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IDE DISCUSSION PAPER No. 695

**A Structural Analysis of Japanese
Economic Development**

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February 2018

Abstract

Japan successfully escaped from poverty after the world war and attained prosperity in a matter of two decades. There were two keys for the success. One was the priority production system – the idea to develop the industries at the bottom of the triangulated input-output table first, and to climb the triangle step by step. The second key for the success was the country's unique financial system; they deliberately grew both long-term financial institutions for large enterprises and local credit associations for small businesses. When Japanese exporting manufacturers fought the appreciation of yen at the end of the 20th century, their answer was the mass introduction of industrial robots. The exporters won the fight but the country did not. What went wrong; what lesson do we learn from it?

Keywords: Priority production system; Specialty financial institutions; Saving-investment balance; Robotization.

JEL classification: C82; E16; O11

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A Structural Analysis of Japanese Economic Development

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Abstract

Japan successfully escaped from poverty after the world war and attained prosperity in a matter of two decades. There were two keys for the success. One was the priority production system – the idea to develop the industries at the bottom of the triangulated input-output table first, and to climb the triangle step by step. The second key for the success was the country's unique financial system; they deliberately grew both long-term financial institutions for large enterprises and local credit associations for small businesses. When Japanese exporting manufacturers fought the appreciation of yen at the end of the 20th century, their answer was the mass introduction of industrial robots. The exporters won the fight but the country did not. What went wrong; what lesson do we learn from it?

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1. Introduction

After the financial crisis of 2008-2009, the interest rates of the mature economies declined significantly while those of the developing economies remained high. Therefore, large-scale fundraisers of the emerging markets turned to the major economies for loans. The problem is that the gap in fundraising cost between the big and small businesses is damaging the latter. Another problem is that the dollar-denominated interest rate is creeping up as the U.S. economy recovers. Soon or later, the developing countries will find it costly to depend on funds from abroad. It must be a good idea for a developing economy to plan ahead and draw a design for self-sufficient development both in terms of production and financing.

When the World War II ended, Japan was suffering from poverty; all the cities were reduced to ruin. Soon after the war, Japan embarked on a project christened 'priority production system', which resembles to the Leontief's economic development model. The idea is that to develop the industries that are at the bottom of the triangulated input-output table first, and to climb up the triangle step by step. In the Japanese case, water utilization, such as irrigation and hydroelectric power generation, came first. Then came the coal mining, which was a necessity in a country where energy was scarce. Coal was used not only for thermal power generation but also for iron and steel manufacturing. Steel is an indispensable input for ship building, which was an essential for an island country like Japan. After the country became rich enough to import oil from abroad, steel was mainly used to produce automobile that soon became the main earner of foreign currency. However, the process of economic development was not that simple because any industry needed enough capital to start up. Another key for Japanese economic development was its financial system.

After the world war, Japan built up a unique system of long-term finance, an indispensable necessity for massive capital formation. Three long-term credit banks and seven trust banks were established solely for this purpose apart from more than a dozen nationwide commercial banks. While the long-term credit banks issued fixed-income bank debentures, the trust banks raised funds through loan trust, a floating rate instrument. Both bank debentures and loan trust were of five-year maturity. Retail investors could demand redemption of bank debentures at par value any time before maturity so that they would never suffer capital loss; they could sell them at current prices if they chose to do so. Thus, the individual holders of bank debentures could earn capital gains if the yield would decline, but never suffer capital loss even if the yield would rise. Loan trust was an investment trust, in which not only the title of the beneficiary but also of the settlor were securitized and negotiable. Since loan trust was a floating rate instrument, capital gain or loss never occurred. Therefore, both bank debentures and loan trust were welcomed by ordinary people who seek both high yield and liquidity. The funds that were raised through these instruments were loaned to large enterprises by the long-term credit banks and the trust banks. Although these two types of specialty banks were the core of post-war Japanese long-term finance, they were supplemented by the huge and dense network of the postal savings system, which raised funds through 10-year fixed income deposits. The bank debentures and the 10 year deposits have one thing in common; they sell well when the general interest rates begin to decline because the holders of bank debentures can earn capital gain as the yield declines while postal-saving depositors can enjoy the peak interest rate for ten years to come. This is a very important feature for a long-term financial instrument because the financial institutions can raise more funds in a wake of recession, and prevent the

economy from further deterioration by promptly injecting the incoming funds. The unique system of long-term finance completely disappeared after the turn of the century.

Another set of specialty financial institutions that solely serve households and small businesses were also set up in the postwar Japan in addition to more than a hundred regional and mutual banks¹. The staff of mutual banks used to regularly visit the depositors to collect monthly installments; all the mutual banks switched to regional banks by the end of 1980s. Japan consists of 47 administrative regions called prefectures; each of them had at least one regional bank and one mutual bank. Each prefecture consists of dozens of cities, towns and villages. Each city and town typically had one credit union and one credit cooperative. The members of the credit unions and credit cooperatives contribute deposits and the institutions provide loans and other financial services to the members, most of them are small business owners. Agricultural and fishery cooperatives, which has dense network of branches in rural area, also accept deposits and make loans. Most of these institutions are still active in business in 21st-century Japan. One of the features of these smaller financial institutions are that each of the category group has its own financial networks and headquarter that serves as a hub. For example, the bank for credit unions known as Shinkin Central Bank, collects redundant deposits from the credit unions and loans to the unions in need. The Bank of Commerce and Industry, known as Shoko Chukin Bank in Japan, is an independent semi-public bank serving small businesses.

2. Changes in the Industrial Structure

2.1 Overview

¹ See Tsujimura and Tsujimura (2008), chapter 7.

The growth in Japanese GDP during the latter half of the twentieth century is depicted in Figure 1. While the black line represents nominal GDP (i.e. GDP at current prices), the grey line indicates real GDP (GDP at 1990 prices). Both nominal and real GDP grew steadily between 1955 and 1998. Real GDP tumbled in 1974 in the wake of the oil crisis. In this year, not only the crude oil embargo by the Organization of Arab Petroleum Exporting Countries but also the worldwide crop shortage caused by El Niño immediately followed by La Niña² hit the Japanese economy; Japan suffered from stagflation, a combination of stagnation and imported inflation. Real GDP dipped again in 1998, however, at this time nominal GDP also slipped. In this year, the government started to deregulate the Japanese financial markets, leading to restructuring of the way those markets operate; long and short term financial markets were merged, and the concept of universal banking was introduced. Yamaichi Securities, one of the top security dealers, and Hokkaido Takushoku Bank, one of the top banks, consecutively closed their doors for business. It took almost twenty years for the nominal GDP to reach the previous maximum recorded in 1997. Figure 2 illustrates the composition of nominal GDP. In 1955, the share of the primary industries, agriculture, forestry, fishing and mining, was almost 22%; manufacturing accounted for 28%, and the other industries held a share of a little less than 50%. The portion of the primary industries declined steadily since then, and fell below 10% in the late 1960s, and below 5% around 1980 before reaching less than 2% in 1997. The share of manufacturing peaked in 1961 at

² A backflow of the Trade Wind in the tropical Pacific Ocean that persists for several months or more is referred to as El Niño. El Niño brings hot and humid air from Baja California into the Midwestern United States, the fertile land known as the Corn Belt. On the contrary, a strengthening of Trade Winds in the tropical Pacific Ocean that persists for several months or more is referred to as La Niña. La Niña brings Chinook Winds into the Corn Belt causing drought; Chinooks are warm and dry winds generated on the eastern slope of the Rocky Mountains when strong winds blow from the Northern Pacific Ocean. A combination of El Niño immediately followed by La Niña cracks the soil often severely damaging the crops.

36%, and remained at the level before the oil crisis battered the industry in 1973-74. The share of manufacturing in nominal GDP rapidly dropped in 1975 and again in the beginning of 1990s. Other industries including commerce and services accounted for a little less than 50% in 1955, and increased its share in nominal GDP thereafter. The share slightly shrank during recessions when nominal GDP growth rate dropped, however, rapidly rose immediately after the oil crisis.

The decline in the share of agriculture in nominal GDP reflects the reduction in employment, which is depicted in Figure 3. While agriculture's share in nominal GDP was less than 22%, that in total employment was more than 36% in 1955 so that the productivity was relatively low creating poverty in rural areas. The redundant labor force was absorbed mainly by the manufacturers during the 1950s and 1960s, but by other industries, which include construction, retail and wholesale, and other services, after the 1970s. The share of manufacturing in employment quickly rose during 1960s, however, suddenly dropped in 1975 in the aftermath of the oil crisis. Although the share of manufacturing remained unchanged until 1992, it continuously declined thereafter partially because of the recession that took place after the real estate bubble of late 1980s collapsed. Most probably, another reason for the decline is the mass introduction of industrial robots. The number of robots in operation in Japan³ was 93 thousand in 1985, but increased to 274 thousand in 1990 and then 387 thousand in 1995; more than 60% of the world's inventory of industrial robots were working in Japan⁴. These robots quickly overtook the manufacturing jobs, assembling, painting, welding and packing etc., from the laborers.

³ Data source: Japan Robot Association.

⁴ Data source: International Federation of Robotics.

2.2 Input-Output Table

The first Japanese input-output table for 1951 was published by the Ministry of International Trade and Industry, which covered 182 industries. The Japanese government ministries have jointly produced input-output accounts since 1950s; the first table was published for 1955 and every five years since then. We have prepared 1965 and 1995 tables for comparison based on the publication. Since the Japanese input-output table is based on cost accounting, a row represents a product while a column stands for a production activity. The original matrices we had used were 156×156 for 1965 and 186×186 for 1995 respectively⁵, however, we made 129×129 matrices for each year to make direct comparison possible. Actually, 1995 table is extended to a 131×131 matrix to accommodate two newborn industries: ‘computer and electronic devices manufacturing’ and ‘industrial robot manufacturing’.

Table 1 lists the industries in order of gross value added. Wholesale and retail trade are ranked high in both 1965 and 1995 and so are the service industries. However, the last column reveals that the manufacturing industries performed far better in 1995. It should be noted that ‘computer and electronic devices manufacturing’ is already ranked at 12th place in 1995 even above the ‘automobile manufacturing’. In terms of the value added ratio, which is the ratio of gross value added to the total output of the product, primary industries along with the real estate business that includes imputed rent are ranked high in Table 2. Again, many of the manufacturing industries’ ranking had risen during the thirty years between 1965 and 1995. It is interesting to know, however, the value added ratio of the automotive manufacturers, the main Japanese exporter, is relatively low comparing to other industries. The ranking was 92nd in 1965 and was

⁵ The unconsolidated tables are 446×335 for 1965 and 519×403 for 1995.

even lower in 1995; it ranked 125th among 131 industries. The value added ratio rankings for the newborn industries were not much higher; ‘computer and electronic devices manufacturing’ ranked 96th while ‘industrial robot manufacturing’ ended at 80th. Since gross value added includes indirect taxes etc., we compare the industries in the ranking of compensation-of-employees ratio, which is the ratio of compensation of employees to the total output of the product, in Table 3. Transportation and communication services were ranked high both in 1965 and 1995 alongside ‘general government service’ and ‘education and research’. The industries that raised their ranks between the two years included ‘food processing’ and textile and apparel manufacturing, which were considered to be declining industries by the end of the century; most probably, they lost their competitiveness because of the high labor cost.

Table 4 lists the industries in order of the amount of exports. ‘Shipbuilding’ and ‘spinning and weaving’ lead the list in 1965 followed by ‘iron and steel production’ and ‘consumer electric appliances manufacturing’. However, by 1995, ‘computer and electronic devices manufacturing’ and ‘automobile manufacturing’ had replaced the two. Most of the industries that climbed the list between 1965 and 1995 were business services, such as ‘transportation related services’ and ‘finance’. Although, in 1965, ‘shipbuilding’ was also ranked first in the list of export ratio, Table 5, the proportion of exports out of total output of the product, ‘international maritime transport’ had replaced it by 1995. ‘Industrial robot manufacturing’, the newcomer, was already fifth in the ranking in 1995. Again, many of business services climbed the list between 1965 and 1995. Table 6 lists the industries in order of the amount of imports. In both 1965 and 1995, ‘oil and natural gas extraction’ ranked first as expected for a country that lack natural resources. While ‘mineral ore mining’ came second in the 1965 ranking,

‘computer and electronic devices manufacturing’ was ranked second in 1995. Since ‘computer and electronic devices manufacturing’ was the largest exporter in that year, it seems that international fragmentation of production was already in progress in the industry. It is also noteworthy that ‘dressmaking’ along with business and financial services climbed the ranking between 1965 and 1995. While ‘dressmaking’ was 79th in the import ranking in 1965, it became 4th in 1995 implying that Japan was quickly losing ground in handworks. As for the import ratio displayed in Table 7, which is the proportion of imports to the total domestic demand, ‘scrap steel recycling’ topped the list both in 1965 and in 1995. ‘Oil and natural gas extraction’ lowered its rank from the 2nd to the 4th as a result of intensive energy-saving investments after the oil crises of the 1970s.

2.3 Triangulation

As Leontief (1963) asserts, one of the best tools to depict the industrial structure (or hierarchy) of an economy is the triangulated input-output table. Triangulation is a technique to simultaneously rearrange the rows and columns of the intermediate transaction matrix of an input-output table so that the largest number of non-zero cells fall below the diagonal running from the upper left corner to the lower right corner of the matrix. “In the hierarchical order of an economy with a strictly triangular matrix, the sectors above and below the horizontal row of any given sector bear quite different relations to that sector. Those below are its suppliers; any increase in final demand for its product generates indirect demands that cascade down the diagonal slope of the matrix and leave the sectors above unaffected. The sectors above, however, are its customers; an increase in final demand for the output of any one of them generates

indirect demand for the output of the sector in question.” (*Ibid.* p. 153) “The extent to which the actual economy departs from one-way interdependence is indicated by the proportion of transactions which fall above the diagonal in the optimal arrangement.” (Chenery and Watanabe, 1958, p.494) Many algorithms of triangulation have been proposed since late 1950s. For example, the procedure of Chenery and Watanabe is a trial and error method of ranking the sectors corresponding to the ratio of inter-industrial input to total input or inter-industrial output to total output. In this paper, however, we are to use much simpler method of triangulation; just count the number of non-zero cells, and rearrange the order of rows and columns accordingly.

Let \mathbf{z}_C be a vector whose elements are the number of non-zero cells in each column; and \mathbf{z}_R be a vector whose elements are the number of non-zero cells in each row. We further define

$$\mathbf{z} = m \cdot \mathbf{i} - \mathbf{z}_C + \mathbf{z}_R \quad (1)$$

where m is the number of rows and columns of the matrix, and \mathbf{i} is a vector in which all of the elements are 1. There are three alternative methods of triangulation. (i) Triangulation according to the number of non-zero cells in each column; i.e. sort the rows and columns in the descending order of z_{Ck} , which is the k th element of vector \mathbf{z}_C . (ii) Triangulation according to the number of non-zero cells in each row; i.e. sort the rows and columns in the ascending order of z_{Ri} , which is the i th element of vector \mathbf{z}_R . (iii) Triangulation according to the number of non-zero cells in the lower-left triangle below the diagonal; i.e. sort the rows and columns in the ascending order of z_i ,

which is the i th element of vector \mathbf{Z} . In method (i), the number of non-zero cells above the diagonal was 31.3% for 1965 and 39.3% for 1995. In method (ii), the numbers were 19.2% for 1965 and 22.6% for 1995; in method (iii), the numbers were 18.5% for 1965 and 22.1% for 1995. As far as the proportion of non-zero cells to the total number of cells above diagonal is concerned, method (iii) is the best method of triangulation as easily predictable. However, each of these methods has slightly different economic implication. As we have mentioned already, Leontief (1963) found input-output hierarchy in triangulation; the rows below are suppliers, and the rows above are consumers of a particular product. Most probably, method (i) best serves the purpose because it is the triangulation based on the input structure. Method (ii) is the triangulation based on the output structure; the industries at the bottom of the triangle supply their products to more industries than the industries above. The priority production system, to which we have mentioned at the beginning of this paper, is based on the idea. If we have a choice, we must develop the industries from the bottom up to the top of the triangle obtained by method (ii). Meanwhile, as Leontief (1963) alluded, the economic hierarchy is more conspicuous in a primitive economy than in a complex economy, in which production processes are fragmented. Method (iii) must be the best tool to know the degree of fragmentation; as Chenery and Watanabe (1958) suggested, the proportion of non-zero cells above the diagonal might be a good indicator. We can confirm from the above observations that the fragmentation certainly progressed in the Japanese economy during the thirty years between 1965 and 1995.

Since there is not too much difference between the sorting orders of the three methods, the triangulation order according to the number of non-zero cells in the lower left triangle below the diagonal is presented in Table 8. In 1965, the industries at the

very bottom of the triangle were 'finance', 'insurance', 'retail trade', 'wholesale trade' and 'transportation related services' in that order. In 1995, 'electric power generation' and 'mineral oil refining' were among the five. In 1965, the industries at the top of the triangle were 'nonresidential construction', 'residential construction', 'engineering works other than public works', 'public works' and 'automobile manufacturing' in that order. 'General government service' and 'restaurants and hotels' replaced 'engineering works other than public works' and 'automobile manufacturing' in 1995. The industries lowered in triangulation ranking between 1965 and 1995 were 'education and research', 'entertainment', 'freight forwarding', 'clock and watch manufacturing' and 'furniture manufacturing'. The industries rose in triangulation ranking were 'transportation related services', 'automotive repair and maintenance', 'general government service' and 'bicycle and motorcycle manufacturing'. The industries at the bottom of the triangle are casually know as upstream industries while those at the top are often called downstream industries. Actually, there are no drastic changes in the triangulation order between 1965 and 1995. Most of upstream industries are either commerce, services for businesses or public utilities, such as electric power generation and water supply. Raw material manufactures are at middle stream. Downstream industries include assembly manufacturing, construction and services for consumers. Since, downstream industries are relatively labor intensive, the urbanization of Japan was only possible, when the bottom up industrialization under the priority production system reached this stage in early 1960s.

2.4 Dispersion Indices

Dispersion indices, which was first proposed by Rasmussen (1957, Chapter 8), are

also often used as industrial structure indicator. The power of dispersion index (PDI) represents the column sum of Leontief inverse matrix while the sensitivity of dispersion index (SDI) symbolizes the row sum. Since the Japanese input-output tables are of Chenery-Moses type, the final demand includes imports with negative signs. Therefore, we will use $\mathcal{A}_M = \{\mathbf{I} - (\mathbf{I} - \tilde{\mathbf{M}})\mathbf{A}\}^{-1}$ instead of $\mathcal{A} = (\mathbf{I} - \mathbf{A})^{-1}$ as Leontief inverse, where \mathbf{I} is a unit matrix, \mathbf{A} is the input coefficient matrix, and $\tilde{\mathbf{M}}$ is a diagonal matrix whose elements are import coefficients. While \mathcal{A} represents technological relationship between industries, \mathcal{A}_M depicts the industrial structure of an economy taking the import coefficient, the ratio of import to the total domestic demand for the product, into consideration. According to Rasmussen's (1957, p. 134) definition, PDI and SDI are written as follows:

$$\text{PDI: } D_j^P = \frac{\sum_{i=1}^n \alpha_{ij}}{\frac{1}{n} \sum_{j=1}^n \sum_{i=1}^n \alpha_{ij}} ; \quad \text{SDI: } D_i^S = \frac{\sum_{j=1}^n \alpha_{ij}}{\frac{1}{n} \sum_{i=1}^n \sum_{j=1}^n \alpha_{ij}} ;$$

where α_{ij} is an element of \mathcal{A}_M at the intersection of row i and column j , and n is the number of rows and columns. The PDI describes the relative extent of the total demand increase for overall products as a result of a unit increase in the final demand for product j . For example, “ $D_j^P > 1$ ” would express that industry j draws heavily (i.e. compared to the industries in general) on the system of industries — and *vice versa* in case $D_j^P < 1$ ” (*ibid.* pp. 134-135). Meanwhile, the SDI describes the relative extent of total increase in the demand for product i as a result of a unit increase in the final demand for overall products. Thus “ $D_i^S > 1$ ” means that industry i generally (i.e. relatively to the system of industries in general) will have to increase its output more

than other industries for given increase in demand and vice versa for $D_i^S < 1$ " (*ibid.* p. 135).

It should be reminded that the idea of triangulation was first conceived in an effort to reduce the calculation time to obtain the Leontief inverse. The U.S. Air Force Planning Research Division scientists led by Wood and Horton (1950) first proposed the idea. "An economist charged with the task of computing the indirect effects of an increase in final demand for the output of this sector would need to know only the input coefficients for sectors below it. If he wants to compute the indirect effects on this sector of demand originating elsewhere, he needs to work only with the input coefficients for this sector and the sectors above it." (Leontief, 1963, p.153) Therefore, the triangulation and the dispersion indices are by no means unrelated. The correlation coefficients between \mathbf{z} , which we used for the triangulation, and PDI were 0.32 for 1965 and 0.25 for 1995; the correlation coefficient between \mathbf{z} and SDI were -0.37 for 1965 and -0.49 for 1995; all the coefficients were statistically significant at the 1% level. While the triangulation sort the industries into one-way hierarchy, the dispersion indices allow us to plot them in a two-dimensional diagram as shown in Figure 4, in which PDI and SDI are plotted horizontally and vertically respectively; the origin of the coordinate axes is (1, 1).

Table 9 shows to which quadrant each industry belongs; we name the quadrants anticlockwise starting from the upper right (see Figure 4). Many of the primary industries along with commerce and services belong to the third quadrant. These are self-sufficient industries so that they grow naturally without any external assistance. The industries belonging to the second quadrant are energy suppliers, public utilities, and financial and transportation services. These industries are so-called infrastructure that is

a prerequisite for economic development; however, they require a lot of capital to start up. Most of the material manufacturers, such as steel and chemical manufacturing, belong to the first quadrant. The industries belonging to the fourth quadrant produce final products that are either consumed by the households or used for capital formation. Although most of the industries remain in the same quadrant in both 1965 and 1995, some industries changed quadrants during the thirty years. For example, ‘precision machinery manufacturing’ moved from the third quadrant to the fourth because of the intricacy of the products; ‘education and research’ shifted from the third quadrant to the second because the activity became more deeply involved in the production process. ‘Automobile manufacturing’ shifted from the fourth quadrant to the first quadrant because of the production fragmentation within the industry. While ‘industrial robot manufacturing’ was in the fourth quadrant in the 1995 diagram, its fellow newcomer ‘computer and electronic devices manufacturing’ is in the first quadrant because the products, such as microprocessors, are often installed in other machinery.

3. Financial Market

3.1 Financial Balance Sheets

As we have mentioned already, an essential key to economic development is the finance to start up the industries. Financial balance sheets, which list financial assets and liabilities of various sectors, are often used to depict the financial market; however, an asset-liability matrix is more useful to illustrate the whole market. The fundamental data we are using is a series of financial balance sheets published by the Bank of Japan (BOJ), which covers 1954-1999 and is based on the SNA 1968. One of the features of this data set is that, most of the source data is available in the BOJ and government

publications so that we can break down the institutional sectors and financial instruments as detailed as possible⁶. While the original BOJ data consist of 18 sectors and 31 instruments, we divided it into 43 sectors and 55 instruments including dummy instruments, which we will explain later. The source data also allow us to construct more than one set of balance sheets based on different valuation methods. There are five alternative valuation principles⁷. In the original cost principle, the book value of each asset and liability in the balance sheet is the amount of funds that have changed hands at the first onerous transaction involving that particular item; the book value of the item does not change even if it is exchanged for funds thereafter. In the historical cost principle, the book value of each asset and liability in the balance sheet is the amount of funds that have changed hands in the last onerous transaction involving that particular item. In the historical buy-back cost principle, the book value of each asset in the balance sheet is the amount of funds that have changed hands in the last onerous transaction involving that particular item; the book value of a liability is equivalent to the book value of the corresponding asset. In the current cost principle, each asset or liability in the balance sheet is valued as if it was being acquired on the date to which the balance sheet relates. In the current buy-back cost principle, each asset in the balance sheet is valued as if it was being acquired on the date to which the balance sheet relates; the book value of a liability is equivalent to the book value of the corresponding asset. Since the financial balance sheets published by the BOJ during the last century is based on the original cost principle, we will also adopt the principle. Note that, in the original cost principle, there is no discrepancy between the valuation of an asset and that of the

⁶ See Tsujimura and Mizoshita (2004) and Tsujimura (ed.) (2004), chapter 9.

⁷ See Tsujimura and Tsujimura (2012) for details.

corresponding liability.

Since the tools for our financial market analysis resemble to those of input-output analysis, we have converted a set of financial balance sheets for each year into an asset-liability matrix. The methods of converting T-shaped accounts, such as financial balance sheets, into a matrix were proposed independently by Stone (1966) and Klein (1983). As Tsujimura and Mizoshita (2003) demonstrated it using financial balance sheets, the Stone and Klein formulae can be used as a pair because the two methods are symmetrical in mathematical operations. The two methods look identical in the sense that they transfer two ‘instrument \times sector’ matrices into a ‘sector \times sector’ matrix, however, while the Stone formula uses the right hand side (liabilities) of the T-accounts as its basis, the Klein formula uses the left-hand side (assets) as its core. Let \mathbf{P} and \mathbf{R} be matrices that represent provision and raising of funds respectively; we denote the elements of the matrices as p_{ki} and r_{lj} . While k and l indicate instruments, i and j denote sectors; n and m are the number of instruments and sectors so that both \mathbf{P} and \mathbf{R} are $n \times m$ matrices. While p_{ki} is instrument k held by sector i as an asset, r_{lj} denotes instrument l incurred by sector j as a liability. We further define diagonal matrices $\hat{\mathbf{T}}$, $\hat{\mathbf{T}}^P$, $\hat{\mathbf{T}}^R$, and vectors $\boldsymbol{\psi}$ and $\boldsymbol{\rho}$. $\hat{\mathbf{T}}$ is a $m \times m$ matrix with t_i as its diagonal elements and zeros elsewhere. Likewise, $\hat{\mathbf{T}}^P$ and $\hat{\mathbf{T}}^R$ are $n \times n$ diagonal matrices with t_k^P and t_k^R as elements respectively. $\boldsymbol{\psi}$ and $\boldsymbol{\rho}$ are vertical vectors of dimension m whose elements are ψ_i and ρ_i .

$$t_i = \max \left(\sum_{k=1}^n p_{ki}, \sum_{k=1}^n r_{ki} \right); \quad (2)$$

$$t_k^P = \sum_{i=1}^m p_{ki} ; \quad t_k^R = \sum_{i=1}^m r_{ki} ; \quad (3)$$

$$\psi_i = t_i - \sum_{k=1}^n p_{ki} \geq 0 ; \quad \rho_i = t_i - \sum_{k=1}^n r_{ki} \geq 0 . \quad (4)$$

ρ_i and ψ_i are positive and negative financial net worth. If total assets is greater than total liabilities of the sector, then $\rho_i > 0$ and $\psi_i = 0$; if total liabilities is greater than total assets of the sector, then $\rho_i = 0$ and $\psi_i > 0$.

We will use new matrices \mathbf{U} and \mathbf{V} to show the two formulae are symmetrical; superscripts S and K stand for the Stone and Klein formula respectively.

$$\mathbf{U}^S \equiv \mathbf{R} ; \quad \mathbf{V}^S \equiv \mathbf{P}' ; \quad (5)$$

$$\mathbf{U}^K \equiv \mathbf{P} ; \quad \mathbf{V}^K \equiv \mathbf{R}' ; \quad (6)$$

the apostrophe denotes transpose. We further define coefficient matrices \mathbf{B}^S , \mathbf{D}^S , \mathbf{B}^K , \mathbf{D}^K of the above matrices \mathbf{U}^S , \mathbf{V}^S , \mathbf{U}^K , \mathbf{V}^K by dividing each cell by the column sum:

$$\mathbf{B}^S = \mathbf{U}^S \hat{\mathbf{T}}^{-1} ; \quad \mathbf{D}^S = \mathbf{V}^S (\hat{\mathbf{T}}^P)^{-1} ; \quad (7)$$

$$\mathbf{B}^K = \mathbf{U}^K \hat{\mathbf{T}}^{-1} ; \quad \mathbf{D}^K = \mathbf{V}^K (\hat{\mathbf{T}}^R)^{-1} . \quad (8)$$

Then we obtain the asset-liability matrices \mathbf{Y}^S and \mathbf{Y}^K , and the corresponding coefficient matrices \mathbf{C}^S and \mathbf{C}^K in the following manner:

$$\mathbf{C}^S = \mathbf{D}^S \mathbf{B}^S ; \quad \mathbf{C}^K = \mathbf{D}^K \mathbf{B}^K ; \quad (9)$$

and

$$\mathbf{Y}^S = \mathbf{C}^S \hat{\mathbf{T}} ; \quad \mathbf{Y}^K = \mathbf{C}^K \hat{\mathbf{T}} . \quad (10)$$

Each column of matrix \mathbf{P} , which we are using, corresponds to the asset vector of the financial balance sheet of each sector while each column of matrix \mathbf{R} is equivalent to the liability vector. Thus, matrices \mathbf{Y}^S and \mathbf{Y}^K obtained through the above procedure are asset-liability matrices for the Stone formula and Klein formula respectively. While row sectors are lenders and column sectors are borrowers in the Stone formula, row sectors are borrowers and column sectors are lenders in the Klein formula. \mathbf{Y}^S and \mathbf{Y}^K are symmetrical about the diagonal running from the upper left to the lower right as proved in the appendix to Tsujimura and Mizoshita (2003) as long as original cost principle is maintained.

The Stone and Klein formulae are a convenient way to transform an ‘instrument \times sector’ matrix into a ‘sector \times sector’ matrix. As for openly traded negotiable instruments (e.g. bonds and stocks), there is no alternative but allocate them on a *pro rata* basis according to the market share. The best strategy to get an accurate from-whom-to-whom matrix is to subdivide the instruments as far as possible. However, in case of the financial instruments directly traded between two parties (e.g. deposits and loans), it is not uncommon that we can identify the trading partners. Whenever such additional information is available, the dummy instrument method, first proposed by Tsujimura and Mizoshita (2004) should be used together with the Stone and Klein formulae. The idea is quite simple; if we know, for example, that the bank made a loan (say amounting to 100) to the local government, we add a dummy instrument to solely record this single transaction. As depicted in Figure 5-1, we enter 100 on the asset side of the balance sheet of the bank while registering the same amount to the liability side of the local government. When we apply Stone (or Klein) formulae to these balance sheets, we will have a ‘sector \times sector’ matrix depicted in Figure 5-2. The trick ensures

that the transaction is automatically recorded at the intersection of the bank's row (column) and the local government's column (row).

3.2 Triangulation

Since an asset-liability matrix is a from-whom-to-whom square matrix just as the intermediate transaction matrix of an input-output table, we can triangulate it in the same manner described in Subsection 2.3 above⁸. Since \mathbf{Y}^S and \mathbf{Y}^K are symmetrical as explained above, (i) triangulation according to the number of non-zero cells in each column of \mathbf{Y}^S is equivalent to (ii) triangulation according to the number of non-zero cells in each row of \mathbf{Y}^K and *vice versa*. As in the case of input-output table, there are not too much difference in the triangulation order, the results of (iii) triangulation according to the number of non-zero cells in the lower-left triangle below the diagonal are listed in Table 10. In this table, trust accounts of the financial institutions are consolidated to their main accounts. In 1965, the sectors at the bottom of the triangle were 'life insurance', 'non-farming households', 'rest of the world', 'farming households' and 'benefit insurance societies' in that order. Since households are principal saver in an economy, they are positioned upstream in the lender-borrower hierarchy. Life insurance institutions that collect contributions only from the households also sit upstream. Since Japan heavily borrowed from abroad to invest in infrastructure in preparation for the 1964 Olympic games, the 'rest of the world' is situated upstream as well. In 1995, 'postal savings and postal life insurance' replaced the 'rest of the world'; Japan became one of the largest exporting countries in the world by the 1970s so that the 'rest of the world' moved downstream. In 1965, the sectors at the top of

⁸ See Tsujimura and Mizoshita (2002a,b and 2004) for details.

triangle were ‘securities finance corporations’, ‘Bank of Commerce and Industry’, ‘central government’, ‘non-financial public corporations’ and ‘small manufacturing private corporations’ in that order. ‘Securities finance corporations’ finance exclusively margin stock trading. The ‘Bank of Commerce and Industry’ is a semi-public bank that extends credit to small businesses. There was not much turnover in the triangle between 1965 and 1995. Non-financial corporations, the principal investors, occupy the top positions in both years, however, large manufacturing corporations significantly moved upstream during the thirty years. Actually large manufacturing corporations are among the top five that moved upstream between 1965 and 1995. The other four were ‘trust banks’, ‘credit cooperatives’, ‘regional banks’ and ‘labor credit associations’, which were competing for increasing household savings. The sectors significantly moved downstream were the ‘rest of the world’, ‘non-corporate enterprises’ (both services and commerce), ‘mortgages companies’ and ‘foreign banks in Japan’. The country was steadily piling up the external assets after the oil crisis of the 1970s. The mortgage companies that went into massive debt when the real estate bubble collapsed in the early 1990s, closed their business by the turn of the century.

Figure 6 illustrates the fluctuations in the triangulation order for the major sectors between 1954 and 1999. ‘Non-farming households’ maintained its role as principal saver throughout the period. ‘Central government’ was the principal fundraiser; ‘local governments’ was in the middle during the 1950s and 1960s, however, they moved downstream during the recessions of the 1970s and 1990s. ‘Non-financial corporations’ were gradually shifting their position upstream during most of the observation period, however, quickly moved downstream in the 1990s. Figure 7 depicts the proportion of capital formation in the nominal GDE. The proportion of private sector increased during

the 1950s and 1960s but decreased after the oil crisis until mid-1980s. The proportion briefly picked up in the latter half of the 1980s, however, again decreased after the real estate bubble had collapsed. Thus, the rise in the non-financial corporations' triangulation ranking in the 1990s does not necessarily reflect the appetite for capital investment; rather, the rise was a result of financial difficulty in a recession.

3.3 Dispersion Indices

We can obtain the dispersion indices for each sector as an analogy to the input-output table as discussed in Tsujimura and Mizoshita (2004). Since there are two asset-liability matrices, the Stone and Klein formulae, we have two sets of PDI and SDI. Let γ_{ij}^S and γ_{ij}^K be the elements of $\Gamma^S = (\mathbf{I} - \mathbf{C}^S)^{-1}$ and $\Gamma^K = (\mathbf{I} - \mathbf{C}^K)^{-1}$ respectively. The dispersion indices are defined as follows⁹.

$$\text{Stone-formula PDI: } D_j^{SP} = \frac{\sum_{i=1}^m \gamma_{ij}^S}{\frac{1}{m} \sum_{j=1}^m \sum_{i=1}^m \gamma_{ij}^S} ;$$

$$\text{Klein-formula PDI: } D_j^{KP} = \frac{\sum_{i=1}^m \gamma_{ij}^K}{\frac{1}{m} \sum_{j=1}^m \sum_{i=1}^m \gamma_{ij}^K} ;$$

$$\text{Stone-formula SDI: } D_i^{SS} = \frac{\sum_{j=1}^m \gamma_{ij}^S}{\frac{1}{m} \sum_{i=1}^m \sum_{j=1}^m \gamma_{ij}^S} ;$$

⁹ See Tsujimura and Mizoshita (2002a,b and 2004) for details.

Klein-formula SDI:
$$D_i^{KS} = \frac{\sum_{j=1}^m \gamma_{ij}^K}{\frac{1}{m} \sum_{i=1}^m \sum_{j=1}^m \gamma_{ij}^K} .$$

The Stone-formula PDI, which is the normalized column sum of the Stone-formula Leontief inverse, represents the relative volume of provision of funds from the total economy as a result of a unit fundraising by sector j . The Klein-formula PDI, which is the normalized column sum of the Klein-formula Leontief inverse, represents the relative volume of provision of funds to the total economy as a result of a unit provision of funds by sector j . Stone-formula SDI, which is the normalized row sum of the Stone-formula Leontief inverse, represents the relative volume of funds that sector i is expected to provide when all the sectors of the economy raise a unit of funds. Klein-formula SDI, which is the normalized row sum of the Klein-formula Leontief inverse, represents the relative volume of funds that sector i is supposed to receive when all the sectors of the economy provide a unit of funds.

We plot the dispersion indices in two two-dimensional diagrams whose origin of the coordinate axes are (1, 1). In the PDI diagram, we plot Stone-formula PDI horizontally and Klein-formula PDI vertically; in the SDI diagram, we plot Stone-formula SDI horizontally and Klein-formula SDI vertically. Table 11 shows to which quadrant each sector belongs; we name the quadrants anticlockwise starting from the upper right. In the PDI diagram, ‘non-farming households’, the principal savers of the economy, are in the second quadrant. Most of ‘non-financial private corporations’, the principal investors, are in the fourth quadrant. Local governments are also positioned in the fourth quadrant. Central government was in the second quadrant in 1965, but moved to the fourth quadrant in 1995 reflecting the changes in its role in the financial market.

The government did not raise funds after the world war until 1965; however, it started to issue bonds after the year and became the largest borrower by the end of 1970s. The ‘rest of the world’ also moved from the second quadrant to the fourth quadrant between 1965 and 1995; Japan repaid the external debt by the end of 1960s and started to accumulate external assets after the oil crisis. Although many of the financial institutions are positioned in the third quadrant in the SDI diagram, ‘nationwide commercial banks’, ‘regional banks’, ‘credit unions’ and ‘financial institutions for agriculture, forestry and fishery’ are in the first quadrant. These depository institutions successfully collected redundant funds from the households and loaned it to the developing industries. ‘Trust banks’, one of the long-term financial institutions, changed its position from the third quadrant to the first quadrant between 1965 and 1995 by penetrating into both the large businesses and the consumer market. The public financial system that consisted of ‘postal savings and life insurance’, ‘government loan fund’ and ‘public financial corporations’ moved from the fourth quadrant to the first quadrant between the two years; they also provided much-needed long-term credit to the private sector. While ‘nationwide commercial banks’ and the long-term financial institutions played a dominant role in financing the large enterprises, ‘credit unions’ and ‘financial institutions for agriculture, forestry and fishery’ took care of the small businesses, which supplied necessary materials to the larger manufacturers. In 1965, all categories of ‘non-financial private corporations’ were in the first quadrant; the large enterprises used to hold the equity stocks of smaller companies and to extend trade credit to the material and merchandize providers; promissory note was the preferred method of payment among the small businesses.

3.4 Financial Net Worth

In the original cost principle, which we are using so far, the total financial assets of an economy including the rest of the world is equivalent to the total liabilities. Nevertheless, it does not necessarily mean the total financial assets of an institutional sector is equivalent to its total liabilities; the difference between the total financial assets and total liabilities is referred to as financial net worth (FNW). The changes in the FNW of the principal sectors are illustrated in Figure 8. The FNW of the households increased steadily between 1954 and 1999 accumulating the savings. Since the FNW of the households was positive during entire observation period, we have normalized the financial net worth of each sector by that of the households¹⁰ as shown in Figure 9. The FNW of the non-financial corporations was negative all the time; they were constantly borrowing to increase production capacity. The proportion of FNW of the non-financial corporation to that of the households was around or a little over one (a little below -1 to be precise) until mid-1960s; that is to say the private sector savings and investments were more or less balanced. However, the ratio declined sharply after the oil crisis, and fell below 0.6 during the 1980s. The ratio made another dive in the mid-1990s, and finally reached 0.38 by the end of the century. It is a problematic situation indeed. Since the total financial assets of the economy including the rest of the world is equivalent to the total liabilities, the sum of the FNW of the all sectors must be zero. If the non-financial corporations absorb only a little portion of the FNW of the household, the other sectors must balance it out. In other words, the other sectors must incur liabilities to balance out the ever-increasing household savings. By the end of 1990s, Japan accumulated the world largest external assets; that means the country loaned redundant

¹⁰ See Tsujimura and Tsujimura (2010) for details.

household savings abroad. However, as Figure 9 shows, the rest of the world alone could not absorb the large FNW of the households. The government had no choice but absorb the redundant fund by issuance of government bonds. Since savings is the income less consumption, huge savings mean the households are not spending too much. Thus, the government had to increase the spending to cover up the shortage of final demand by heavy borrowing.

The annual increase or decrease of the FNW of the general government and the non-financial corporations normalized by that of the households are depicted in Figure 10. This indicator is known as net lending or borrowing (NLB) in the national accounting, and used as an indicator of the saving-investment balance. Note that the NLB of the households was positive every year between 1955 and 1999. The NLB of the non-financial corporations was in the negative domain until 1994, but shifted to positive in 1995 and remained in the sphere thereafter. It means that the non-financial corporations turned from net borrower to net lender in mid-1990s. In Figure 10, the green line of the general government is somewhat a mirror image of the blue line of the non-financial corporations. By 1965, when the non-financial corporations borrowed heavily and vigorously invested in production facilities, the NLB of the general government was positive. In contrast to this, as the NLB of the non-financial corporations turned to positive, the general government started to accumulate public debt. There is a peculiar correlation between the NLB of the non-financial corporations and the unemployment rate depicted in Figure 11. Especially, during the 1990s, both the NLB of the non-financial corporations and the unemployment rate shot up. The unemployment rate shot up during this time at least partially because of the mass introduction of industrial robots. As we have mentioned earlier, the number of robots in

operation in Japan suddenly increased between 1985 and 1990. The number of working robots were 93 thousand in 1985, but increased to 274 thousand in 1990 and then 387 thousand in 1995. These robots quickly overtook the manufacturing jobs, assembling, painting, welding and packing etc., from the laborers. An average robot costed around 6610 thousand yen in 1990, an equivalent of two years' pay of an average worker; of course, the robots work around the clock if necessary. The manufactures did not have to borrow too much to install new robots so that it did not take too much for the robots to take over the human job. The productivity of the manufactures increased considerably, however, the household income declined and the final demand slumped. In that sense, the saving-investment imbalance and the disequilibrium in the product market is the two sides of the same coin.

4. Concluding Remarks

Japan successfully escaped from poverty after the world war and attained prosperity in a matter of two decades. There were two keys for the success. One was the priority production system – the idea to develop the industries at the bottom of the triangulated input-output table first, and to climb the triangle step by step. The country concentrated in hydroelectric power generation and coal mining to supply the energy. This energy was then used to manufacture iron and steel, which supplied necessary material for shipbuilding. When they found redundancy in steel supply, Japan developed automobile and electric appliances manufacturing that became the leading industries of the country. Since the assembling industries hired heavily, surplus labor from the farming communities found jobs in the manufacturing plants escaping from poverty.

The second key for the success was the country's unique financial system. The

financial institutions specialized in long-term finance, such as trust banks and long-term credit banks, supplied the necessary funds for developing new industries. However, they also realized the importance of the small businesses. While the large manufactures assembled parts and components, the small enterprises supplied those necessary materials. Regional banks, mutual banks, credit unions and credit cooperatives were there to take care of and provide finance to the small businesses.

The first setback to the economy was the oil crisis that hit energy-scarce Japan in the 1970s. Fortunately, the country could overcome the difficulty by heavily investing in energy-saving technologies. They successfully solved pollution problems by doing so, which the country was suffering for decades. The second set back was the appreciation of yen. After the Nixon shock in 1971, the Japanese currency was rising against U.S. dollar and other currencies of the world. Plaza accord of 1985 was an agreement between the governments of France, West Germany, Japan, the United States, and the United Kingdom, to depreciate the U.S. dollar in relation to the Japanese yen and Deutsche mark by intervening in currency markets. Japanese exporting manufacturers had to fight the appreciation of yen by cutting the production cost; their answer was the mass introduction of industrial robots. The exporters won the fight but the country did not. It was the robots who were producing robots so that the industry did not hire too many people; unemployment rate rose and the household income began to shrink. The success formula of the past did not work this time.

Most probably, they forgot another message of Leontief (1963). In his paper, Leontief points out the alternative to the triangle structure of the industries is the block structure or block triangle structure. When the Japanese economists drew the blueprint of the priority production system, what they had in mind was the one-way hierarchy of

the industries – energy, steel, shipbuilding and so on. They did not explore the other blocks of industries, such as chemistry and apparel. It is efficient to concentrate in only one field of technology, but it is a double-edged sword; when the industry come to a dead end there is no ready escape.

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Figure 1: Gross domestic products of Japan (SNA1968)

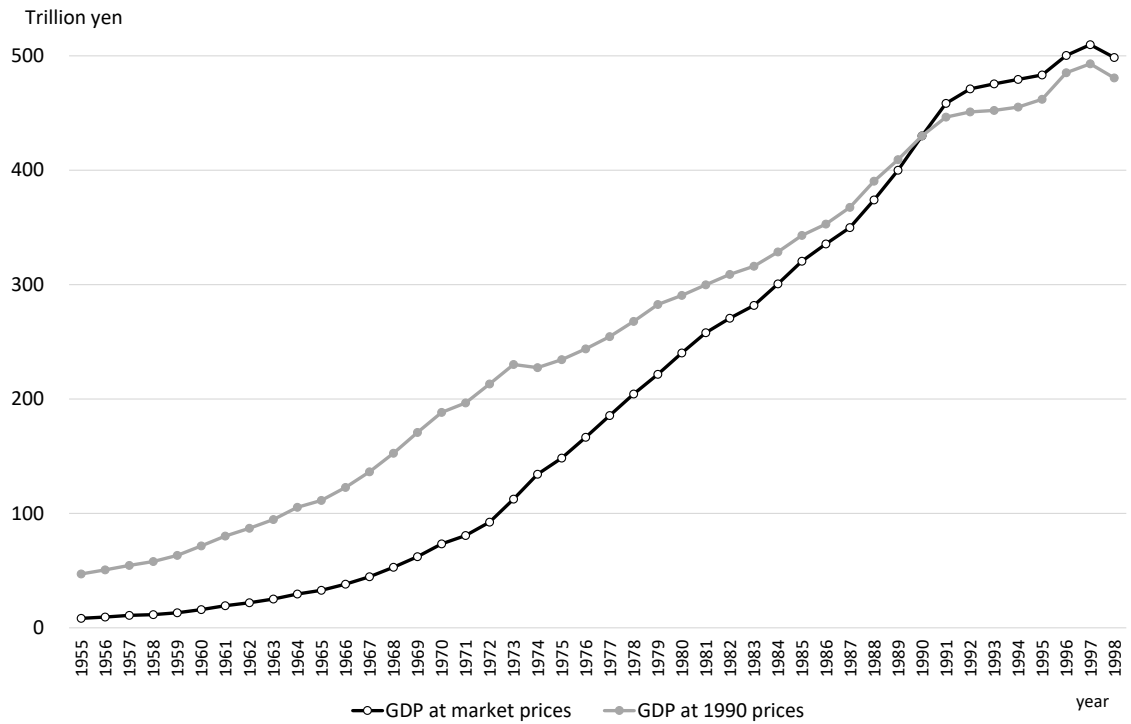


Figure 2: The share in nominal GDP

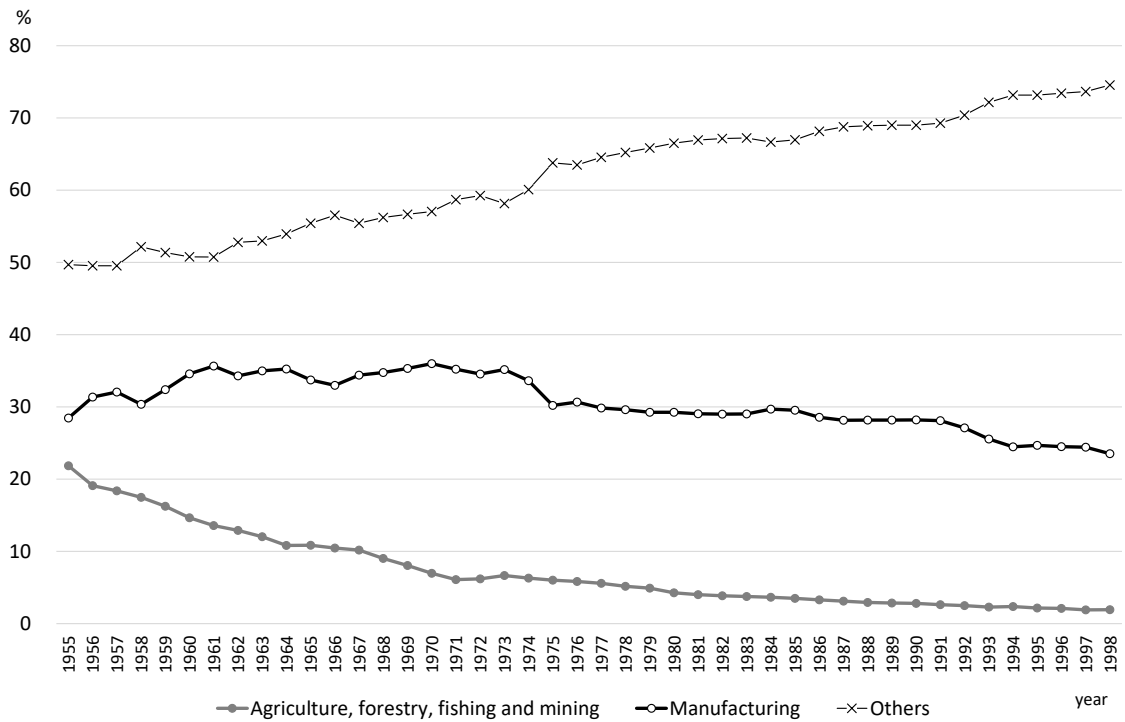


Figure 3: The share in employment

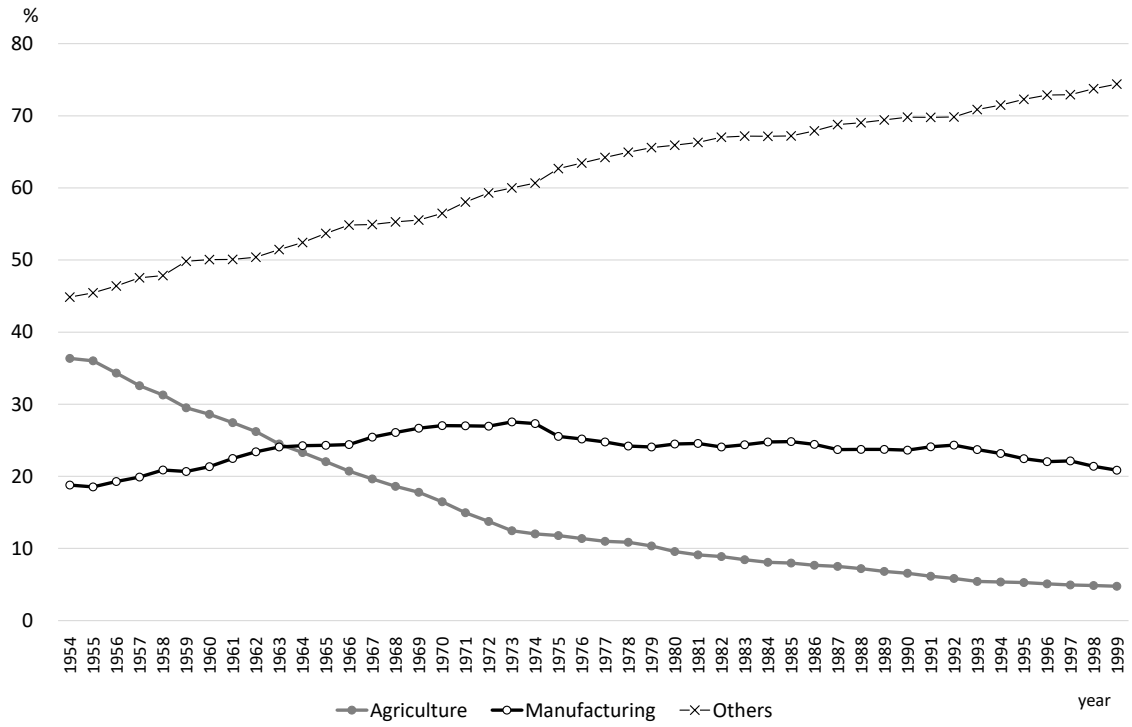


Figure 4-1: Scatter diagram between PDI and SDI (1965)

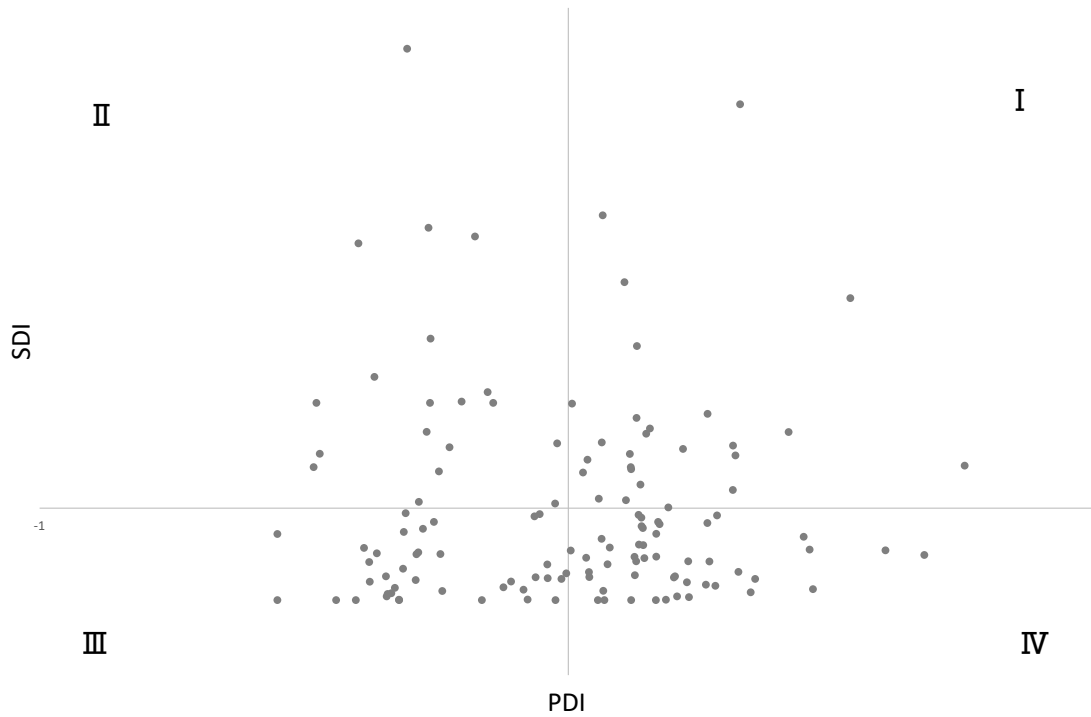


Figure 4-2: Scatter diagram between PDI and SDI (1995)

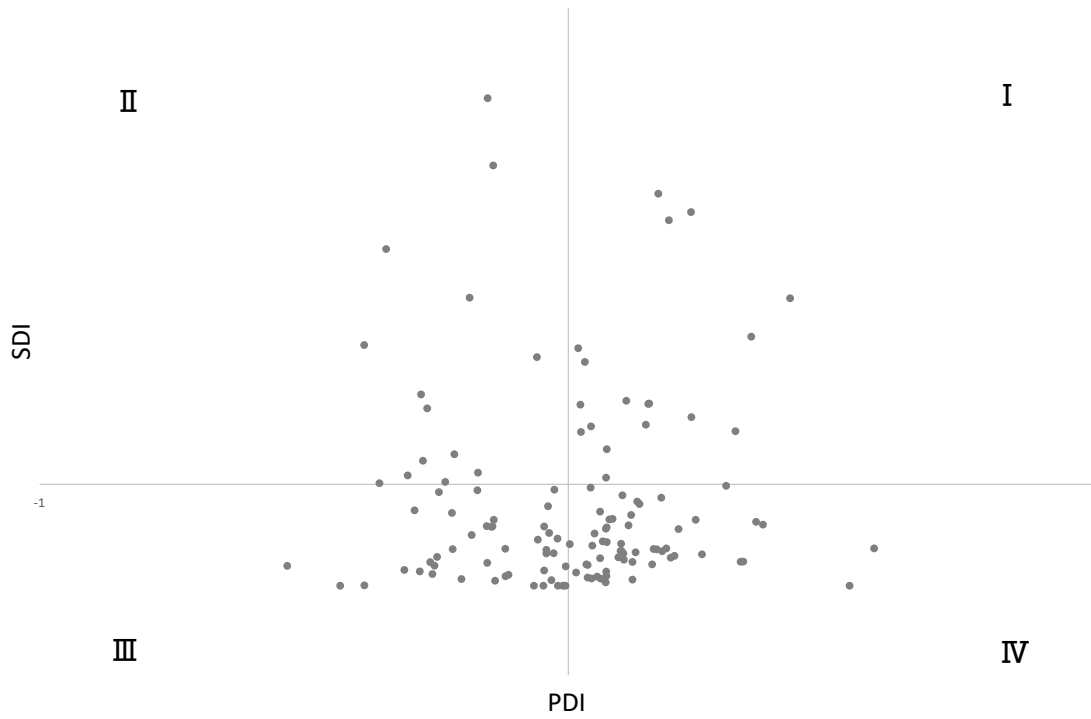


Figure 5-1: Concept of dummy instrument method

	Bank		Local government	
	Assets	Liabilities	Assets	Liabilities
Loan to the local government	100			100

Figure 5-2: Asset-liability matrix compiled from dummy instrument method

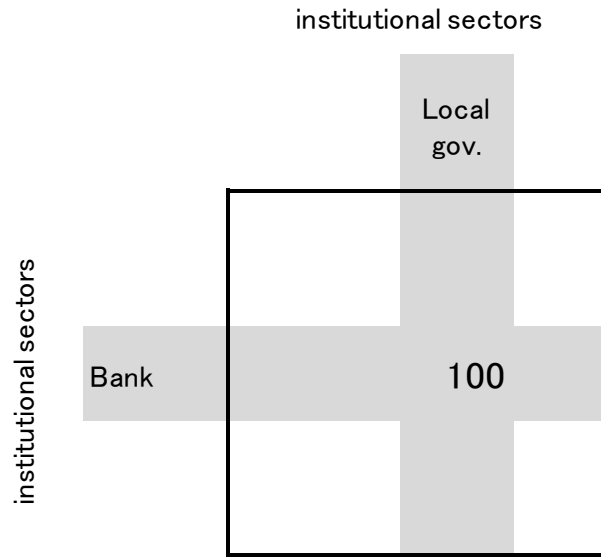


Figure 6: Triangulation ranking

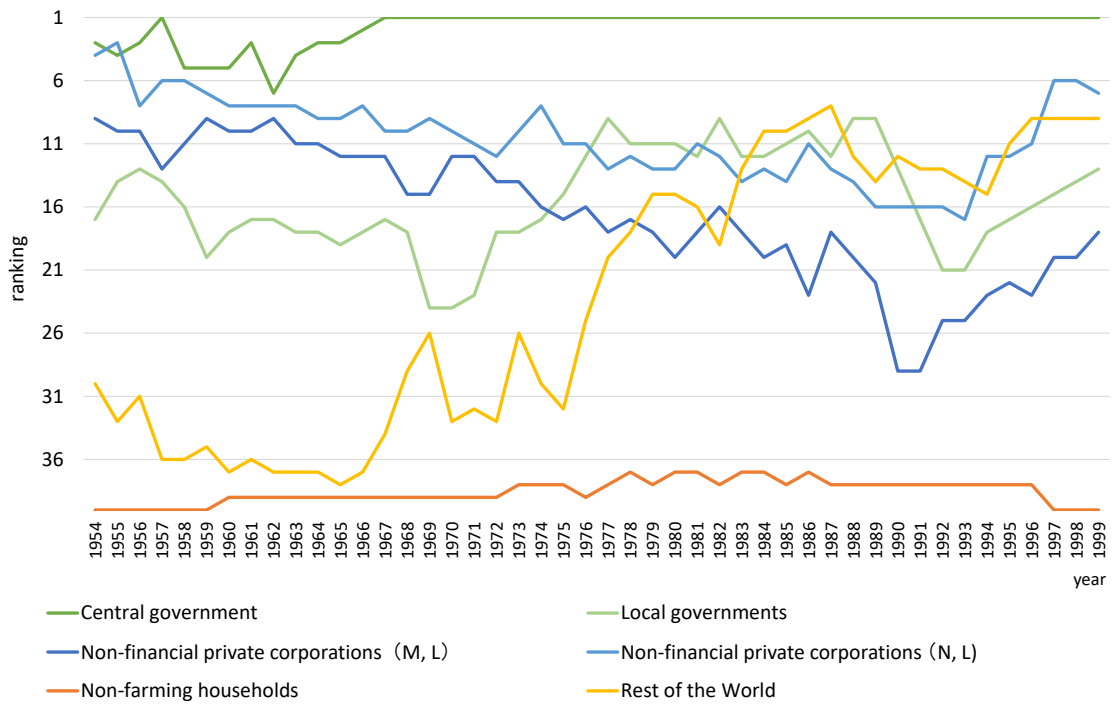


Figure 7: The proportion of capital formation in the nominal GDE

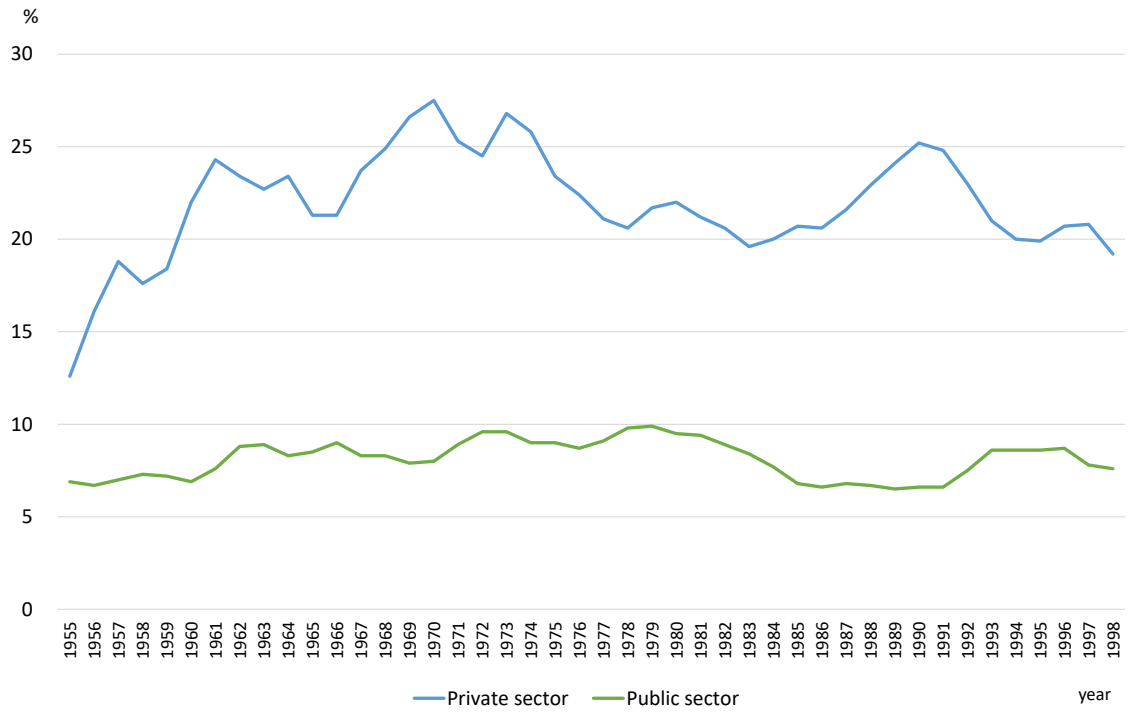


Figure 8: Financial net worth of each sector

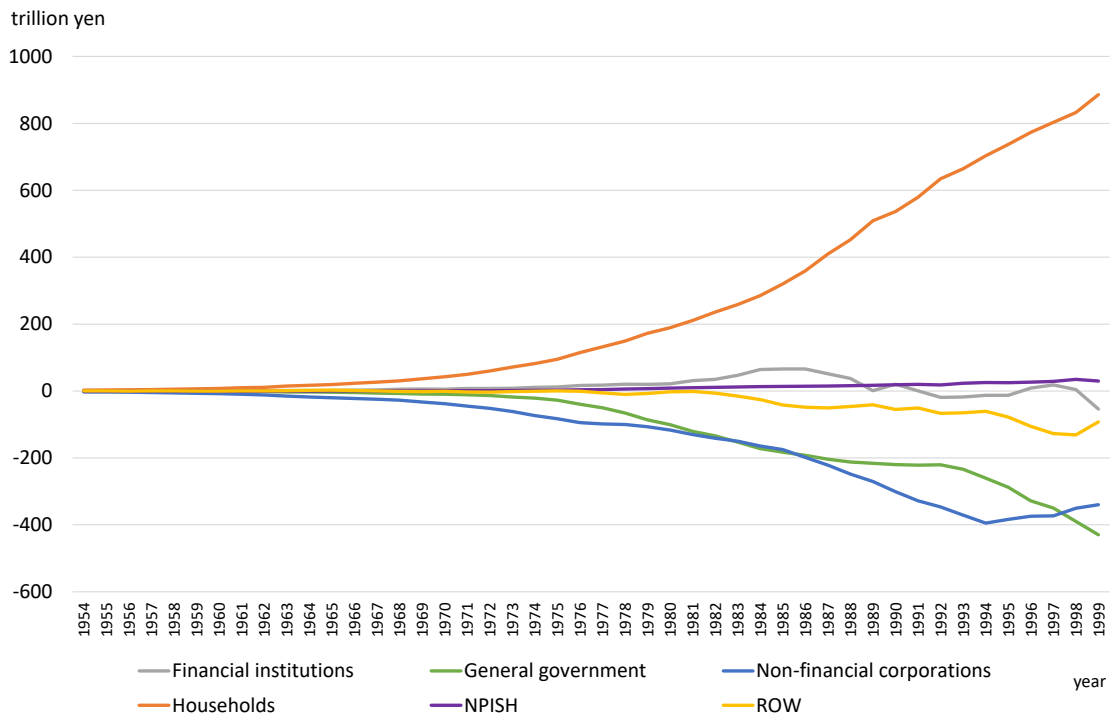


Figure 9: Financial net worth normalized by that of the households

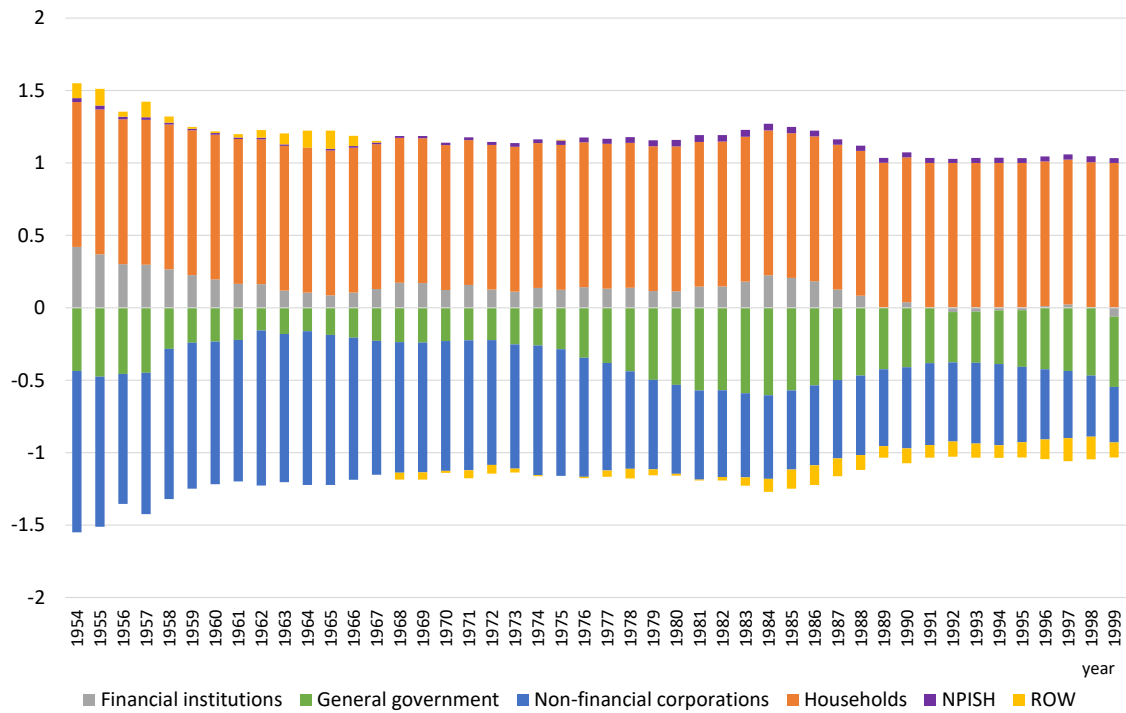


Figure 10: Net lending or borrowing normalized by that of the households

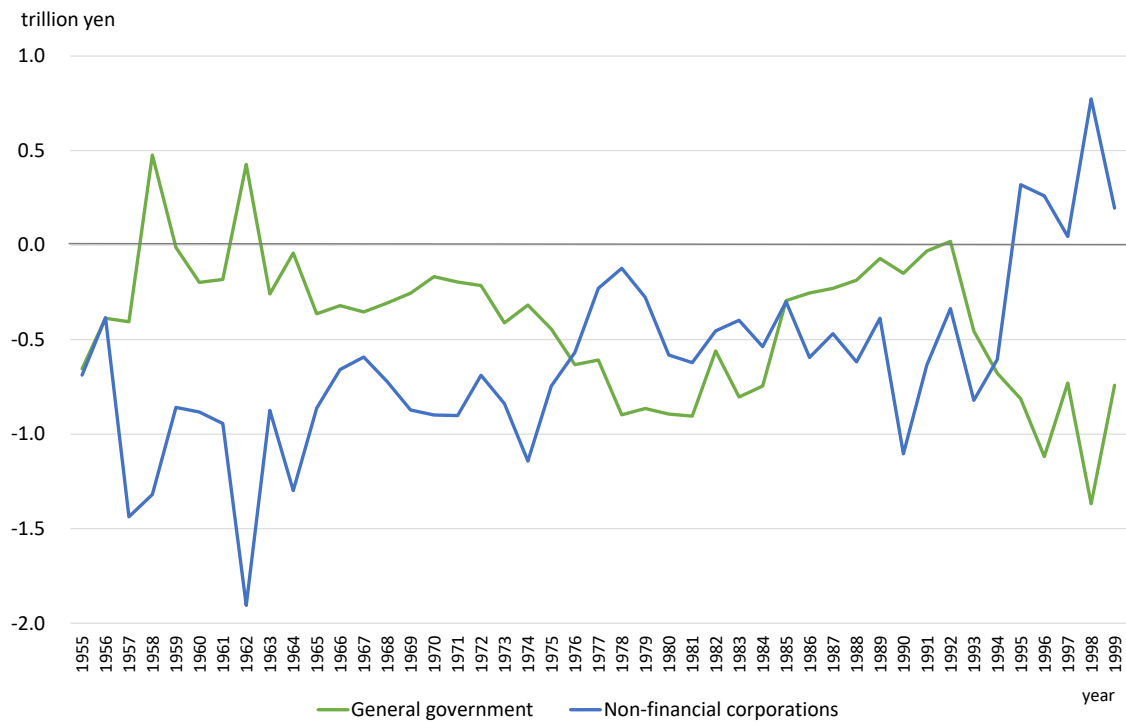


Figure 11: The unemployment rate

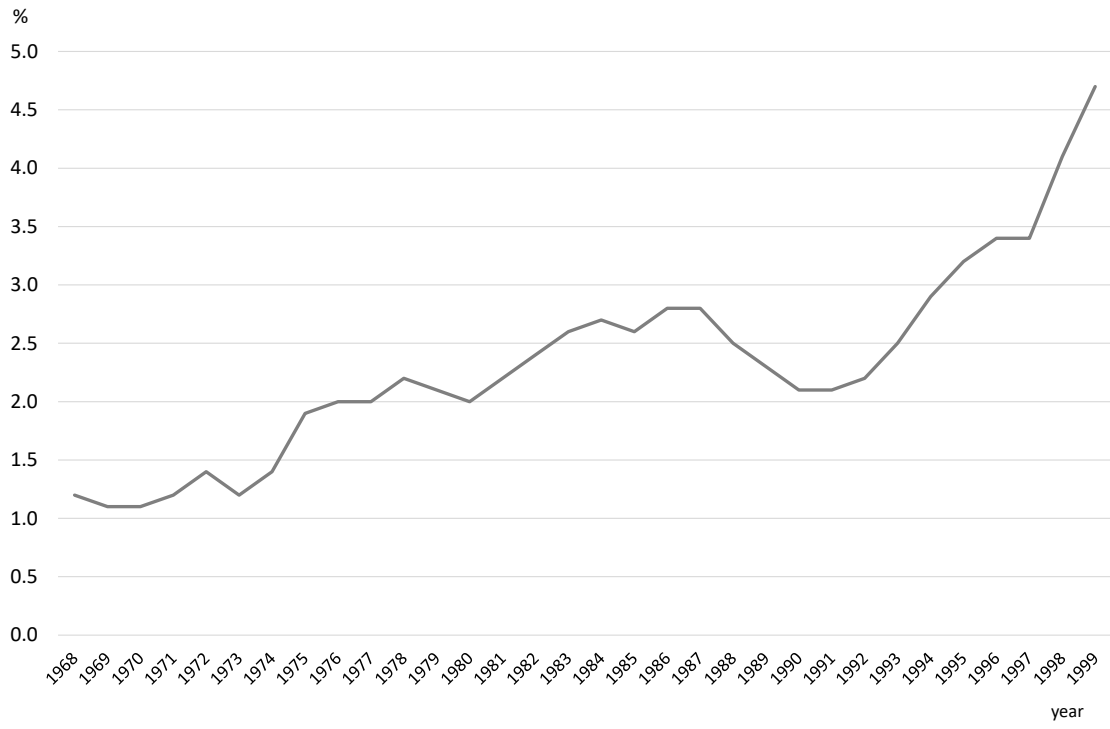


Table 1: Gross value added ranking

	1965	1995	Rise in ranking
1	Wholesale trade	Housing	Transportation related services
2	Retail trade	Wholesale trade	Dressmaking
3	Housing	Business support services	Plastic product manufacturing
4	General government service	Retail trade	Aluminum products manufacturing
5	Grain farming	Education and research	Cement milling
6	Finance	Finance	Fiber crop farming
7	Education and research	General government service	Water supply and waste management
8	Residential construction	Medical services	Soft drink manufacturing
9	Medical services	Restaurants and hotels	Vegetable oil refining
10	Electric power generation	Residential construction	Warehousing
11	Other consumer services	Public works	Office machine manufacturing
12	Communication services	Computer and electronic devices manufacturing	Nonferrous metal foundries
13	Engineering works other than public works	Communication services	Copper rolling and wiring
14	Mineral oil refining	Road freight transport	Air transport
15	Rail transport	Real estate	Business support services
16	Liquor manufacturing	Entertainment	Freight forwarding
17	Road freight transport	Electric power generation	Other transportation equipment manufacturing
18	Nonresidential construction	Automobile manufacturing	Sugar refinery
19	Real estate	Other consumer services	Fish processing
20	Entertainment	Other public services	Metal plating
21	Public works	Nonresidential construction	Flour milling
22	Automobile manufacturing	Engineering works other than public works	Restaurants and hotels
23	Industrial machinery manufacturing	Printing and publishing	Gas distribution
24	Other electric appliance manufacturing	Insurance	Precision machinery manufacturing
25	Other public services	Water supply and waste management	Aircraft manufacturing
26	Vegetable farming	Mineral oil refining	Ferroalloy manufacturing
27	Printing and publishing	Industrial machinery manufacturing	Paint manufacturing
28	Restaurants and hotels	Plastic product manufacturing	Paper milling
29	Road passenger transport	Fabricated metal products manufacturing	Agricultural services
30	Sea water fishing	Transportation related services	Building maintenance and repair
31	Business support services	Road passenger transport	Paper product manufacturing
32	Tobacco manufacturing	Building maintenance and repair	Baking
33	Not elsewhere classified	Rail transport	Insurance
34	Fabricated metal products manufacturing	Automotive repair and maintenance	Meat processing and daily product manufacturing
35	Metal construction material manufacturing	Liquor manufacturing	Pharmaceutical manufacturing
36	Insurance	Not elsewhere classified	Generator and transformer manufacturing
37	Other manufacturing	Consumer electric appliances manufacturing	Glass manufacturing
38	Forest nurturing	Pharmaceutical manufacturing	Public works
39	Consumer electric appliances manufacturing	Generator and transformer manufacturing	Rubber product manufacturing
40	Spinning and weaving	Tobacco manufacturing	Automotive repair and maintenance
41	Clay manufacturing	Other electric appliance manufacturing	Inorganic chemical manufacturing
42	Automotive repair and maintenance	Grain farming	Organic chemical manufacturing
43	Other food processing	Dressmaking	Footwear manufacturing
44	Iron rolling	Other manufacturing	Industrial device manufacturing
45	Domestic water transport	Warehousing	Fabricated metal products manufacturing
46	Building maintenance and repair	Baking	Other public services
47	Fruit farming	Other food processing	Automobile manufacturing
48	Reeling and spinning	Cement milling	Entertainment
49	Generator and transformer manufacturing	Industrial device manufacturing	Fruit and vegetable processing
50	Pharmaceutical manufacturing	Vegetable farming	Printing and publishing
51	International maritime transport	Machinery parts manufacturing	Real estate
52	Quarrying	Domestic water transport	Ceramic manufacturing
53	Sawing	Paper product manufacturing	Machine tool manufacturing
54	Machinery parts manufacturing	Paper milling	Machinery parts manufacturing
55	Furniture manufacturing	Organic chemical manufacturing	Road freight transport
56	Industrial device manufacturing	Rubber product manufacturing	Coal product manufacturing
57	Cattle farming	Furniture manufacturing	Consumer electric appliances manufacturing
58	Baking	Fish processing	Freshwater fishing
59	Chemical fiber manufacturing	Soft drink manufacturing	Education and research
60	Steel manufacturing	Metal construction material manufacturing	Housing
61	Shipbuilding	Sea water fishing	Leather product manufacturing
62	Iron hardening	Aluminum products manufacturing	Wood manufacturing
63	Organic chemical manufacturing	Metal plating	Medical services
64	Logging	Steel manufacturing	Oil and natural gas extraction
65	Rubber product manufacturing	Iron rolling	Communication services
66	Paper product manufacturing	Gas distribution	Finance
67	Other apparel manufacturing	Nonferrous metal foundries	Furniture manufacturing
68	Coal mining	Machine tool manufacturing	Road passenger transport
69	Paper milling	Clay manufacturing	Scrap steel recycling
70	Engine and boiler manufacturing	Iron hardening	Wholesale trade
71	Machine tool manufacturing	Precision machinery manufacturing	Nonresidential construction
72	Water supply and waste management	Sawing	Not elsewhere classified
73	Chemical manufacturing	Air transport	Residential construction
74	Oilseed farming	Glass manufacturing	Retail trade
75	Railway rolling stock manufacturing	Cattle farming	Steel tubing
76	Other chemical product manufacturing	Sugar refinery	General government service
77	Textile finishing and fabric coating	Meat processing and daily product manufacturing	Industrial machinery manufacturing
78	Bicycle and motorcycle manufacturing	Vegetable oil refining	Other food processing
79	Optical and photographic equipment manufacturing	Quarrying	Steel manufacturing
80	Fish processing	Fiber crop farming	Other textile manufacturing
81	Knitting	Fruit farming	Domestic water transport
82	Warehousing	Inorganic chemical manufacturing	Electric power generation
83	Gas distribution	Shipbuilding	Feed grain processing
84	Glass manufacturing	Engine and boiler manufacturing	Other manufacturing
85	Metal plating	Chemical manufacturing	Animal slaughtering
86	Plastic product manufacturing	Office machine manufacturing	Iron hardening
87	Precision machinery manufacturing	Wood manufacturing	Other consumer services
88	Wood manufacturing	Other apparel manufacturing	Stone mining
89	Meat processing and daily product manufacturing	Ceramic manufacturing	Tobacco manufacturing
90	Inorganic chemical manufacturing	Copper rolling and wiring	Engineering works other than public works
91	Other textile manufacturing	Forest nurturing	Nonferrous metal smelting and refining
92	Ceramic manufacturing	Ferroalloy manufacturing	Charcoal production hunting etc.
93	Nonferrous metal smelting and refining	Other chemical product manufacturing	Chemical manufacturing
94	Pulp milling	Textile finishing and fabric coating	Mineral oil refining
95	Cement milling	Paint manufacturing	Chemical fertilizer manufacturing
96	Silkworm farming	Optical and photographic equipment manufacturing	Engine and boiler manufacturing
97	Mineral ore mining	Other textile manufacturing	Clock and watch manufacturing
98	Nonferrous metal foundries	Freight forwarding	Optical and photographic equipment manufacturing
99	Clock and watch manufacturing	Agricultural services	Other chemical product manufacturing
100	Air transport	Aircraft manufacturing	Other electric appliance manufacturing
101	Sugar refinery	Other transportation equipment manufacturing	Textile finishing and fabric coating
102	Steel tubing	Spinning and weaving	Cattle farming
103	Chemical fertilizer manufacturing	Coal product manufacturing	Rail transport
104	Soft drink manufacturing	Nonferrous metal smelting and refining	Liquor manufacturing
105	Coal product manufacturing	Steel tubing	Pulp milling
106	Dressmaking	Railway rolling stock manufacturing	Sawing
107	Ferroalloy manufacturing	International maritime transport	Iron rolling
108	Charcoal production hunting etc.	Chemical fiber manufacturing	Other apparel manufacturing
109	Transportation related services	Flour milling	Shipbuilding
110	Paint manufacturing	Fruit and vegetable processing	Vegetable farming
111	Feed grain processing	Leather product manufacturing	Metal construction material manufacturing
112	Leather product manufacturing	Industrial robot manufacturing	Quarrying
113	Agricultural services	Reeling and spinning	Clay manufacturing
114	Fruit and vegetable processing	Pulp milling	Mineral ore mining
115	Aircraft manufacturing	Footwear manufacturing	Railway rolling stock manufacturing
116	Animal slaughtering	Clock and watch manufacturing	Sea water fishing
117	Aluminum products manufacturing	Logging	Silkworm farming
118	Office machine manufacturing	Chemical fertilizer manufacturing	Fruit farming
119	Copper rolling and wiring	Feed grain processing	Grain farming
120	Stone mining	Oilseed farming	Knitting
121	Footwear manufacturing	Charcoal production hunting etc.	Bicycle and motorcycle manufacturing
122	Vegetable oil refining	Bicycle and motorcycle manufacturing	Oilseed farming
123	Freight forwarding	Freshwater fishing	Chemical fiber manufacturing
124	Freshwater fishing	Knitting	Logging
125	Oil and natural gas extraction	Animal slaughtering	Forest nurturing
126	Other transportation equipment manufacturing	Oil and natural gas extraction	International maritime transport
127	Fiber crop farming	Coal mining	Coal mining
128	Scrap steel recycling	Mineral ore mining	Spinning and weaving
129	Flour milling	Stone mining	Reeling and spinning
130		Silkworm farming	
131		Scrap steel recycling	

Table 2: Value added ratio ranking

	1965	1995	Rise in ranking
1	General government service	Housing	Other consumer services
2	Real estate	Tobacco manufacturing	Paper product manufacturing
3	Communication services	Real estate	Footwear manufacturing
4	Forest nurturing	Forest nurturing	Other food processing
5	Education and research	Education and research	Other apparel manufacturing
6	Housing	Other consumer services	Aluminum products manufacturing
7	Grain farming	Retail trade	Leather product manufacturing
8	Finance	Insurance	Chemical fertilizer manufacturing
9	Fruit farming	Wholesale trade	Nonresidential construction
10	Silkworm farming	Fruit farming	Dressmaking
11	Retail trade	General government service	Copper rolling and wiring
12	Warehousing	Transportation related services	Vegetable oil refining
13	Insurance	Freight forwarding	Residential construction
14	Other public services	Communication services	Fruit and vegetable processing
15	Oilseed farming	Finance	Iron hardening
16	Transportation related services	Entertainment	Tobacco manufacturing
17	Water supply and waste management	Oil and natural gas extraction	Building maintenance and repair
18	Domestic water transport	Other public services	Business support services
19	Restaurants and hotels	Grain farming	Wholesale trade
20	Freight forwarding	Water supply and waste management	Baking
21	Fiber crop farming	Fiber crop farming	Oil and natural gas extraction
22	Tobacco manufacturing	Vegetable farming	Wood manufacturing
23	Charcoal production hunting etc.	Liquor manufacturing	Reeling and spinning
24	Sea water fishing	Sea water fishing	Steel tubing
25	Stone mining	Warehousing	Liquor manufacturing
26	Entertainment	Business support services	Metal plating
27	Wholesale trade	Oilseed farming	Other textile manufacturing
28	Electric power generation	Domestic water transport	Textile finishing and fabric coating
29	Road passenger transport	Agricultural services	Vegetable farming
30	Rail transport	Mineral ore mining	Agricultural services
31	Road freight transport	Medical services	Mineral oil refining
32	Mineral ore mining	Coal mining	Ceramic manufacturing
33	Oil and natural gas extraction	Electric power generation	Entertainment
34	Vegetable farming	Gas distribution	Generator and transformer manufacturing
35	Coal mining	Mineral oil refining	Rubber product manufacturing
36	Quarrying	Road freight transport	Paper milling
37	Liquor manufacturing	Rail transport	Aircraft manufacturing
38	Gas distribution	Ceramic manufacturing	Fish processing
39	Medical services	Quarrying	Medical services
40	Agricultural services	Stone mining	Printing and publishing
41	Machinery parts manufacturing	Printing and publishing	Freight forwarding
42	Freshwater fishing	Freshwater fishing	Engineering works other than public works
43	Automotive repair and maintenance	Textile finishing and fabric coating	Sawing
44	Business support services	Machinery parts manufacturing	Coal product manufacturing
45	Fabricated metal products manufacturing	Restaurants and hotels	Inorganic chemical manufacturing
46	Mineral oil refining	Fabricated metal products manufacturing	Public works
47	Machine tool manufacturing	Iron hardening	Steel manufacturing
48	Ceramic manufacturing	Glass manufacturing	Glass manufacturing
49	Printing and publishing	Public works	Housing
50	Air transport	Automotive repair and maintenance	Insurance
51	Precision machinery manufacturing	Residential construction	Gas distribution
52	Clay manufacturing	Clay manufacturing	Knitting
53	Glass manufacturing	Charcoal production hunting etc.	Not elsewhere classified
54	Metal construction material manufacturing	Engineering works other than public works	Other transportation equipment manufacturing
55	Public works	Machine tool manufacturing	Retail trade
56	Textile finishing and fabric coating	Nonresidential construction	Transportation related services
57	Soft drink manufacturing	Aircraft manufacturing	Coal mining
58	Other consumer services	Building maintenance and repair	Industrial device manufacturing
59	Railway rolling stock manufacturing	Other food processing	Cement milling
60	Office machine manufacturing	Pharmaceutical manufacturing	Flour milling
61	Engineering works other than public works	Footwear manufacturing	Mineral ore mining
62	Pharmaceutical manufacturing	Paper product manufacturing	Pharmaceutical manufacturing
63	Clock and watch manufacturing	Wood manufacturing	Sugar refinery
64	Optical and photographic equipment manufacturing	Metal construction material manufacturing	Spinning and weaving
65	Aircraft manufacturing	Generator and transformer manufacturing	Clay manufacturing
66	International maritime transport	Optical and photographic equipment manufacturing	Education and research
67	Industrial machinery manufacturing	Aluminum products manufacturing	Feed grain processing
68	Iron hardening	Precision machinery manufacturing	Fiber crop farming
69	Furniture manufacturing	Industrial device manufacturing	Forest nurturing
70	Other chemical product manufacturing	Baking	Freshwater fishing
71	Other electric appliance manufacturing	Cement milling	Iron rolling
72	Industrial device manufacturing	Rubber product manufacturing	Sea water fishing
73	Cement milling	Leather product manufacturing	Animal slaughtering
74	Engine and boiler manufacturing	Other apparel manufacturing	Fabricated metal products manufacturing
75	Generator and transformer manufacturing	Dressmaking	Fruit farming
76	Residential construction	Not elsewhere classified	Paint manufacturing
77	Building maintenance and repair	Railway rolling stock manufacturing	Real estate
78	Other manufacturing	Other chemical product manufacturing	Scrap steel recycling
79	Wood manufacturing	Other textile manufacturing	Chemical manufacturing
80	Not elsewhere classified	Industrial robot manufacturing	Nonferrous metal foundries
81	Organic chemical manufacturing	Clock and watch manufacturing	Optical and photographic equipment manufacturing
82	Rubber product manufacturing	Furniture manufacturing	Machinery parts manufacturing
83	Chemical fiber manufacturing	Industrial machinery manufacturing	Meat processing and daily product manufacturing
84	Consumer electric appliances manufacturing	Inorganic chemical manufacturing	Quarrying
85	Nonresidential construction	Soft drink manufacturing	Water supply and waste management
86	Baking	Chemical fertilizer manufacturing	Other public services
87	Logging	Air transport	Electric power generation
88	Shipbuilding	Other electric appliance manufacturing	Road freight transport
89	Inorganic chemical manufacturing	Other manufacturing	Chemical fiber manufacturing
90	Plastic product manufacturing	Chemical fiber manufacturing	Plastic product manufacturing
91	Chemical manufacturing	Reeling and spinning	Automotive repair and maintenance
92	Automobile manufacturing	Copper rolling and wiring	Finance
93	Other textile manufacturing	Road passenger transport	Nonferrous metal smelting and refining
94	Ferroalloy manufacturing	Chemical manufacturing	Rail transport
95	Bicycle and motorcycle manufacturing	Knitting	Machine tool manufacturing
96	Other food processing	Computer and electronic devices manufacturing	Other chemical product manufacturing
97	Pulp milling	Paper milling	Domestic water transport
98	Knitting	Plastic product manufacturing	General government service
99	Paint manufacturing	Fruit and vegetable processing	Metal construction material manufacturing
100	Nonferrous metal foundries	Vegetable oil refining	Other manufacturing
101	Aluminum products manufacturing	Engine and boiler manufacturing	Communication services
102	Cattle farming	Paint manufacturing	Cattle farming
103	Dressmaking	Shipbuilding	Furniture manufacturing
104	Paper milling	Nonferrous metal foundries	Grain farming
105	Reeling and spinning	Consumer electric appliances manufacturing	Oilseed farming
106	Footwear manufacturing	Fish processing	Shipbuilding
107	Leather product manufacturing	Other transportation equipment manufacturing	Warehousing
108	Paper product manufacturing	Steel tubing	Industrial machinery manufacturing
109	Other transportation equipment manufacturing	Silkworm farming	Stone mining
110	Other apparel manufacturing	Sawing	Other electric appliance manufacturing
111	Sugar refinery	Metal plating	Clock and watch manufacturing
112	Fish processing	Sugar refinery	Precision machinery manufacturing
113	Spinning and weaving	Logging	Railway rolling stock manufacturing
114	Nonferrous metal smelting and refining	Spinning and weaving	Consumer electric appliances manufacturing
115	Sawing	Office machine manufacturing	Ferroalloy manufacturing
116	Meat processing and daily product manufacturing	Cattle farming	Logging
117	Chemical fertilizer manufacturing	Ferroalloy manufacturing	Engine and boiler manufacturing
118	Copper rolling and wiring	Coal product manufacturing	Pulp milling
119	Fruit and vegetable processing	Organic chemical manufacturing	Restaurants and hotels
120	Iron rolling	Steel manufacturing	Soft drink manufacturing
121	Steel tubing	Meat processing and daily product manufacturing	Bicycle and motorcycle manufacturing
122	Coal product manufacturing	Iron rolling	Charcoal production hunting etc.
123	Metal plating	Nonferrous metal smelting and refining	Automobile manufacturing
124	Steel manufacturing	Pulp milling	Air transport
125	Vegetable oil refining	Automobile manufacturing	Organic chemical manufacturing
126	Feed grain processing	Bicycle and motorcycle manufacturing	Office machine manufacturing
127	Animal slaughtering	International maritime transport	International maritime transport
128	Scrap steel recycling	Feed grain processing	Road passenger transport
129	Flour milling	Flour milling	Silkworm farming
130		Animal slaughtering	
131		Scrap steel recycling	

Table 3: Compensation of employees ratio ranking

	1965	1995	Rise in ranking
1	General government service	Education and research	Other food processing
2	Education and research	General government service	Paper product manufacturing
3	Insurance	Other public services	Nonresidential construction
4	Road passenger transport	Insurance	Other consumer services
5	Communication services	Forest nurturing	Forest nurturing
6	Freight forwarding	Retail trade	Other textile manufacturing
7	Warehousing	Freight forwarding	Reeling and spinning
8	Rail transport	Wholesale trade	Residential construction
9	Coal mining	Road freight transport	Footwear manufacturing
10	Other public services	Medical services	Textile finishing and fabric coating
11	Road freight transport	Domestic water transport	Chemical fiber manufacturing
12	Domestic water transport	Coal mining	Building maintenance and repair
13	Restaurants and hotels	Agricultural services	Knitting
14	Mineral ore mining	Textile finishing and fabric coating	Other apparel manufacturing
15	Water supply and waste management	Warehousing	Aluminum products manufacturing
16	Public works	Other consumer services	Other transportation equipment manufacturing
17	Railway rolling stock manufacturing	Automotive repair and maintenance	Real estate
18	Agricultural services	Mineral ore mining	Leather product manufacturing
19	Wholesale trade	Public works	Plastic product manufacturing
20	Engineering works other than public works	Building maintenance and repair	Steel tubing
21	Sea water fishing	Nonresidential construction	Cement milling
22	Ceramic manufacturing	Finance	Retail trade
23	Medical services	Communication services	Baking
24	Retail trade	Engineering works other than public works	Iron hardening
25	Finance	Water supply and waste management	Sugar refinery
26	Entertainment	Business support services	Chemical manufacturing
27	Automotive repair and maintenance	Residential construction	Iron rolling
28	Air transport	Other food processing	Copper rolling and wiring
29	Fabricated metal products manufacturing	Restaurants and hotels	Logging
30	Machinery parts manufacturing	Aircraft manufacturing	Metal plating
31	Printing and publishing	Road passenger transport	Generator and transformer manufacturing
32	Metal construction material manufacturing	Printing and publishing	Medical services
33	Precision machinery manufacturing	Railway rolling stock manufacturing	Wholesale trade
34	Quarrying	Fabricated metal products manufacturing	Automotive repair and maintenance
35	Business support services	Iron hardening	Vegetable oil refining
36	Machine tool manufacturing	Machinery parts manufacturing	Business support services
37	Stone mining	Ceramic manufacturing	Optical and photographic equipment manufacturing
38	Aircraft manufacturing	Machine tool manufacturing	Aircraft manufacturing
39	Forest nurturing	Optical and photographic equipment manufacturing	Dressmaking
40	Clock and watch manufacturing	Transportation related services	Freshwater fishing
41	Wood manufacturing	Stone mining	Gas distribution
42	Fiber crop farming	Other apparel manufacturing	Paint manufacturing
43	Textile finishing and fabric coating	Knitting	Steel manufacturing
44	Glass manufacturing	Footwear manufacturing	Cattle farming
45	Office machine manufacturing	Precision machinery manufacturing	Fish processing
46	Transportation related services	Generator and transformer manufacturing	Other public services
47	Building maintenance and repair	Leather product manufacturing	Coal product manufacturing
48	Optical and photographic equipment manufacturing	Clock and watch manufacturing	Transportation related services
49	Industrial machinery manufacturing	Logging	Agricultural services
50	Shipbuilding	Metal construction material manufacturing	Chemical fertilizer manufacturing
51	Iron hardening	Other textile manufacturing	Ferroalloy manufacturing
52	Industrial device manufacturing	Industrial device manufacturing	Fruit and vegetable processing
53	Engine and boiler manufacturing	Air transport	Furniture manufacturing
54	Clay manufacturing	Reeling and spinning	Not elsewhere classified
55	Other consumer services	Clay manufacturing	Rubber product manufacturing
56	Soft drink manufacturing	Baking	Finance
57	Residential construction	Dressmaking	Oilseed farming
58	International maritime transport	Furniture manufacturing	Animal slaughtering
59	Generator and transformer manufacturing	Paper product manufacturing	Feed grain processing
60	Other electric appliance manufacturing	Rubber product manufacturing	Road freight transport
61	Nonresidential construction	Entertainment	Sawing
62	Furniture manufacturing	Wood manufacturing	Spinning and weaving
63	Logging	Gas distribution	Domestic water transport
64	Rubber product manufacturing	Rail transport	Education and research
65	Dressmaking	Cement milling	Silkworm farming
66	Other manufacturing	Other transportation equipment manufacturing	Flour milling
67	Other apparel manufacturing	Aluminum products manufacturing	Industrial device manufacturing
68	Knitting	Glass manufacturing	Nonferrous metal smelting and refining
69	Oil and natural gas extraction	Shipbuilding	Pharmaceutical manufacturing
70	Leather product manufacturing	Quarrying	Clay manufacturing
71	Gas distribution	Other electric appliance manufacturing	Freight forwarding
72	Baking	Spinning and weaving	Fruit farming
73	Footwear manufacturing	Sea water fishing	General government service
74	Spinning and weaving	Chemical fiber manufacturing	Insurance
75	Consumer electric appliances manufacturing	Other manufacturing	Printing and publishing
76	Automobile manufacturing	Industrial machinery manufacturing	Scrap steel recycling
77	Nonferrous metal foundries	Plastic product manufacturing	Vegetable farming
78	Electric power generation	Sawing	Housing
79	Charcoal production hunting etc.	Real estate	Machine tool manufacturing
80	Sawing	Steel tubing	Coal mining
81	Paper milling	Industrial robot manufacturing	Organic chemical manufacturing
82	Other chemical product manufacturing	Paint manufacturing	Public works
83	Other textile manufacturing	Chemical manufacturing	Liquor manufacturing
84	Cement milling	Computer and electronic devices manufacturing	Mineral ore mining
85	Reeling and spinning	Consumer electric appliances manufacturing	Engineering works other than public works
86	Other food processing	Copper rolling and wiring	Stone mining
87	Pharmaceutical manufacturing	Nonferrous metal foundries	Fabricated metal products manufacturing
88	Bicycle and motorcycle manufacturing	Engine and boiler manufacturing	Tobacco manufacturing
89	Paint manufacturing	Pharmaceutical manufacturing	Inorganic chemical manufacturing
90	Other transportation equipment manufacturing	Ferroalloy manufacturing	Machinery parts manufacturing
91	Aluminum products manufacturing	Other chemical product manufacturing	Meat processing and daily product manufacturing
92	Ferroalloy manufacturing	Office machine manufacturing	Mineral oil refining
93	Inorganic chemical manufacturing	Fruit and vegetable processing	Grain farming
94	Pulp milling	Oil and natural gas extraction	Other chemical product manufacturing
95	Fruit and vegetable processing	Sugar refinery	Clock and watch manufacturing
96	Meat processing and daily product manufacturing	Fish processing	Consumer electric appliances manufacturing
97	Chemical manufacturing	Soft drink manufacturing	Nonferrous metal foundries
98	Copper rolling and wiring	Automobile manufacturing	Warehousing
99	Plastic product manufacturing	Paper milling	Other manufacturing
100	Steel tubing	Metal plating	Water supply and waste management
101	Fish processing	Inorganic chemical manufacturing	Other electric appliance manufacturing
102	Chemical fiber manufacturing	Iron rolling	Precision machinery manufacturing
103	Real estate	Chemical fertilizer manufacturing	Ceramic manufacturing
104	Paper product manufacturing	Meat processing and daily product manufacturing	Paper milling
105	Nonferrous metal smelting and refining	Freshwater fishing	Railway rolling stock manufacturing
106	Chemical fertilizer manufacturing	Vegetable oil refining	Restaurants and hotels
107	Organic chemical manufacturing	Nonferrous metal smelting and refining	Communication services
108	Tobacco manufacturing	Electric power generation	Metal construction material manufacturing
109	Sugar refinery	Coal product manufacturing	Pulp milling
110	Liquor manufacturing	Steel manufacturing	Shipbuilding
111	Freshwater fishing	Fiber crop farming	Automobile manufacturing
112	Metal plating	Organic chemical manufacturing	Wood manufacturing
113	Coal product manufacturing	Bicycle and motorcycle manufacturing	Bicycle and motorcycle manufacturing
114	Vegetable oil refining	Pulp milling	Oil and natural gas extraction
115	Iron rolling	Tobacco manufacturing	Glass manufacturing
116	Steel manufacturing	Liquor manufacturing	Air transport
117	Mineral oil refining	Charcoal production hunting etc.	Industrial machinery manufacturing
118	Feed grain processing	Feed grain processing	Road passenger transport
119	Silkworm farming	International maritime transport	Electric power generation
120	Grain farming	Silkworm farming	Engine and boiler manufacturing
121	Fruit farming	Oilseed farming	Entertainment
122	Oilseed farming	Cattle farming	Charcoal production hunting etc.
123	Animal slaughtering	Animal slaughtering	Quarrying
124	Flour milling	Fruit farming	Soft drink manufacturing
125	Vegetable farming	Mineral oil refining	Office machine manufacturing
126	Housing	Flour milling	Sea water fishing
127	Cattle farming	Not elsewhere classified	Rail transport
128	Scrap steel recycling	Vegetable farming	International maritime transport
129	Not elsewhere classified	Grain farming	Fiber crop farming
130		Housing	
131		Scrap steel recycling	

Table 4: Exports ranking

	1965	1995	Rise in ranking
1	Shipbuilding	Computer and electronic devices manufacturing	Transportation related services
2	Spinning and weaving	Automobile manufacturing	Finance
3	Iron rolling	Wholesale trade	Restaurants and hotels
4	Consumer electric appliances manufacturing	Industrial machinery manufacturing	Other public services
5	Wholesale trade	International maritime transport	Business support services
6	Other manufacturing	Consumer electric appliances manufacturing	Education and research
7	International maritime transport	Other electric appliance manufacturing	Other transportation equipment manufacturing
8	Metal plating	Generator and transformer manufacturing	Electric power generation
9	Industrial machinery manufacturing	Shipbuilding	Office machine manufacturing
10	Automobile manufacturing	Organic chemical manufacturing	Nonferrous metal foundries
11	Steel tubing	Industrial device manufacturing	Communication services
12	Other electric appliance manufacturing	Plastic product manufacturing	Coal product manufacturing
13	Chemical fiber manufacturing	Business support services	Paint manufacturing
14	Other apparel manufacturing	Transportation related services	Tobacco manufacturing
15	Rubber product manufacturing	Metal plating	Insurance
16	Optical and photographic equipment manufacturing	Office machine manufacturing	Sugar refinery
17	Bicycle and motorcycle manufacturing	Machinery parts manufacturing	Housing
18	Fabricated metal products manufacturing	Machine tool manufacturing	Plastic product manufacturing
19	Chemical fertilizer manufacturing	Iron rolling	Organic chemical manufacturing
20	Sea water fishing	Rubber product manufacturing	Inorganic chemical manufacturing
21	Metal construction material manufacturing	Finance	Industrial device manufacturing
22	Ceramic manufacturing	Fabricated metal products manufacturing	Machine tool manufacturing
23	Reeling and spinning	Road freight transport	Scrap steel recycling
24	Not elsewhere classified	Air transport	Aircraft manufacturing
25	Generator and transformer manufacturing	Optical and photographic equipment manufacturing	Precision machinery manufacturing
26	Mineral oil refining	Other manufacturing	Road freight transport
27	Fish processing	Precision machinery manufacturing	Generator and transformer manufacturing
28	Air transport	Other chemical product manufacturing	Vegetable oil refining
29	Sawing	Engine and boiler manufacturing	Machinery parts manufacturing
30	Knitting	Bicycle and motorcycle manufacturing	Fiber crop farming
31	Other textile manufacturing	Spinning and weaving	Clock and watch manufacturing
32	Machinery parts manufacturing	Domestic water transport	Copper rolling and wiring
33	Chemical manufacturing	Nonferrous metal foundries	Other chemical product manufacturing
34	Nonferrous metal smelting and refining	Mineral oil refining	Pulp milling
35	Industrial device manufacturing	Chemical manufacturing	Steel manufacturing
36	Organic chemical manufacturing	Steel tubing	Freight forwarding
37	Engine and boiler manufacturing	Industrial robot manufacturing	Automobile manufacturing
38	Other chemical product manufacturing	Copper rolling and wiring	Domestic water transport
39	Plastic product manufacturing	Restaurants and hotels	Engine and boiler manufacturing
40	Domestic water transport	Glass manufacturing	Glass manufacturing
41	Road freight transport	Clock and watch manufacturing	Clay manufacturing
42	Machine tool manufacturing	Other transportation equipment manufacturing	Gas distribution
43	Dressmaking	Chemical fiber manufacturing	Pharmaceutical manufacturing
44	Paper milling	Inorganic chemical manufacturing	Charcoal production hunting etc.
45	Railway rolling stock manufacturing	Clay manufacturing	Industrial machinery manufacturing
46	Precision machinery manufacturing	Paper milling	Other electric appliance manufacturing
47	Glass manufacturing	Pharmaceutical manufacturing	Air transport
48	Fruit and vegetable processing	Other textile manufacturing	Paper product manufacturing
49	Copper rolling and wiring	Ceramic manufacturing	Animal slaughtering
50	Wood manufacturing	Nonferrous metal smelting and refining	Entertainment
51	Clay manufacturing	Aircraft manufacturing	Furniture manufacturing
52	Pharmaceutical manufacturing	Insurance	Printing and publishing
53	Clock and watch manufacturing	Paint manufacturing	Quarrying
54	Other consumer services	Paper product manufacturing	Feed grain processing
55	Leather product manufacturing	Vegetable oil refining	International maritime transport
56	Other food processing	Fish processing	Warehousing
57	Paper product manufacturing	Other public services	Wholesale trade
58	Rail transport	Communication services	Freshwater fishing
59	Office machine manufacturing	Not elsewhere classified	Cement milling
60	Cement milling	Printing and publishing	Mineral ore mining
61	Iron hardening	Cement milling	Stone mining
62	Printing and publishing	Knitting	Automotive repair and maintenance
63	Aluminum products manufacturing	Furniture manufacturing	Liquor manufacturing
64	Ferroalloy manufacturing	Coal product manufacturing	Paper milling
65	Furniture manufacturing	Warehousing	Chemical manufacturing
66	Warehousing	Tobacco manufacturing	Consumer electric appliances manufacturing
67	Footwear manufacturing	Electric power generation	Medical services
68	Inorganic chemical manufacturing	Railway rolling stock manufacturing	General government service
69	Aircraft manufacturing	Dressmaking	Fabricated metal products manufacturing
70	Oilseed farming	Reeling and spinning	Water supply and waste management
71	Vegetable oil refining	Education and research	Baking
72	Baking	Freight forwarding	Grain farming
73	Vegetable farming	Sea water fishing	Real estate
74	Nonferrous metal foundries	Leather product manufacturing	Rubber product manufacturing
75	Forest nurturing	Other apparel manufacturing	Oil and natural gas extraction
76	Flour milling	Metal construction material manufacturing	Metal plating
77	Retail trade	Sugar refinery	Agricultural services
78	Cattle farming	Baking	Building maintenance and repair
79	Business support services	Steel manufacturing	Mineral oil refining
80	Freight forwarding	Entertainment	Nonresidential construction
81	Fruit farming	Iron hardening	Engineering works other than public works
82	Entertainment	Chemical fertilizer manufacturing	Public works
83	Insurance	Other food processing	Residential construction
84	Liquor manufacturing	Fiber crop farming	Shipbuilding
85	Meat processing and daily product manufacturing	Scrap steel recycling	Textile finishing and fabric coating
86	Paint manufacturing	Liquor manufacturing	Optical and photographic equipment manufacturing
87	Stone mining	Animal slaughtering	Road passenger transport
88	Steel manufacturing	Stone mining	Soft drink manufacturing
89	Animal slaughtering	Feed grain processing	Coal mining
90	Feed grain processing	Quarrying	Meat processing and daily product manufacturing
91	Soft drink manufacturing	Flour milling	Bicycle and motorcycle manufacturing
92	Quarrying	Pulp milling	Silkworm farming
93	Water supply and waste management	Aluminum products manufacturing	Flour milling
94	Other transportation equipment manufacturing	Sawing	Logging
95	Communication services	Fruit and vegetable processing	Nonferrous metal smelting and refining
96	Road passenger transport	Housing	Iron rolling
97	Fiber crop farming	Footwear manufacturing	Other textile manufacturing
98	Tobacco manufacturing	Water supply and waste management	Fruit farming
99	Logging	Meat processing and daily product manufacturing	Leather product manufacturing
100	Coal product manufacturing	Fruit farming	Iron hardening
101	Pulp milling	Other consumer services	Other manufacturing
102	Coal mining	Charcoal production hunting etc.	Railway rolling stock manufacturing
103	Silkworm farming	Wood manufacturing	Dressmaking
104	Sugar refinery	Soft drink manufacturing	Steel tubing
105	Mineral ore mining	Ferroalloy manufacturing	Ceramic manufacturing
106	Charcoal production hunting etc.	Mineral ore mining	Other food processing
107	Scrap steel recycling	Road passenger transport	Fish processing
108	Freshwater fishing	Freshwater fishing	Aluminum products manufacturing
109	Grain farming	Cattle farming	Chemical fiber manufacturing
110	Agricultural services	Vegetable farming	Footwear manufacturing
111	Oil and natural gas extraction	Rail transport	Spinning and weaving
112	Textile finishing and fabric coating	Oilseed farming	Cattle farming
113	Residential construction	Gas distribution	Knitting
114	Nonresidential construction	Logging	Not elsewhere classified
115	Building maintenance and repair	Grain farming	Vegetable farming
116	Public works	Coal mining	Ferroalloy manufacturing
117	Engineering works other than public works	Silkworm farming	Oilseed farming
118	Electric power generation	Oil and natural gas extraction	Forest nurturing
119	Gas distribution	Agricultural services	Fruit and vegetable processing
120	Finance	Forest nurturing	Other consumer services
121	Real estate	Textile finishing and fabric coating	Reeling and spinning
122	Housing	Residential construction	Rail transport
123	Transportation related services	Nonresidential construction	Sea water fishing
124	General government service	Building maintenance and repair	Wood manufacturing
125	Education and research	Public works	Retail trade
126	Medical services	Engineering works other than public works	Metal construction material manufacturing
127	Other public services	Real estate	Other apparel manufacturing
128	Automotive repair and maintenance	General government service	Chemical fertilizer manufacturing
129	Restaurants and hotels	Medical services	Sawing
130		Automotive repair and maintenance	
131		Retail trade	

Table 5: Export ratio ranking

	1965	1995	Rise in ranking
1	Shipbuilding	International maritime transport	Transportation related services
2	Ceramic manufacturing	Bicycle and motorcycle manufacturing	Mineral ore mining
3	Air transport	Stone mining	Restaurants and hotels
4	Steel tubing	Shipbuilding	Finance
5	International maritime transport	Industrial robot manufacturing	Coal product manufacturing
6	Optical and photographic equipment manufacturing	Optical and photographic equipment manufacturing	Stone mining
7	Chemical fertilizer manufacturing	Clock and watch manufacturing	Other public services
8	Consumer electric appliances manufacturing	Other chemical product manufacturing	Business support services
9	Spinning and weaving	Computer and electronic devices manufacturing	Industrial device manufacturing
10	Metal plating	Office machine manufacturing	Freshwater fishing
11	Bicycle and motorcycle manufacturing	Spinning and weaving	Nonferrous metal foundries
12	Iron rolling	Machine tool manufacturing	Organic chemical manufacturing
13	Other manufacturing	Chemical fiber manufacturing	Other chemical product manufacturing
14	Rubber product manufacturing	Generator and transformer manufacturing	Machine tool manufacturing
15	Office machine manufacturing	Steel tubing	Other electric appliance manufacturing
16	Chemical fiber manufacturing	Other electric appliance manufacturing	Pulp milling
17	Dressmaking	Industrial machinery manufacturing	Inorganic chemical manufacturing
18	Other textile manufacturing	Industrial device manufacturing	Automobile manufacturing
19	Other apparel manufacturing	Consumer electric appliances manufacturing	Paint manufacturing
20	Aircraft manufacturing	Automobile manufacturing	Tobacco manufacturing
21	Freight forwarding	Knitting	Charcoal production hunting etc.
22	Copper rolling and wiring	Organic chemical manufacturing	Clay manufacturing
23	Sea water fishing	Precision machinery manufacturing	Sugar refinery
24	Fruit and vegetable processing	Air transport	Engine and boiler manufacturing
25	Knitting	Machinery parts manufacturing	Insurance
26	Clock and watch manufacturing	Engine and boiler manufacturing	Education and research
27	Leather product manufacturing	Other transportation equipment manufacturing	Generator and transformer manufacturing
28	Other transportation equipment manufacturing	Metal plating	Steel manufacturing
29	Precision machinery manufacturing	Rubber product manufacturing	Clock and watch manufacturing
30	Machinery parts manufacturing	Copper rolling and wiring	Quarrying
31	Industrial machinery manufacturing	Chemical manufacturing	Feed grain processing
32	Fabricated metal products manufacturing	Transportation related services	Industrial machinery manufacturing
33	Generator and transformer manufacturing	Mineral ore mining	Paper product manufacturing
34	Fish processing	Ceramic manufacturing	Chemical manufacturing
35	Plastic product manufacturing	Domestic water transport	Vegetable oil refining
36	Nonferrous metal smelting and refining	Aircraft manufacturing	Furniture manufacturing
37	Aluminum products manufacturing	Glass manufacturing	Paper milling
38	Domestic water transport	Other textile manufacturing	Housing
39	Other chemical product manufacturing	Iron rolling	Communication services
40	Glass manufacturing	Nonferrous metal foundries	Bicycle and motorcycle manufacturing
41	Machine tool manufacturing	Inorganic chemical manufacturing	Mineral oil refining
42	Chemical manufacturing	Nonferrous metal smelting and refining	Pharmaceutical manufacturing
43	Metal construction material manufacturing	Other manufacturing	Precision machinery manufacturing
44	Other electric appliance manufacturing	Clay manufacturing	Road freight transport
45	Footwear manufacturing	Plastic product manufacturing	Wholesale trade
46	Automobile manufacturing	Paint manufacturing	Machinery parts manufacturing
47	Engine and boiler manufacturing	Fabricated metal products manufacturing	Office machine manufacturing
48	Reeling and spinning	Wholesale trade	Road passenger transport
49	Railway rolling stock manufacturing	Reeling and spinning	Knitting
50	Stone mining	Leather product manufacturing	Chemical fiber manufacturing
51	Industrial device manufacturing	Freight forwarding	Domestic water transport
52	Organic chemical manufacturing	Paper milling	Electric power generation
53	Wood manufacturing	Mineral oil refining	Glass manufacturing
54	Wholesale trade	Railway rolling stock manufacturing	Silkworm farming
55	Not elsewhere classified	Chemical fertilizer manufacturing	Coal mining
56	Fiber crop farming	Coal product manufacturing	International maritime transport
57	Cement milling	Road freight transport	Other transportation equipment manufacturing
58	Ferroalloy manufacturing	Vegetable oil refining	Optical and photographic equipment manufacturing
59	Mineral oil refining	Pharmaceutical manufacturing	Reeling and spinning
60	Warehousing	Finance	Flour milling
61	Sawing	Paper product manufacturing	Spinning and weaving
62	Paper milling	Business support services	General government service
63	Road freight transport	Other apparel manufacturing	Logging
64	Oilseed farming	Restaurants and hotels	Agricultural services
65	Pharmaceutical manufacturing	Charcoal production hunting etc.	Grain farming
66	Baking	Fish processing	Liquor manufacturing
67	Clay manufacturing	Footwear manufacturing	Railway rolling stock manufacturing
68	Inorganic chemical manufacturing	Tobacco manufacturing	Real estate
69	Vegetable oil refining	Furniture manufacturing	Shipbuilding
70	Nonferrous metal foundries	Insurance	Building maintenance and repair
71	Paint manufacturing	Sea water fishing	Nonferrous metal smelting and refining
72	Iron hardening	Warehousing	Nonresidential construction
73	Other food processing	Fiber crop farming	Oil and natural gas extraction
74	Paper product manufacturing	Cement milling	Engineering works other than public works
75	Fruit farming	Freshwater fishing	Printing and publishing
76	Animal slaughtering	Sugar refinery	Public works
77	Soft drink manufacturing	Pulp milling	Residential construction
78	Rail transport	Feed grain processing	Scrap steel recycling
79	Furniture manufacturing	Not elsewhere classified	Textile finishing and fabric coating
80	Vegetable farming	Metal construction material manufacturing	Animal slaughtering
81	Meat processing and daily product manufacturing	Fruit and vegetable processing	Copper rolling and wiring
82	Forest nurturing	Iron hardening	Rail transport
83	Printing and publishing	Animal slaughtering	Iron hardening
84	Other consumer services	Quarrying	Plastic product manufacturing
85	Gas distribution	Other public services	Consumer electric appliances manufacturing
86	Entertainment	Dressmaking	Entertainment
87	Water supply and waste management	Rail transport	Steel tubing
88	Charcoal production hunting etc.	Baking	Warehousing
89	Cattle farming	Printing and publishing	Fabricated metal products manufacturing
90	Liquor manufacturing	Steel manufacturing	Rubber product manufacturing
91	Insurance	Communication services	Aircraft manufacturing
92	Retail trade	Fruit farming	Cement milling
93	Tobacco manufacturing	Silkworm farming	Fiber crop farming
94	Feed grain processing	Other food processing	Fruit farming
95	Business support services	Liquor manufacturing	Metal plating
96	Silkworm farming	Road passenger transport	Retail trade
97	Flour milling	Entertainment	Automotive repair and maintenance
98	Communication services	Wood manufacturing	Other textile manufacturing
99	Sugar refinery	Flour milling	Air transport
100	Mineral ore mining	Aluminum products manufacturing	Other food processing
101	Road passenger transport	Electric power generation	Baking
102	Quarrying	Sawing	Footwear manufacturing
103	Coal product manufacturing	Meat processing and daily product manufacturing	Meat processing and daily product manufacturing
104	Electric power generation	Ferroalloy manufacturing	Medical services
105	Pulp milling	Coal mining	Water supply and waste management
106	Freshwater fishing	Oilseed farming	Cattle farming
107	Coal mining	Soft drink manufacturing	Leather product manufacturing
108	Medical services	Education and research	Not elsewhere classified
109	Steel manufacturing	Water supply and waste management	Iron rolling
110	Logging	Retail trade	Other consumer services
111	Automotive repair and maintenance	Other consumer services	Freight forwarding
112	Grain farming	Cattle farming	Gas distribution
113	Agricultural services	Vegetable farming	Other manufacturing
114	Oil and natural gas extraction	Logging	Soft drink manufacturing
115	Textile finishing and fabric coating	Gas distribution	Ceramic manufacturing
116	Scrap steel recycling	Housing	Fish processing
117	Residential construction	Grain farming	Vegetable farming
118	Nonresidential construction	Agricultural services	Forest nurturing
119	Building maintenance and repair	Forest nurturing	Metal construction material manufacturing
120	Public works	Oil and natural gas extraction	Sawing
121	Engineering works other than public works	Textile finishing and fabric coating	Oilseed farming
122	Finance	Scrap steel recycling	Other apparel manufacturing
123	Real estate	Residential construction	Wood manufacturing
124	Housing	Nonresidential construction	Ferroalloy manufacturing
125	Transportation related services	Building maintenance and repair	Chemical fertilizer manufacturing
126	General government service	Public works	Sea water fishing
127	Education and research	Engineering works other than public works	Fruit and vegetable processing
128	Other public services	Real estate	Aluminum products manufacturing
129	Restaurants and hotels	General government service	Dressmaking
130		Medical services	
131		Automotive repair and maintenance	

Table 6: Imports ranking

	1965	1995	Rise in ranking
1	Oil and natural gas extraction	Oil and natural gas extraction	International maritime transport
2	Mineral ore mining	Computer and electronic devices manufacturing	Insurance
3	Vegetable farming	Business support services	Dressmaking
4	Fiber crop farming	Dressmaking	Finance
5	Logging	Nonferrous metal smelting and refining	Transportation related services
6	Mineral oil refining	Fish processing	Furniture manufacturing
7	Cattle farming	Automobile manufacturing	Inorganic chemical manufacturing
8	Nonferrous metal smelting and refining	Mineral oil refining	Business support services
9	Grain farming	Air transport	Other apparel manufacturing
10	Oilseed farming	Animal slaughtering	Iron rolling
11	Coal mining	Sawing	Rubber product manufacturing
12	Not elsewhere classified	Finance	Consumer electric appliances manufacturing
13	Sugar refinery	Other manufacturing	Automobile manufacturing
14	Flour milling	Organic chemical manufacturing	Other public services
15	Domestic water transport	International maritime transport	Wood manufacturing
16	Scrap steel recycling	Mineral ore mining	Education and research
17	Industrial machinery manufacturing	Coal mining	Leather product manufacturing
18	Wholesale trade	Consumer electric appliances manufacturing	Paper milling
19	Stone mining	Not elsewhere classified	Tobacco manufacturing
20	Other electric appliance manufacturing	Industrial machinery manufacturing	Charcoal production hunting etc.
21	Animal slaughtering	Oilseed farming	Footwear manufacturing
22	Steel manufacturing	Pharmaceutical manufacturing	Plastic product manufacturing
23	Aircraft manufacturing	Logging	Sawing
24	Organic chemical manufacturing	Other apparel manufacturing	Metal plating
25	Chemical manufacturing	Fiber crop farming	Copper rolling and wiring
26	Vegetable oil refining	Aircraft manufacturing	Fish processing
27	Fish processing	Generator and transformer manufacturing	Air transport
28	Pulp milling	Plastic product manufacturing	Other textile manufacturing
29	Air transport	Other electric appliance manufacturing	Precision machinery manufacturing
30	Fruit farming	Precision machinery manufacturing	Nonferrous metal foundries
31	Other manufacturing	Fruit and vegetable processing	Fabricated metal products manufacturing
32	Machine tool manufacturing	Rubber product manufacturing	Other manufacturing
33	Other chemical product manufacturing	Sea water fishing	Liquor manufacturing
34	Pharmaceutical manufacturing	Pulp milling	Retail trade
35	Office machine manufacturing	Leather product manufacturing	Ceramic manufacturing
36	Chemical fertilizer manufacturing	Chemical manufacturing	Generator and transformer manufacturing
37	Sawing	Furniture manufacturing	Sea water fishing
38	Other consumer services	Fabricated metal products manufacturing	Pharmaceutical manufacturing
39	Industrial device manufacturing	Iron rolling	Soft drink manufacturing
40	Other food processing	Domestic water transport	Animal slaughtering
41	Generator and transformer manufacturing	Vegetable farming	Clay manufacturing
42	Fruit and vegetable processing	Tobacco manufacturing	Fruit and vegetable processing
43	Spinning and weaving	Insurance	Organic chemical manufacturing
44	Meat processing and daily product manufacturing	Steel manufacturing	Freshwater fishing
45	Automobile manufacturing	Industrial device manufacturing	Other transportation equipment manufacturing
46	Machinery parts manufacturing	Sugar refinery	Gas distribution
47	Sea water fishing	Liquor manufacturing	Electric power generation
48	Reeling and spinning	Inorganic chemical manufacturing	Bicycle and motorcycle manufacturing
49	Optical and photographic equipment manufacturing	Spinning and weaving	Clock and watch manufacturing
50	Precision machinery manufacturing	Fruit farming	Cement milling
51	Business support services	Grain farming	Nonferrous metal smelting and refining
52	Engine and boiler manufacturing	Paper milling	Automotive repair and maintenance
53	Baking	Meat processing and daily product manufacturing	Steel tubing
54	Plastic product manufacturing	Clock and watch manufacturing	General government service
55	Printing and publishing	Clay manufacturing	Oil and natural gas extraction
56	Fabricated metal products manufacturing	Other textile manufacturing	Road freight transport
57	Feed grain processing	Wholesale trade	Glass manufacturing
58	Clock and watch manufacturing	Optical and photographic equipment manufacturing	Real estate
59	Consumer electric appliances manufacturing	Machinery parts manufacturing	Warehousing
60	Freight forwarding	Reeling and spinning	Medical services
61	Quarrying	Transportation related services	Mineral oil refining
62	Forest nurturing	Nonferrous metal foundries	Agricultural services
63	Leather product manufacturing	Other food processing	Aircraft manufacturing
64	Liquor manufacturing	Copper rolling and wiring	Industrial machinery manufacturing
65	Communication services	Wood manufacturing	Building maintenance and repair
66	Clay manufacturing	Stone mining	Nonresidential construction
67	Glass manufacturing	Metal plating	Engineering works other than public works
68	Metal construction material manufacturing	Glass manufacturing	Public works
69	Tobacco manufacturing	Engine and boiler manufacturing	Residential construction
70	Other apparel manufacturing	Other chemical product manufacturing	Restaurants and hotels
71	Paint manufacturing	Footwear manufacturing	Textile finishing and fabric coating
72	Entertainment	Printing and publishing	Shipbuilding
73	Paper product manufacturing	Office machine manufacturing	Coal mining
74	Rubber product manufacturing	Quarrying	Industrial device manufacturing
75	Ferroalloy manufacturing	Baking	Iron hardening
76	Other textile manufacturing	Feed grain processing	Pulp milling
77	Chemical fiber manufacturing	Vegetable oil refining	Spinning and weaving
78	Knitting	Communication services	Not elsewhere classified
79	Dressmaking	Charcoal production hunting etc.	Aluminum products manufacturing
80	Paper milling	Soft drink manufacturing	Meat processing and daily product manufacturing
81	Nonferrous metal foundries	Machine tool manufacturing	Optical and photographic equipment manufacturing
82	Iron rolling	Cattle farming	Other electric appliance manufacturing
83	Finance	Chemical fertilizer manufacturing	Housing
84	Shipbuilding	Ceramic manufacturing	Railway rolling stock manufacturing
85	Silkworm farming	Other transportation equipment manufacturing	Chemical manufacturing
86	Copper rolling and wiring	Paper product manufacturing	Oilseed farming
87	Rail transport	Scrap steel recycling	Reeling and spinning
88	Aluminum products manufacturing	Other public services	Coal product manufacturing
89	Coal product manufacturing	Shipbuilding	Communication services
90	Metal plating	Education and research	Machinery parts manufacturing
91	Railway rolling stock manufacturing	Freshwater fishing	Paper product manufacturing
92	Soft drink manufacturing	Chemical fiber manufacturing	Quarrying
93	Road passenger transport	Entertainment	Mineral ore mining
94	Other transportation equipment manufacturing	Metal construction material manufacturing	Chemical fiber manufacturing
95	Furniture manufacturing	Steel tubing	Engine and boiler manufacturing
96	Steel tubing	Aluminum products manufacturing	Printing and publishing
97	Footwear manufacturing	Knitting	Logging
98	Iron hardening	Bicycle and motorcycle manufacturing	Feed grain processing
99	Ceramic manufacturing	Paint manufacturing	Knitting
100	Freshwater fishing	Retail trade	Fruit farming
101	Wood manufacturing	Railway rolling stock manufacturing	Entertainment
102	Water supply and waste management	Coal product manufacturing	Fiber crop farming
103	Bicycle and motorcycle manufacturing	Cement milling	Baking
104	Inorganic chemical manufacturing	Iron hardening	Silkworm farming
105	Charcoal production hunting etc.	Ferroalloy manufacturing	Steel manufacturing
106	Cement milling	Flour milling	Other food processing
107	Agricultural services	Silkworm farming	Water supply and waste management
108	Textile finishing and fabric coating	Gas distribution	Domestic water transport
109	Residential construction	Electric power generation	Metal construction material manufacturing
110	Nonresidential construction	Agricultural services	Paint manufacturing
111	Building maintenance and repair	Forest nurturing	Ferroalloy manufacturing
112	Public works	Textile finishing and fabric coating	Sugar refinery
113	Engineering works other than public works	Residential construction	Other chemical product manufacturing
114	Electric power generation	Nonresidential construction	Road passenger transport
115	Gas distribution	Building maintenance and repair	Office machine manufacturing
116	Retail trade	Public works	Vegetable farming
117	Real estate	Engineering works other than public works	Wholesale trade
118	Housing	Real estate	Grain farming
119	Road freight transport	Road freight transport	Rail transport
120	Warehousing	Freight forwarding	Chemical fertilizer manufacturing
121	Transportation related services	Warehousing	Stone mining
122	General government service	General government service	Forest nurturing
123	Education and research	Industrial robot manufacturing	Machine tool manufacturing
124	Medical services	Automotive repair and maintenance	Vegetable oil refining
125	Other public services	Water supply and waste management	Freight forwarding
126	Automotive repair and maintenance	Medical services	Scrap steel recycling
127	Restaurants and hotels	Other consumer services	Cattle farming
128	Insurance	Housing	Other consumer services
129	International maritime transport	Rail transport	Flour milling
130		Road passenger transport	
131		Restaurants and hotels	

Table 7: Import ratio ranking

	1965	1995	Rise in ranking
1	Scrap steel recycling	Scrap steel recycling	International maritime transport
2	Oil and natural gas extraction	International maritime transport	Restaurants and hotels
3	Fiber crop farming	Mineral ore mining	Charcoal production hunting etc.
4	Mineral ore mining	Oil and natural gas extraction	Inorganic chemical manufacturing
5	Stone mining	Stone mining	Other apparel manufacturing
6	Aircraft manufacturing	Coal mining	Footwear manufacturing
7	Oilseed farming	Oilseed farming	Bicycle and motorcycle manufacturing
8	Sugar refinery	Nonferrous metal smelting and refining	Transportation related services
9	Coal mining	Leather product manufacturing	Tobacco manufacturing
10	Air transport	Logging	Furniture manufacturing
11	Office machine manufacturing	Clock and watch manufacturing	Wood manufacturing
12	Nonferrous metal smelting and refining	Animal slaughtering	Insurance
13	Vegetable farming	Air transport	Reeling and spinning
14	Logging	Aircraft manufacturing	Knitting
15	Freight forwarding	Fruit and vegetable processing	Liquor manufacturing
16	Domestic water transport	Pulp milling	Rubber product manufacturing
17	Vegetable oil refining	Fish processing	Other textile manufacturing
18	Cattle farming	Fiber crop farming	Freshwater fishing
19	Fruit farming	Dressmaking	Dressmaking
20	Animal slaughtering	Sawing	Sawing
21	Pulp milling	Other apparel manufacturing	Spinning and weaving
22	Mineral oil refining	Footwear manufacturing	Leather product manufacturing
23	Chemical manufacturing	Other manufacturing	Clay manufacturing
24	Fruit and vegetable processing	Charcoal production hunting etc.	Consumer electric appliances manufacturing
25	Machine tool manufacturing	Reeling and spinning	Iron rolling
26	Chemical fertilizer manufacturing	Optical and photographic equipment manufacturing	Ceramic manufacturing
27	Other chemical product manufacturing	Spinning and weaving	Clock and watch manufacturing
28	Organic chemical manufacturing	Freshwater fishing	Copper rolling and wiring
29	Fish processing	Fruit farming	Finance
30	Not elsewhere classified	Precision machinery manufacturing	Other public services
31	Optical and photographic equipment manufacturing	Chemical manufacturing	Silkworm farming
32	Precision machinery manufacturing	Computer and electronic devices manufacturing	Chemical fiber manufacturing
33	Clock and watch manufacturing	Tobacco manufacturing	Other manufacturing
34	Grain farming	Organic chemical manufacturing	Sea water fishing
35	Industrial machinery manufacturing	Other textile manufacturing	Education and research
36	Pharmaceutical manufacturing	Sea water fishing	Fish processing
37	Leather product manufacturing	Silkworm farming	Paper milling
38	Flour milling	Mineral oil refining	Metal plating
39	Other electric appliance manufacturing	Chemical fertilizer manufacturing	Fruit and vegetable processing
40	Machinery parts manufacturing	Knitting	Animal slaughtering
41	Other manufacturing	Other chemical product manufacturing	Steel tubing
42	Meat processing and daily product manufacturing	Rubber product manufacturing	Road passenger transport
43	Plastic product manufacturing	Inorganic chemical manufacturing	Gas distribution
44	Industrial device manufacturing	Liquor manufacturing	Housing
45	Steel manufacturing	Domestic water transport	Optical and photographic equipment manufacturing
46	Generator and transformer manufacturing	Copper rolling and wiring	Pulp milling
47	Engine and boiler manufacturing	Consumer electric appliances manufacturing	Rail transport
48	Paint manufacturing	Restaurants and hotels	Retail trade
49	Feed grain processing	Bicycle and motorcycle manufacturing	Logging
50	Other food processing	Sugar refinery	Nonferrous metal smelting and refining
51	Sea water fishing	Vegetable farming	Coal mining
52	Ferrous alloy manufacturing	Generator and transformer manufacturing	Shipbuilding
53	Dressmaking	Clay manufacturing	Precision machinery manufacturing
54	Sawing	Pharmaceutical manufacturing	Entertainment
55	Glass manufacturing	Wood manufacturing	Mineral ore mining
56	Silkworm farming	Not elsewhere classified	Cement milling
57	Baking	Feed grain processing	Oilseed farming
58	Quarrying	Other electric appliance manufacturing	Scrap steel recycling
59	Wholesale trade	Furniture manufacturing	Stone mining
60	Spinning and weaving	Vegetable oil refining	Iron hardening
61	Aluminum products manufacturing	Glass manufacturing	Oil and natural gas extraction
62	Other transportation equipment manufacturing	Meat processing and daily product manufacturing	Railway rolling stock manufacturing
63	Freshwater fishing	Quarrying	Air transport
64	Reeling and spinning	Ceramic manufacturing	Automotive repair and maintenance
65	Business support services	Engine and boiler manufacturing	Nonferrous metal foundries
66	Forest nurturing	Office machine manufacturing	Medical services
67	Copper rolling and wiring	Chemical fiber manufacturing	Quarrying
68	Fabricated metal products manufacturing	Industrial machinery manufacturing	Automobile manufacturing
69	Automobile manufacturing	Transportation related services	General government service
70	Other textile manufacturing	Grain farming	Generator and transformer manufacturing
71	Other consumer services	Other transportation equipment manufacturing	Glass manufacturing
72	Nonferrous metal foundries	Industrial device manufacturing	Organic chemical manufacturing
73	Consumer electric appliances manufacturing	Iron rolling	Road freight transport
74	Printing and publishing	Machinery parts manufacturing	Real estate
75	Soft drink manufacturing	Automobile manufacturing	Warehousing
76	Knitting	Nonferrous metal foundries	Agricultural services
77	Footwear manufacturing	Steel manufacturing	Coal product manufacturing
78	Rubber product manufacturing	Paper milling	Feed grain processing
79	Clay manufacturing	Shipbuilding	Aircraft manufacturing
80	Liquor manufacturing	Machine tool manufacturing	Building maintenance and repair
81	Shipbuilding	Other food processing	Chemical manufacturing
82	Other apparel manufacturing	Fabricated metal products manufacturing	Electric power generation
83	Communication services	Finance	Nonresidential construction
84	Tobacco manufacturing	Plastic product manufacturing	Engineering works other than public works
85	Chemical fiber manufacturing	Business support services	Other transportation equipment manufacturing
86	Paper product manufacturing	Metal plating	Public works
87	Ceramic manufacturing	Steel tubing	Residential construction
88	Metal construction material manufacturing	Insurance	Textile finishing and fabric coating
89	Paper milling	Baking	Paper product manufacturing
90	Coal product manufacturing	Cattle farming	Fruit farming
91	Railway rolling stock manufacturing	Soft drink manufacturing	Metal construction material manufacturing
92	Entertainment	Entertainment	Chemical fertilizer manufacturing
93	Charcoal production hunting etc.	Paint manufacturing	Fabricated metal products manufacturing
94	Steel tubing	Railway rolling stock manufacturing	Other chemical product manufacturing
95	Metal plating	Rail transport	Water supply and waste management
96	Wood manufacturing	Paper product manufacturing	Fiber crop farming
97	Iron rolling	Road passenger transport	Mineral oil refining
98	Water supply and waste management	Coal product manufacturing	Soft drink manufacturing
99	Rail transport	Printing and publishing	Engine and boiler manufacturing
100	Furniture manufacturing	Metal construction material manufacturing	Pharmaceutical manufacturing
101	Iron hardening	Aluminum products manufacturing	Communication services
102	Bicycle and motorcycle manufacturing	Communication services	Other electric appliance manufacturing
103	Road passenger transport	Ferrous alloy manufacturing	Business support services
104	Finance	Iron hardening	Meat processing and daily product manufacturing
105	Inorganic chemical manufacturing	Other public services	Printing and publishing
106	Cement milling	Wholesale trade	Not elsewhere classified
107	Agricultural services	Cement milling	Industrial device manufacturing
108	Textile finishing and fabric coating	Flour milling	Domestic water transport
109	Residential construction	Education and research	Other food processing
110	Nonresidential construction	Other consumer services	Baking
111	Building maintenance and repair	Gas distribution	Steel manufacturing
112	Public works	Retail trade	Industrial machinery manufacturing
113	Engineering works other than public works	Water supply and waste management	Machinery parts manufacturing
114	Electric power generation	Housing	Grain farming
115	Gas distribution	Agricultural services	Vegetable farming
116	Retail trade	Forest nurturing	Other consumer services
117	Real estate	Textile finishing and fabric coating	Aluminum products manufacturing
118	Housing	Residential construction	Plastic product manufacturing
119	Road freight transport	Nonresidential construction	Sugar refinery
120	Warehousing	Building maintenance and repair	Vegetable oil refining
121	Transportation related services	Public works	Paint manufacturing
122	General government service	Engineering works other than public works	Wholesale trade
123	Education and research	Electric power generation	Forest nurturing
124	Medical services	Real estate	Ferrous alloy manufacturing
125	Other public services	Road freight transport	Machine tool manufacturing
126	Automotive repair and maintenance	Freight forwarding	Office machine manufacturing
127	Restaurants and hotels	Warehousing	Flour milling
128	Insurance	General government service	Cattle farming
129	International maritime transport	Medical services	Freight forwarding
130		Automotive repair and maintenance	
131		Industrial robot manufacturing	

Table 8: Triangulation according to the number of non-zero cells in the lower-left triangle below the diagonal

	1965	1995	Rise in ranking
1	Nonresidential construction	General government service	Transportation related services
2	Residential construction	Nonresidential construction	Automotive repair and maintenance
3	Engineering works other than public works	Public works	Industrial machinery manufacturing
4	Public works	Residential construction	General government service
5	Automobile manufacturing	Restaurants and hotels	Bicycle and motorcycle manufacturing
6	Shipbuilding	Medical services	Metal construction material manufacturing
7	Railway rolling stock manufacturing	Engineering works other than public works	Office machine manufacturing
8	Baking	Railway rolling stock manufacturing	Other chemical product manufacturing
9	Medical services	Automobile manufacturing	International maritime transport
10	Aircraft manufacturing	Shipbuilding	Aluminum products manufacturing
11	Tobacco manufacturing	Machine tool manufacturing	Engine and boiler manufacturing
12	Education and research	Other transportation equipment manufacturing	Generator and transformer manufacturing
13	Meat processing and daily product manufacturing	Office machine manufacturing	Coal mining
14	Restaurants and hotels	Aircraft manufacturing	Machine tool manufacturing
15	Entertainment	Industrial robot manufacturing	Charcoal production hunting etc.
16	Steel manufacturing	Tobacco manufacturing	Consumer electric appliances manufacturing
17	Fruit and vegetable processing	Metal construction material manufacturing	Housing
18	Liquor manufacturing	Transportation related services	Weaving
19	Soft drink manufacturing	Industrial machinery manufacturing	Vegetable farming
20	Pharmaceutical manufacturing	Baking	Coal product manufacturing
21	Feed grain processing	Optical and photographic equipment manufacturing	Optical and photographic equipment manufacturing
22	Freshwater fishing	Consumer electric appliances manufacturing	Other public services
23	Ferrous metal manufacturing	Engine and boiler manufacturing	Forest nurturing
24	Agricultural services	Bicycle and motorcycle manufacturing	Other transportation equipment manufacturing
25	Mineral ore mining	Other food processing	Industrial device manufacturing
26	Other transportation equipment manufacturing	Forest nurturing	Business support services
27	Pulp milling	Housing	Other consumer services
28	Fish processing	Textile finishing and fabric coating	Other electric appliance manufacturing
29	Silkworm farming	Steel manufacturing	Paper product manufacturing
30	Other food processing	Sea water fishing	Restaurants and hotels
31	Textile finishing and fabric coating	Liquor manufacturing	Retail trade
32	Clock and watch manufacturing	Agricultural services	Cement milling
33	Fruit farming	Automotive repair and maintenance	Chemical manufacturing
34	Knitting	Fruit and vegetable processing	Copper rolling and wiring
35	Optical and photographic equipment manufacturing	Pulp milling	Reeling and spinning
36	Machine tool manufacturing	Meat processing and daily product manufacturing	Sea water fishing
37	Sea water fishing	Fish processing	Scrap steel recycling
38	Logging	Generator and transformer manufacturing	Stone mining
39	Forest nurturing	Soft drink manufacturing	Communication services
40	Iron hardening	Freshwater fishing	Other food processing
41	Furniture manufacturing	Cement milling	Oil and natural gas extraction
42	Sugar refinery	Knitting	Other apparel manufacturing
43	Nonferrous metal foundries	Feed grain processing	Precision machinery manufacturing
44	Quarrying	Mineral ore mining	Finance
45	Consumer electric appliances manufacturing	Pharmaceutical manufacturing	Grain farming
46	Chemical fiber manufacturing	Aluminum products manufacturing	Textile finishing and fabric coating
47	Chemical fertilizer manufacturing	Fruit farming	Wholesale trade
48	Cement milling	Silkworm farming	Wood manufacturing
49	Oilseed farming	Vegetable farming	Medical services
50	Housing	Logging	Road passenger transport
51	Flour milling	Chemical fiber manufacturing	Other manufacturing
52	Vegetable oil refining	Sugar refinery	Air transport
53	Freight forwarding	Precision machinery manufacturing	Public works
54	Engine and boiler manufacturing	Iron hardening	Real estate
55	Animal slaughtering	Oilseed farming	Building maintenance and repair
56	Footwear manufacturing	Quarrying	Domestic water transport
57	Precision machinery manufacturing	Other chemical product manufacturing	Insurance
58	Steel tubing	Stone mining	Nonferrous metal smelting and refining
59	Fiber crop farming	Flour milling	Nonresidential construction
60	Cattle farming	Animal slaughtering	Railway rolling stock manufacturing
61	Ceramic manufacturing	International maritime transport	Water supply and waste management
62	Machinery parts manufacturing	Grain farming	Clay manufacturing
63	Leather product manufacturing	Reeling and spinning	Fabricated metal products manufacturing
64	Stone mining	Cattle farming	Gas distribution
65	Grain farming	Oil and natural gas extraction	Metal plating
66	Vegetable farming	Copper rolling and wiring	Paint manufacturing
67	Iron rolling	Charcoal production hunting etc.	Residential construction
68	Generator and transformer manufacturing	Steel tubing	Rubber product manufacturing
69	Oil and natural gas extraction	Fiber crop farming	Cattle farming
70	Reeling and spinning	Weaving	Sawing
71	Plastic product manufacturing	Ceramic manufacturing	Aircraft manufacturing
72	Nonferrous metal smelting and refining	Machinery parts manufacturing	Animal slaughtering
73	Copper rolling and wiring	Ferrous metal manufacturing	Automobile manufacturing
74	Office machine manufacturing	Nonferrous metal smelting and refining	Chemical fiber manufacturing
75	Metal plating	Coal mining	Glass manufacturing
76	Organic chemical manufacturing	Chemical fertilizer manufacturing	Mineral oil refining
77	Paper milling	Iron rolling	Engineering works other than public works
78	Aluminum products manufacturing	Metal plating	Other textile manufacturing
79	Sawing	Scrap steel recycling	Printing and publishing
80	General government service	Industrial device manufacturing	Shipbuilding
81	Metal construction material manufacturing	Other electric appliance manufacturing	Tobacco manufacturing
82	Paint manufacturing	Footwear manufacturing	Oilseed farming
83	Glass manufacturing	Sawing	Road freight transport
84	Dressmaking	Coal product manufacturing	Rail transport
85	Scrap steel recycling	Computer and electronic devices manufacturing	Warehousing
86	Other textile manufacturing	Paint manufacturing	Agricultural services
87	Clay manufacturing	Nonferrous metal foundries	Flour milling
88	Weaving	Organic chemical manufacturing	Inorganic chemical manufacturing
89	Other electric appliance manufacturing	Glass manufacturing	Knitting
90	Charcoal production hunting etc.	Paper milling	Not elsewhere classified
91	Bicycle and motorcycle manufacturing	Clay manufacturing	Pulp milling
92	Industrial device manufacturing	Other textile manufacturing	Fish processing
93	Not elsewhere classified	Wood manufacturing	Ceramic manufacturing
94	Other manufacturing	Other manufacturing	Fiber crop farming
95	Wood manufacturing	Chemical manufacturing	Iron rolling
96	Inorganic chemical manufacturing	Entertainment	Machinery parts manufacturing
97	Other chemical product manufacturing	Other public services	Steel tubing
98	Coal product manufacturing	Paper product manufacturing	Sugar refinery
99	Industrial machinery manufacturing	Vegetable oil refining	Electric power generation
100	International maritime transport	Other consumer services	Organic chemical manufacturing
101	Chemical manufacturing	Plastic product manufacturing	Baking
102	Fabricated metal products manufacturing	Not elsewhere classified	Logging
103	Rubber product manufacturing	Clock and watch manufacturing	Paper milling
104	Coal mining	Business support services	Quarrying
105	Paper product manufacturing	Inorganic chemical manufacturing	Liquor manufacturing
106	Building maintenance and repair	Fabricated metal products manufacturing	Steel manufacturing
107	Other consumer services	Rubber product manufacturing	Fruit farming
108	Printing and publishing	Furniture manufacturing	Iron hardening
109	Water supply and waste management	Building maintenance and repair	Fruit and vegetable processing
110	Other public services	Leather product manufacturing	Freshwater fishing
111	Gas distribution	Education and research	Mineral ore mining
112	Business support services	Water supply and waste management	Silkworm farming
113	Warehousing	Communication services	Soft drink manufacturing
114	Rail transport	Printing and publishing	Feed grain processing
115	Domestic water transport	Gas distribution	Meat processing and daily product manufacturing
116	Air transport	Other apparel manufacturing	Pharmaceutical manufacturing
117	Communication services	Air transport	Footwear manufacturing
118	Electric power generation	Domestic water transport	Chemical fertilizer manufacturing
119	Other apparel manufacturing	Road passenger transport	Plastic product manufacturing
120	Road passenger transport	Retail trade	Dressmaking
121	Road freight transport	Warehousing	Nonferrous metal foundries
122	Real estate	Rail transport	Leather product manufacturing
123	Mineral oil refining	Real estate	Vegetable oil refining
124	Automotive repair and maintenance	Wholesale trade	Ferrous metal manufacturing
125	Transportation related services	Dressmaking	Furniture manufacturing
126	Wholesale trade	Freight forwarding	Clock and watch manufacturing
127	Retail trade	Finance	Freight forwarding
128	Insurance	Road freight transport	Entertainment
129	Finance	Mineral oil refining	Education and research
130		Electric power generation	
131		Insurance	

Table 9: The quadrant each industry belongs in the PDI and SDI diagram

		1965	1995
1	Grain farming	II	II
2	Vegetable farming	II	III
3	Fruit farming	III	III
4	Oilseed farming	III	III
5	Fiber crop farming	III	III
6	Cattle farming	I	I
7	Silkworm farming	III	IV
8	Agricultural services	III	III
9	Forest nurturing	II	II
10	Logging	II	IV
11	Charcoal production hunting etc.	III	III
12	Sea water fishing	III	III
13	Freshwater fishing	III	III
14	Mineral ore mining	III	II
15	Quarrying	III	III
16	Stone mining	III	III
17	Coal mining	II	III
18	Oil and natural gas extraction	III	II
19	Animal slaughtering	IV	IV
20	Meat processing and daily product manufacturing	IV	IV
21	Fish processing	IV	IV
22	Flour milling	IV	IV
23	Baking	IV	IV
24	Fruit and vegetable processing	IV	IV
25	Sugar refinery	III	IV
26	Other food processing	IV	IV
27	Liquor manufacturing	III	III
28	Soft drink manufacturing	IV	IV
29	Feed grain processing	I	IV
30	Tobacco manufacturing	III	III
31	Reeling and spinning	I	IV
32	Weaving	I	IV
33	Knitting	IV	IV
34	Textile finishing and fabric coating	IV	III
35	Other textile manufacturing	IV	IV
36	Dressmaking	IV	IV
37	Other apparel manufacturing	IV	IV
38	Sawing	I	I
39	Wood manufacturing	IV	IV
40	Furniture manufacturing	IV	IV
41	Pulp milling	I	IV
42	Paper milling	I	I
43	Paper product manufacturing	I	I
44	Printing and publishing	I	II
45	Chemical fertilizer manufacturing	IV	IV
46	Inorganic chemical manufacturing	I	I
47	Organic chemical manufacturing	I	I
48	Rubber product manufacturing	I	IV
49	Plastic product manufacturing	IV	I
50	Chemical fiber manufacturing	I	IV
51	Pharmaceutical manufacturing	IV	III
52	Vegetable oil refining	IV	IV
53	Paint manufacturing	IV	IV
54	Other chemical product manufacturing	I	IV
55	Chemical manufacturing	IV	IV
56	Mineral oil refining	II	II
57	Coal product manufacturing	IV	III
58	Footwear manufacturing	IV	III
59	Leather product manufacturing	IV	IV
60	Glass manufacturing	III	III
61	Cement milling	III	IV
62	Ceramic manufacturing	III	III
63	Clay manufacturing	II	III
64	Steel manufacturing	I	I
65	Scrap steel recycling	III	III
66	Iron rolling	I	I
67	Steel tubing	IV	IV
68	Metal plating	I	I
69	Iron hardening	I	III
70	Ferroalloy manufacturing	III	IV
71	Nonferrous metal smelting and refining	II	II
72	Copper rolling and wiring	IV	III
73	Nonferrous metal foundries	III	III
74	Metal construction material manufacturing	IV	IV
75	Aluminum products manufacturing	III	IV
76	Fabricated metal products manufacturing	I	I
77	Engine and boiler manufacturing	IV	IV
78	Industrial machinery manufacturing	I	IV
79	Machinery parts manufacturing	III	IV
80	Industrial device manufacturing	IV	IV
81	Machine tool manufacturing	III	IV
82	Office machine manufacturing	IV	IV
83	Consumer electric appliances manufacturing	IV	IV
84	Generator and transformer manufacturing	IV	IV
85	Other electric appliance manufacturing	I	IV
86	Automobile manufacturing	IV	I
87	Motorcycle manufacturing	IV	IV
88	Shipbuilding	IV	IV
89	Railway rolling stock manufacturing	IV	IV
90	Aircraft manufacturing	III	III
91	Other transportation equipment manufacturing	IV	IV
92	Optical and photographic equipment manufacturing	IV	IV
93	Clock and watch manufacturing	IV	IV
94	Precision machinery manufacturing	III	IV
95	Other manufacturing	I	IV
96	Residential construction	IV	IV
97	Nonresidential construction	IV	IV
98	Building maintenance and repair	I	I
99	Public works	IV	IV
100	Other engineering works	IV	IV
101	Electric power generation	II	II
102	Gas distribution	III	III
103	Water supply and waste management	III	III
104	Wholesale trade	II	II
105	Retail trade	III	II
106	Finance	II	II
107	Insurance	III	III
108	Real estate	II	II
109	Housing	III	III
110	Rail transport	II	III
111	Road passenger transport	III	I
112	Road freight transport	II	II
113	International maritime transport	I	III
114	Domestic water transport	II	II
115	Air transport	III	III
116	Freight forwarding	III	III
117	Warehousing	III	III
118	Transportation related services	III	II
119	Communication services	II	II
120	General government service	III	III
121	Education and research	III	II
122	Medical services	III	III
123	Other public services	III	III
124	Business support services	II	II
125	Automotive repair and maintenance	I	I
126	Entertainment	III	III
127	Restaurants and hotels	III	III
128	Other consumer services	I	III
129	Not elsewhere classified	I	I
130	Industrial robot manufacturing		IV
131	Computer and electronic devices manufacturing		I

Table 10: Triangulation according to the number of non-zero cells in the lower-left triangle below the diagonal

	1965	1995	Rise in ranking
1	Securities finance corporations	Central government	Rest of the World
2	Bank of Commerce and Industry	Securities finance corporations	Non-corporate enterprises (services)
3	Central government	Non-financial public corporations	Non-corporate enterprises (commerce)
4	Non-financial public corporations	Non-financial private corporations (N, S)	Mortgage companies
5	Non-financial private corporations (M, S)	Non-financial private corporations (M, S)	Foreign banks in Japan
6	Non-financial private corporations (N, S)	Bank of Commerce and Industry	Securities companies
7	Nationwide commercial banks	Moneylenders	Moneylenders
8	Money market brokers	Mortgage companies	Non-corporate enterprises (manufacturing)
9	Non-financial private corporations (N, L)	Bank of Japan	Government loan fund
10	Financial Institutions for agriculture forestry and fisheries	Non-corporate enterprises (commerce)	Private non-profit institutions serving households
11	Bank of Japan	Rest of the World	Bank of Japan
12	Non-financial private corporations (M, L)	Non-financial private corporations (N, L)	Investment trust
13	Credit cooperatives	Money market brokers	Central government
14	Trust banks	Non-corporate enterprises (services)	Local governments
15	Moneylenders	Foreign banks in Japan	Non-financial private corporations (N, S)
16	Public financial corporations	Nationwide commercial banks	Life insurance
17	Regional Banks	Local governments	Non-life insurance
18	Long-term credit banks	Non-corporate enterprises (manufacturing)	Non-financial public corporations
19	Local governments	Financial Institutions for agriculture forestry and fisheries	Farming households
20	Pension funds	Public financial corporations	Non-farming households
21	Mortgage companies	Long-term credit banks	Credit cooperatives
22	Deposit insurance corporations	Non-financial private corporations (M, L)	Non-financial private corporations (M, S)
23	Mutual loans and savings banks	Pension funds	Securities finance corporations
24	Labor credit associations	Securities companies	Mutual loans and savings banks
25	Non-corporate enterprises (commerce)	Mutual loans and savings banks	Long-term credit banks
26	Non-corporate enterprises (manufacturing)	Government loan fund	Pension funds
27	Foreign banks in Japan	Investment trust	Non-financial private corporations (N, L)
28	Credit cooperatives	Credit cooperatives	Bank of Commerce and Industry
29	Investment trust	Deposit insurance corporations	Benefit insurance societies
30	Government loan fund	Credit cooperatives	Public financial corporations
31	Non-corporate enterprises (services)	Private non-profit institutions serving households	Money market brokers
32	Postal savings and postal life insurance	Regional Banks	Postal savings and postal life insurance
33	Securities companies	Non-life insurance	Deposit insurance corporations
34	Non-life insurance	Trust banks	Nationwide commercial banks
35	Private non-profit institutions serving households	Labor credit associations	Financial Institutions for agriculture forestry and fisheries
36	Benefit insurance societies	Farming households	Non-financial private corporations (M, L)
37	Farming households	Postal savings and postal life insurance	Labor credit associations
38	Rest of the World	Non-farming households	Regional Banks
39	Non-farming households	Life insurance	Credit cooperatives
40	Life insurance	Benefit insurance societies	Trust banks

Note: Non-financial private corporations are cross-classified into four categories.

M: Manufacturing, N: Non-manufacturing,

L: Large, S: Small (Paid-in capital of 100 million yen or less)

Table 11: The quadrant each sector belongs in the PDI and SDI diagrams

	PDI		SDI	
	1965	1995	1965	1995
Bank of Japan	II	II	III	III
Long-term credit banks	IV	I	III	III
Trust banks	III	II	III	I
Nationwide commercial banks	IV	I	I	I
Regional banks	IV	II	I	I
Mutual banks	I	I	I	III
Foreign banks in Japan	IV	IV	III	III
Credit Unions	I	II	I	I
Credit cooperatives	I	I	III	III
Labor credit associations	II	II	III	III
Commerce and Industrial Bank	I	II	III	III
Financial institutions for agriculture forestry and fisheries	I	I	I	I
Investment trust	III	III	III	III
Securities companies	I	II	III	III
Securities finance corporations	I	II	III	III
Money market brokers	I	I	III	III
Deposit insurance corporations	III	I	III	III
Mortgage companies	III	I	III	III
Moneylenders	I	II	III	III
Life insurance	III	III	III	IV
Non-life insurance	III	II	III	III
Benefit insurance societies	I	II	III	III
Pension funds	II	II	III	III
Postal savings and postal life insurance	II	II	IV	I
Government loan fund	II	I	IV	I
Public financial corporations	I	I	IV	I
Central government	II	IV	IV	I
Non-financial public corporations	IV	IV	II	II
Local governments	IV	IV	III	II
Non-financial private corporations (M, L)	IV	IV	I	II
Non-financial private corporations (M, S)	I	IV	I	III
Non-financial private corporations (N, L)	IV	IV	I	I
Non-financial private corporations (N, S)	IV	IV	I	I
Non-corporate enterprises (manufacturing)	I	IV	III	III
Non-corporate enterprises (commerce)	I	IV	III	III
Non-corporate enterprises (services)	I	IV	III	III
Farming households	II	II	IV	III
Non-farming households	II	II	IV	I
Private non-profit institutions serving households	II	II	III	III
Rest of the World	II	IV	IV	I