become an important form for developing countries joining in the international division of labor. In the process of the transfer of global industrial chains, China's mainland has already undertaken the transfer of labor-intensive procedures. In order to minimize the cost, foreign direct investment has been increasingly concentrated in China, which has placed China in a situation of a long-term trade surplus. The results of empirical analyses also prove that it has an active impact on China's trade surplus. The degree that China participates in the intra-product division of labor increases by 1%, then China's foreign trade surplus will increase by 1.478%" (Song 2011).

The intra-product division of labor also has an active impact on the overall productivity level of China's industries, but the active impact on different industries is different. For example, for the capital-intensive industry, the influence factor is 4.94 and it is 3.48 for the labor-intensive industry.[4] This elaborates that under the condition of international division of labor, developing countries can improve the productivity of their capital-intensive industry through intra-product of labor. Thus, it is not the case that developing countries have no chance to improve their productivity through the intra-product division of labor of value chains, and then further realize their industrial upgrading.

[3] Liu et al. (2009).

[4] Hu (2007).

However, different countries' positions in the intra-product division of labor are different. Although they are in a same industrial chain, they are specialized in different procedures, the added value they can obtain from the division of labor is different. The concept of the Smiling Curve tries to elaborate that different procedures in the intra-product division of labor are confronted with different value added of products and profit space. As enterprises in the upstream industrial chain can obtain higher value added, therefore, economies with advanced technologies, a strong innovative capability and a comparatively large scale have a relatively low level of the vertical division of labor (Wen 2011).

On the other hand, countries participating in the intra-product division of labor will also increase their dependence on international raw materials and markets of parts and components as well as their international competitiveness. As for countries (regions) and industries with higher levels of the intra-product division of labor, although their export scales may be huge, it does not definitely mean that they can obtain correspondingly profits from the international division of labor. The export scales of developing countries' high-tech manufacturing are expanded rapidly, but most are exports of parts and components and processing products. The scarcity of technologies and capital causes developing countries heavily relying on foreign demand and technologies, which also results in some problems in their exports.

Some characteristics of the intra-product division of labor can be observed from the example of the intra-product trade of electrical and electronic products between China and Japan. As shown in Table 1.2, China, as a developing country, had a lower competitive level of parts and components compared with Japan, which was the result of China's advantage in assembling in Sino-Japan trade. In the specific structure of intra-product trade, China, as situated in the downstream industrial value chain, only had an advantage in assembling. However, in the industrial value chain, as Japanese enterprises have occupied the upstream R&D and production processes of core parts and components, they could make best use of their own positions and comparative advantages to increase the price of their products. Chinese enterprises in the downstream industrial chain had to accept the unequal transaction as they only possessed the comparative advantage in assembling. Generally, in the profit distribution system of the intra-product division of labor, the added value of a country's products has a positive correlation with the quantity of high-quality and high-level factors the country possesses. Countries with high-quality factors can obtain more profits from this system. But developing countries such as China have taken part in the division of labor with their advantages in assembling and served as suppliers of low valued-added products, therefore, what they could obtain was very limited.

As a result, the intra-product division of labor is also a double-edged sword for China. Although the participation of China's high-tech manufacturing in the intra-product international division of labor has increased China's economic connections with the world, the resulting reasons for China's position in the industrial chain with the lowest value added should attribute to the current less inputs in R&D, a weak independent innovative capability, its scientific and technological backwardness and the scarcity of human capital. Therefore, the way of China's participation in the intra-product division of labor led to China's extensive model of economic growth. As the

Table 1.2 Advantages in production and assembling of China-made electrical and electronic parts and components in Japanese markets

Classification no	Type of advantages	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
762.11	Advantage in production	0.163	0.248	0.126	0.436	0.696	0.857	1.464	2.197	2.128	5.674	19.77	35.19
	Advantage in assembling	0.082	0.02	0.077	0.005	0.024	0.079	0.223	0.203	0.106	0.055	0.016	0.035
762.22	Advantage in production	19.552	32.235	11.064	14.232	11.137	5.083	7.987	7.042	27.268	12.819	8.436	12.12
	Advantage in assembling	0.015	0.013	0.065	0.002	0.003	0.004	0.049	0.007	0	0.001	0.004	0.007
764.91	Advantage in production	0.243	0.346	0.273	0.241	0.341	1.277	0.969	1.432	0.952	0.583	–	–
	Advantage in assembling	2.916	1.672	1.842	1.472	1.83	1.068	1.184	1.072	1.04	1.001	–	–
764.92	Advantage in production	1.035	2.581	1.633	0.696	0.798	1.123	1.009	0.56	1.122	0.828	1.838	2.371
	Advantage in assembling	17.873	10.548	13.385	12.955	15.04	8.544	7.163	6.053	6.987	6.946	5.503	6.348
764.93	Advantage in production	1.261	1.168	0.854	0.872	2.086	1.541	0.985	0.878	0.807	0.906	1.082	1.295

(continued)

Table 1.2 (continued)

Classification no	Type of advantages	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Advantage in assembling	5.318	6.768	6.913	6.045	3.763	3.294	4.106	4.218	3.244	3.055	2.613	2.9
764.99	Advantage in production	3.125	3.938	4.007	3.586	3.719	6.126	6.312	4.559	2.75	1.877	2.99	3.274
	Advantage in assembling	13.632	9.302	8.619	7.81	7.868	6.398	4.574	3.783	3.856	4.614	1.873	1.565
771.29	Advantage in production	1.236	2.263	2.134	1.459	1.448	1.549	1.522	1.264	1.341	1.405	1.646	1.241
	Advantage in assembling	16.136	14.849	9.778	8.361	8.609	6.47	5.343	5.482	4.278	4.673	3.182	2.809
772	Advantage in production	0.301	0.347	0.359	0.294	0.348	0.362	0.376	0.408	0.454	0.537	0.78	0.822
	Advantage in assembling	6.223	6.316	6.379	6.501	7.034	5.909	4.775	4.68	5.622	5.856	4.924	5.171
773	Advantage in production	1.01	1.337	1.315	1.23	1.247	2.075	2.217	2.21	2.137	3.083	4.382	4.106
	Advantage in assembling	2.441	1.932	2.092	2.104	1.76	1.45	1.111	1.022	1.114	1.083	0.84	0.93
775.49	Advantage in production	0.213	0.277	0.449	0.283	0.312	0.871	0.425	0.266	0.521	0.632	0.98	0.732
	Advantage in assembling	1.35	0.505	1.26	3.743	3.026	3.495	3.693	3.211	4.226	4.083	3.959	5.084
775.79	Advantage in production	20.61	22.559	8.163	2.79	3.707	4.751	4.107	7.647	10.44	14.019	21.71	24.98

(continued)