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The Economic and Industrial Forecast of Japan 2014-2035 By revised model JIDEA91

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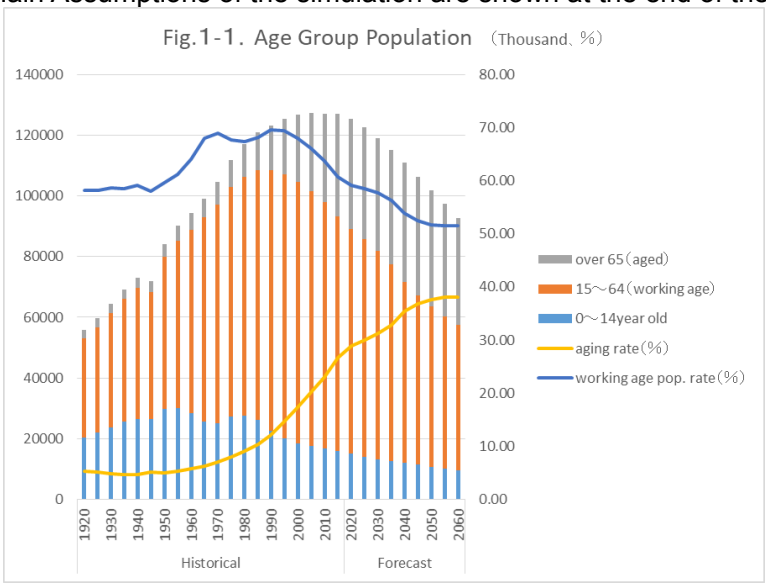
Part 1: Shrinking Japanese Economy, Industries and Employment

1-1. The challenges of Japan under the shrinking Japanese economy

The long forecast of Japanese economy is affected by the shrinking population. The population of Japan reached at its peak 12.710 million on 2015 and begin to decrease until 2050. In that case, the working population reached at the peak 1995 and the aged population over 65 years old increase rapidly (fig.1-1). The cause of shrinking population owes to the big wave of generation change. The baby boom of just after the World War II is now reaching to aged population. At mid-21 Century the aging rate shall reach the peak and after that the decrease of population will be stopped and the population stabilize. Accordingly these 30 years is the key epoch how to manage shrinking Japanese economy. The Main Assumptions of the simulation are shown at the end of the chapter Appendix I.



(Source National Institute of Population and Social Securities Research, April 2017

They say that the high growth Japanese economy after the World War II was supported by the Japanese business practice (such as lifelong employment, seniority-based promotion, etc.) but they are based on the continuous supply of young labor force originated in high growth rate of Japanese population. The shrinking population is making this basic condition impossible and request the conversion of lifelong employment or the seniority based-wage. The shrinking population make reduce the demand of consumption, and diminuend the size of economy. How to manage this economic situation and re-direct the Japanese economy to growing economy.

The relation between the enterprise and society and also workers and company are forced to change by the electronics technology, AI revolution. At this big social and economic turning point, the reduction of working-age population is inevitable, accordingly the remedial measures of labor environment and improvement of labor productivity is the urgent issues. Because of the shrinking Japanese market, many enterprises have been tried to develop overseas market, to transfer the production facilities. As the result, the domestic investment is reducing but the big wave of economic change request the enforcement of strategic selection of domestic investment and the same time, the social regime which supported the high economic growth should be changed to adopt shrinking economy.

Even at the age of shrinking economy, if we adopt well the social change and improve the productivity and conserve the disposable income per capita, the level of personal wealth will be kept same. Keeping in mind these urgent issue, based at past 15 years Japanese economy, we forecast Japanese economy until 2035 to see what will

happen in labor productivity, in labor market, in personal income and find the way how to keep economic wealth.

1-1-1. Shrinking Japanese Economy

The change of employment correspond closely with the change of economy. At first, under the shrinking population we see how the employment follow the economy (tab.1-1). The data of Japanese population are given by NIPSSR[1]. We adopt the assumption of medium-fertility and medium-mortality. The number of employment is calculated by multiplying the output forecasted by the model with the labor coefficient which is the inverse of labor productivity. The number of unemployment is the difference of labor force population and the employment.

Referring to Table 1-1, the unemployment is reducing since 2015 and it will reach at the level of 2.2% which is almost full employment considering the natural unemployment. The labor force employment is the total of employment and unemployment and it is forecasted by multiplying the population over 15 years old with the labor participation rate. The labor participation rate is the important factor for forecasting and its past trend is decreasing. In this model, the labor participation rate is forecasted[2] by the historical value since 1996 to 2014. At present, the shortage of labor force occurs in several sectors, accordingly the labor participation rate seems to be increase. They say that the labor participation of women or aged people will be increase but considering more precisely the population over 65, the high aged people over 75 increase more than low aged in next 30 years and it makes decrease the total labor participation over 65. To cope with labor shortage, not taking easy way to depend on imported foreign workers, we should take fundamental policy for labor market, for example to make easy to choose the individual working time freely for any necessity of daily life such as baby sitting, or to reform the tax system to get tax break more easily for the double income family.

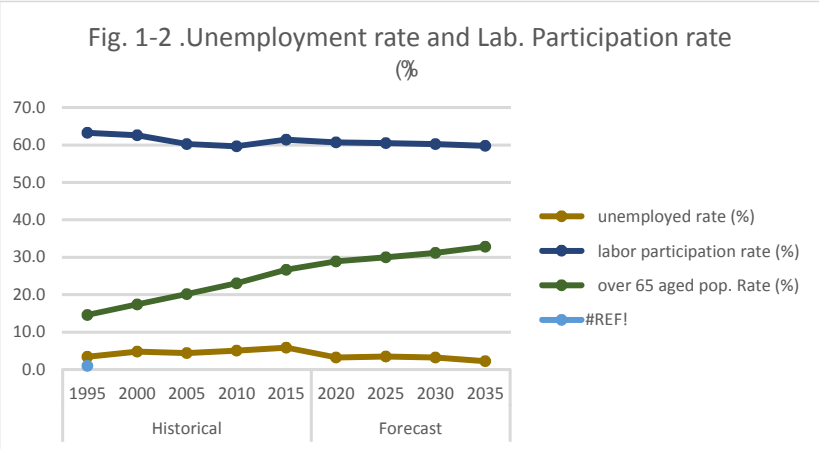
Table 1-1 .Population and Employment (10 thousand)

	Historical					Forecast				2035/ 2015 change rate (%)	2015～35 Annual growth rate(%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total population	1,255.7	1,269.3	1,277.7	1,280.6	1,270.9	1,253.2	1,225.4	1,191.2	1,152.2	-9.3	-0.489
15 ～ 64 years old	1,055.4	1,084.2	1,101.8	1,112.2	1,111.5	1,102.5	1,084.7	1,059.1	1,027.6	-7.5	-0.392
over 65yeas old	182.8	220.4	257.6	294.8	338.7	361.9	367.7	371.6	378.2	11.7	0.553
younger than 15 years	200.3	185.1	175.9	168.4	159.4	150.8	140.7	132.1	124.6	-21.8	-1.224
labor force population	667.4	678.7	664.0	663.2	682.8	669.4	656.4	638.0	614.2	-10.0	-0.528
employed population	644.6	646.2	635.0	629.8	642.9	647.9	633.4	617.6	600.7	-6.6	-0.339
unemployed	22.8	32.5	29.1	33.4	40.0	21.4	23.0	20.4	13.5	-66.3	-5.286
unemployed rate (%)	3.4	4.8	4.4	5.0	5.9	3.2	3.5	3.2	2.2	–	–
labor participation rate (%)	63.2	62.6	60.3	59.6	61.4	60.7	60.5	60.2	59.8	–	–
over 65 aged pop. Rate (%)	14.6	17.4	20.2	23.0	26.7	28.9	30.0	31.2	32.8	–	–
Annual working hours per worker	1,907	1,850	1,811	1,755	1,735	1,735	1,726	1,717	1,706	-1.7	-0.085

Source: Forecasted by JIDEA91. Hereafter the source is same except otherwice indicated.

[1] National Institute of Population and Social Security Research (hhttp://www.ipss.go.jp/index-e.asp)

[2] The result of regression equation is shown at the end of this chapter.



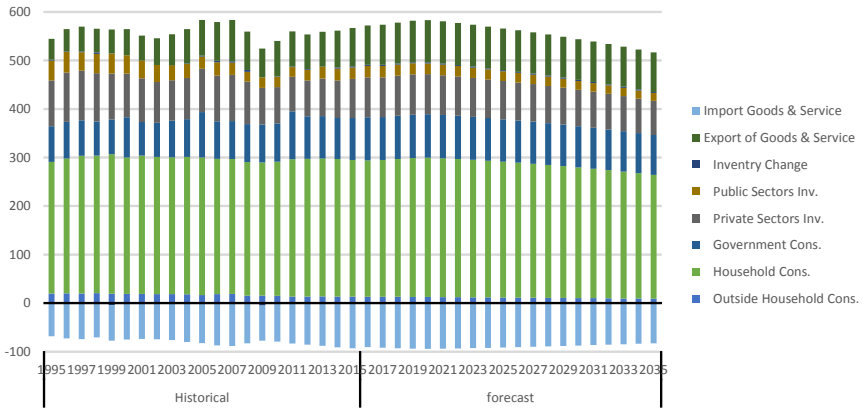
What is the economic back ground from which this labor situation appears? Japanese economy got into the long depression after the crisis of Lehman Brothers in 2008 followed by the Great East Japan Earthquake. After the Abenomics the economy gradually turn around. Abenomics try to break away continued deflation for several years and to revive the long stagnation through “three-arrowed economic booster plan”, a bold policy monetary easing, fiscal stimulation through spending on public projects, and a growth strategy that entails structural reform. These plan are only realized the first arrow of monetary easing and the left two are scarcely realized or not realized and the effects are not apparent. JIDEA91 model is based on real economics and difficult to include monetary measures, accordingly their effects are included only in the historical data up to 2015. The model itself has historical data since 1995 to 2014 but the result of macro economy 2015 is already published, so, the 2015 macro data has been taken into the model.

Japanese GDP in real term is gradually get back after the big earthquake in 2012 and will reach at its peak in 2020 when the Tokyo Olympic games will take place and then the economy will begin to shrink until 2035, shown as the index based on 2015, it comes down 88.7 in 2035 (Tab. 1-2, Fig. 1-3).

Looking at the 2035/2015 ratio of difference, the contraction of total consumption is almost same as GDP 89.0, but the Investment Total is reduced much more than GDP 82.8, and the Government Investment reduce even more than Private Sectors. In the model, the Government Investment is forecasted by the distribution equation based on the value of preceding year. Accordingly, if the government change the policy and take the investment stimulation measures, the result will change significantly. The import reduces much more than export, so the deficit of trade balance reduces year by year. However, the exchange rate and oil price are fixed at 2017 value and continue same until 2035, accordingly if these value changed, the result will be different significantly.

GDP means the increase of economic activity and Japanese GDP is apparently shrinking (Tab.1-1), but if it is divided by population and shown by index based 2015, it is 100.9 in 2035 and in the same period the output is 106.7. It is clear that these two are higher than 2015 (Tab.1-3).

Fig. 1-3.Gdp in real by expediture category (price 2011, Trillion Yen)



Tab. 1-2. Gdp in real by expediture category (price 2011, trillion Yen)

	Historical					Forecast				2015/ 1995 change rate (%)	2035/ 2015 change rate (%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
GDP	476.5	489.4	500.8	461.2	474.1	489.0	474.3	456.5	433.9	99.5	88.7
Consumption Total	364.5	383.2	393.6	370.4	381.5	389.3	378.8	364.6	346.4	104.7	89.0
Outside Household Cons.	19.9	18.9	16.7	15.1	13.3	12.7	11.5	10.4	9.2	66.8	72.6
Household Cons.	271.0	281.2	283.5	276.3	281.5	286.9	279.7	269.1	255.1	103.9	88.9
Government Cons.	73.6	83.1	93.4	79.0	86.7	89.7	87.6	85.2	82.0	117.8	91.5
Investment Total	137.2	127.3	116.3	96.8	106.6	107.1	101.3	95.5	88.7	77.7	82.8
Private Sectors Inv.	94.4	89.8	89.5	74.7	80.4	82.5	78.8	75.0	70.3	85.1	85.2
Public Sectors Inv.	40.9	37.6	25.1	21.1	23.9	22.2	20.2	18.2	16.1	58.5	72.4
Inventry Change	1.9	-0.2	1.7	1.1	2.3	2.3	2.3	2.3	2.3	119.6	100.0
Export of Goods & Service	43.1	53.8	73.5	73.1	79.0	86.9	85.8	83.9	81.6	183.4	93.9
Import Goods & Service	-68.3	-74.9	-82.5	-79.2	-93.0	-94.2	-91.6	-87.5	-82.8	136.1	87.9
Trade Balance	-25.2	-21.1	-9.0	-6.1	-14.0	-7.3	-5.9	-3.6	-1.2	-	-
Cons. Household per Person (10	420.5	435.2	446.5	438.7	437.9	442.8	441.6	435.7	424.7	104.2	95.9

* The inventry change is fixed at 2015 value.

Tab. 1-3. Income, Consumption, Output and Wages per Capita (Price 2011, Thoousand Yen)

	Historical					Forecast			
	1995	2000	2005	2010	2015	2020	2025	2030	2035
GDP per Capita	3,795	3,856	3,920	3,601	3,731	3,902	3,871	3,832	3,766
Consumption per Capita	2,903	3,019	3,080	2,893	3,002	3,106	3,092	3,061	3,006
Household Cons. Per Capita	2,158	2,216	2,219	2,158	2,215	2,289	2,282	2,259	2,214
Output per Capita	7,460	7,413	7,613	7,028	7,385	7,804	7,818	7,860	7,878
Wages per Capita	4,053	4,203	3,941	3,739	3,891	4,032	4,001	3,946	3,846
Index (2015=100)									
GDP per Capita	101.7	103.4	105.1	96.5	100.0	104.6	103.8	102.7	100.9
Consumption per Capita	96.7	100.6	102.6	96.4	100.0	103.5	103.0	102.0	100.1
Household Cons. Per Capita	97.4	100.0	100.2	97.4	100.0	103.3	103.0	102.0	100.0
Output per Capita	101.0	100.4	103.1	95.2	100.0	105.7	105.9	106.4	106.7
Wages per Capita	104.2	108.0	101.3	96.1	100.0	103.6	102.8	101.4	98.9

*The wages are converted in real term by consumption deflator.

1-1-2. Labor productivity and Labor share rate

In spite of reduced GDP, GDP per capita keeps constant or slightly increased. It is caused by the improvement of labor productivity. If the labor productivity increase sufficiently, that is to say, the production per workers increase sufficiently, then the income per worker can be kept the level or increase in spite of reduced GDP.

We have calculated the labor productivity by two methods, the first one is to divide the value added in real term by number of workers and second one is to divide the value added by total hours worked[3]. Both result are same as they are increased but second one

[3] =number of workers * hours worked per worker for one year

increased more than the first (Tab. 1-4, Fig. 1-4). The hours worked has been decreased gradually since 1996 with the increase of part time workers and the recession. Accordingly, the productivity by the second method might be described more precisely the real economy.

These forecasted increase of labor productivity means even though the decreased value added in real term, the number of workers or the amount of hours worked decreased even more than that.

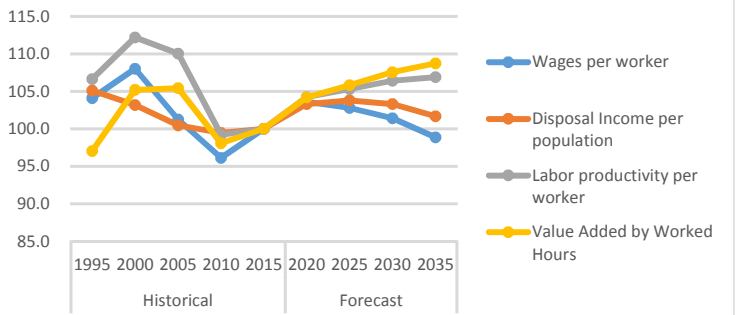
On the other hand, the wages per worker do not increase in proportion to the labor productivity and the labor share decrease (Tab. 1-4). Shown as Tab. 1-3, GDP per capita is increased from 100.0 in 2015 to 100.9 in 2035, however the consumption per capita keeps almost same level 100.1 in 2035. The decrease of the labor share cause the decrease of disposable income and then the decrease of consumption and finally cause the stagnation of economy.

Tab. 1-4. Real Wages per Worker and Labor Productivity (Price 2015, Million Yen)

	Historical					Forecast			
	1995	2000	2005	2010	2015	2020	2025	2030	2035
Wages per worker	4.052	4.203	3.941	3.741	3.892	4.032	4.000	3.947	3.848
Disposal Income per population	2.546	2.499	2.434	2.410	2.423	2.503	2.515	2.503	2.463
Labor productivity per worker	7.742	8.144	7.989	7.201	7.260	7.565	7.643	7.726	7.762
Value Added by Worked Hours	4.061	4.402	4.411	4.104	4.184	4.359	4.428	4.500	4.550
Index (2015=100)									
Wages per worker	104.1	108.0	101.2	96.1	100.0	103.6	102.8	101.4	98.9
Disposal Income per population	105.1	103.2	100.5	99.5	100.0	103.3	103.8	103.3	101.7
Labor productivity per worker	106.6	112.2	110.0	99.2	100.0	104.2	105.3	106.4	106.9
Value Added by Worked Hours	97.0	105.2	105.4	98.1	100.0	104.2	105.8	107.5	108.7
Labor share rate (%)	52.3	51.6	49.3	51.9	53.6	53.3	52.3	51.1	49.6

*Wages are converted in real term by househol consum. deflator and value added is converted by Domestic Demand Deflator.

Fig. 1-4 .Index of Labor productivity and Wages per Capita
(2015年=100)



Looking at the labor productivity with the hours worked, the annual growth rate since 1995 to 2015 is 0.52% however since 2015 to 2035 it decreased to 0.36% (Tab. 1-5). It is because the hours worked decrease more than value added in real. One of the important factors of Japanese business practice, the lifelong employment system may prevent to discharge the workers corresponding to reduced production. From 1995 to 2015, the productivity of Total Manufacturing industry is improved but Total Service industry is decreased. The decrease of service industry caused by the decrease of big waited sector such as Commerce and Public administration.

Tab. 1-5 Index of labor productivity with Hours Worked (Value added/ Hours worked) (2015=100)

	Historical					Forecast				1995~2015 Annual	2015~35 Annual growth
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total	90.4	98.7	102.1	97.5	100.0	103.5	105.4	107.2	108.3	0.51	0.40
01 Agriculture, Fishery, Fore	83.1	101.0	90.4	104.5	100.0	105.7	107.6	109.0	110.2	0.93	0.49
02 Mining	330.6	233.5	139.0	104.4	100.0	106.5	103.3	96.8	91.0	-5.80	-0.47
Total Manufacturing	103.5	111.3	109.0	99.2	100.0	104.3	106.5	108.0	108.4	-0.17	0.41
03 Food, beverage	119.4	127.5	118.7	105.9	100.0	100.1	100.5	101.2	102.6	-0.88	0.13
04 Textiles, Clothing	144.3	156.4	150.7	139.3	100.0	114.8	120.1	126.9	135.4	-1.82	1.53
05 Wood, Pulp, Furniture	119.4	127.2	128.1	111.3	100.0	102.4	98.7	92.8	84.1	-0.88	-0.86
06 Chemicals	91.3	104.1	105.1	108.4	100.0	114.7	122.8	130.5	135.5	0.45	1.53
06 Pharmaceuticals	80.3	90.7	92.8	95.8	100.0	108.7	120.7	133.1	145.9	1.10	1.91
07 Petroleum, Coal product	267.0	219.7	142.3	139.2	100.0	97.8	95.2	92.7	89.9	-4.79	-0.53
08 Rubber, Plastics	90.5	113.4	122.0	107.5	100.0	103.1	103.3	104.0	104.4	0.50	0.22
09 Glass, Cement, Ceramics	91.1	100.3	107.2	88.8	100.0	96.2	94.4	91.1	86.5	0.47	-0.72
10 Iron, Steel	90.8	98.7	116.2	100.8	100.0	102.8	99.0	95.6	91.9	0.48	-0.42
11 Non-ferrous Metals	151.0	197.4	136.9	119.7	100.0	103.5	103.8	105.0	107.2	-2.04	0.35
12 Metal Products	167.1	165.9	145.0	101.1	100.0	100.1	98.5	94.4	88.6	-2.53	-0.60
13 General Machines	78.4	85.9	93.0	85.5	100.0	111.7	119.8	126.5	128.0	1.23	1.24
14 Electric Machines	94.5	106.5	104.4	105.1	100.0	107.8	108.6	110.5	114.5	0.28	0.68
15 Computer, Communication Eq	109.0	118.8	123.3	120.3	100.0	99.6	89.9	81.2	72.4	-0.43	-1.60
16 Transportation Equip	52.5	55.3	72.7	75.8	100.0	105.5	111.9	117.0	120.0	3.28	0.91
15 Motor Vehicls	57.4	61.2	90.8	83.5	100.0	101.6	105.3	109.3	113.6	2.82	0.64
17 Other Manufacturing	115.6	118.1	120.2	128.1	100.0	102.1	106.2	113.1	121.8	-0.72	0.99
17 Construction, Civil Engi	62.4	66.6	69.4	60.2	100.0	99.7	103.8	103.8	99.6	2.39	-0.02
18 Electricity, Gas, Water	215.7	234.3	169.2	145.8	100.0	112.5	117.2	120.4	122.0	-3.77	1.00
Total Service Industry	106.6	121.4	108.6	98.7	100.0	99.3	98.0	96.2	93.9	-0.32	-0.31
20 Commerce	70.5	79.4	98.4	91.4	100.0	101.5	101.9	100.4	97.6	1.76	-0.12
21 Finance, Insurance	62.8	69.0	80.0	95.7	100.0	102.8	102.5	101.3	99.4	2.36	-0.03
22 Real Estate, Imputed Ren	95.4	94.5	92.2	96.8	100.0	96.3	98.1	100.4	103.7	0.24	0.18
23 Transportation	111.6	105.3	105.8	100.1	100.0	103.6	103.2	103.4	103.3	-0.55	0.16
24 Communication, Informa	54.5	97.2	109.2	113.4	100.0	99.7	102.0	106.1	111.4	3.08	0.54
25 Public Administration	83.5	143.7	161.3	100.5	100.0	105.5	101.4	96.0	87.6	0.91	-0.66
26 Education,Research	118.1	116.9	129.2	115.2	100.0	105.1	104.4	104.0	103.2	-0.83	0.16
27 Medical,Health,Nursery	63.6	69.4	77.1	82.1	100.0	102.3	108.5	114.4	119.8	2.29	0.91
28 Business Service	90.9	93.3	88.6	83.9	100.0	113.6	121.3	127.3	131.9	0.48	1.39
29 Personal Service	97.9	106.3	106.2	98.6	100.0	92.7	95.5	99.7	106.9	0.11	0.33
30 N.E.C.	122.7	96.2	75.2	-32.7	100.0	93.7	90.9	87.8	84.3	-1.02	-0.85

*The value added is converted into real term by Domestic demand deflator.

*The Total Manufacturing include Construction/ Civil engeneering, Electricity/ Gas/ Water. (same as below)

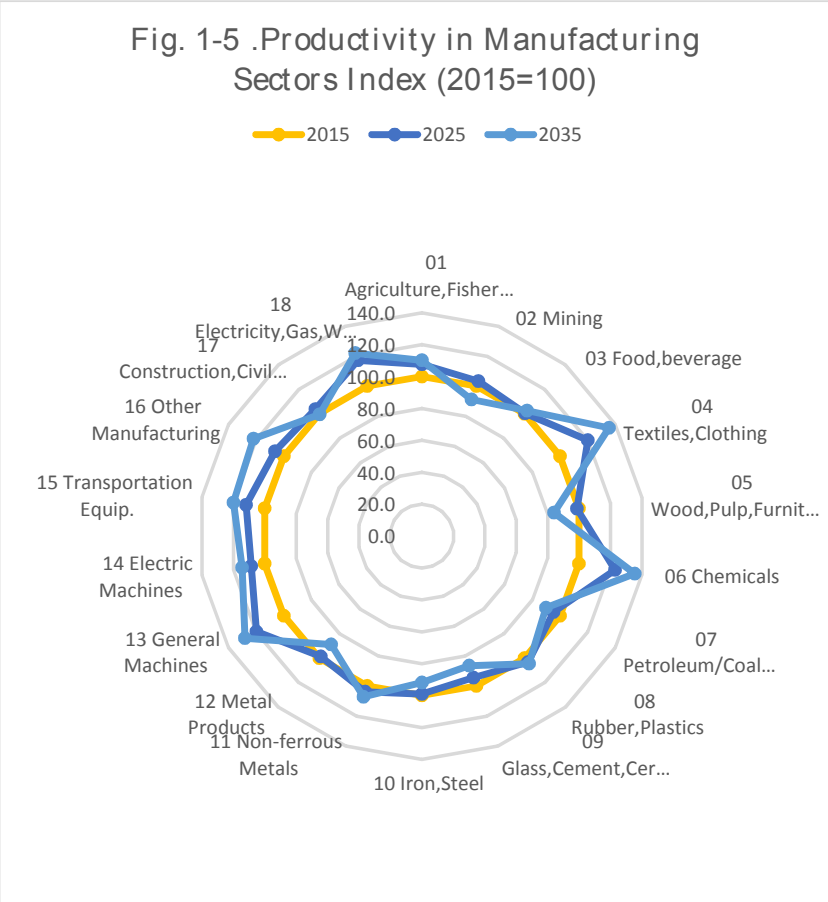
*The model is constructed 85 sectors but in this table the sectors are aggregated 30 sectors.

The labor input coefficient is the reciprocal number of labor productivity and in the model JIDEA91, it is determined by regression equation. The explanatory variables are capital stock and time trend, accordingly the change of past labor productivity has big effect for the forecast. The labor productivity itself basically affected by the technical innovation but the technical innovation tend to be discontinuity and irregular to happen. Accordingly, these technical innovations are difficult to include in the model such as explanatory variable. Perhaps, these factors may be included through the past trend of historical data and expressed in the model as time-trend.

By the way, we can obtain the number of employment by sectors only every 5 years. To fill up the missing data, we use the Annual Report of National Account in which they published the number of employment by sectors but the number of sectors is only 30. Accordingly we expand the 30 sectors to 85. Same as that, the data for hours worked available from the same source by 30 sectors. We also expanded the 30 sectors hours worked to 85. The limitation of availability of these data may deprive the accuracy of the forecast.

Looking at the productivity change sector by sector, Textiles and Chemicals increase noticeably. The Textile sector is forced to rationalize because of foreign competition. The Chemicals sector is affected by the large sub-sector, the Pharmaceuticals whose output increased rapidly. In the Manufacturing sectors, the Productivity of General Machines, Electric Machines, Transportation Equipment, Other Manufacturing are increased, on the

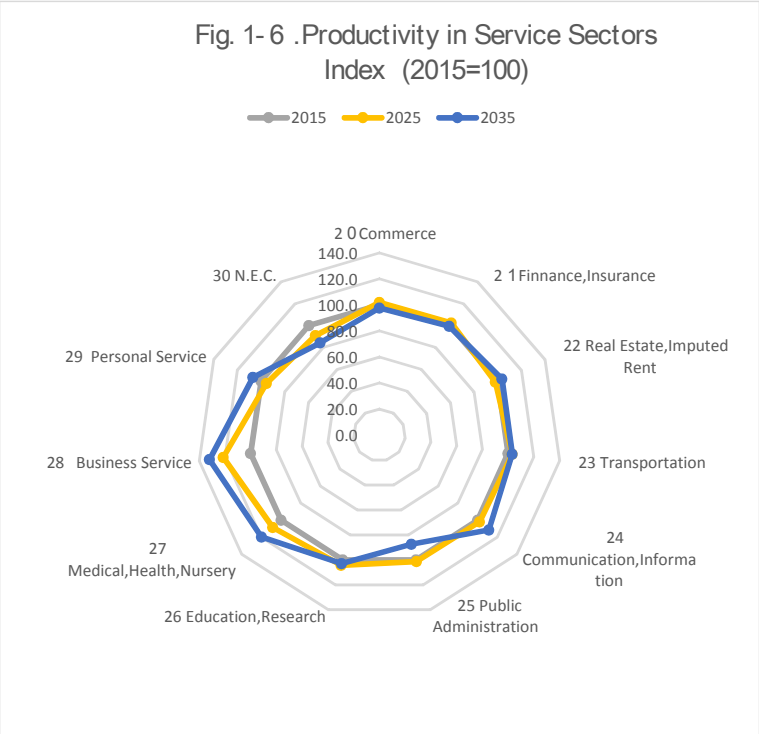
contrary, the raw material sectors such as Petroleum/Coal products, Rubber /Plastics, Glass/Cement, Iron & Steel, Non-Ferrous Metal are stagnant (Fig. 1-5). The Construction/Civil Engineering sectors are suffered by recession which is caused by the holding back of new order from the government who is struggling with big budgetary deficit. In the Electricity/Gas/Water sector, the Electricity has the biggest weight and which are affected big disaster of East Japan Earthquake of which the damage continues owning to the restriction to use nuclear power.



The productivity of the service sectors are relatively low comparing with the Manufacturing. Many service sectors have labor-intensive characters and are hard to be affected by the technical innovation. However, the application of new technology such as IT[4] or AI[5] may contribute significantly to Service industry and the productivity of Commerce, Finance/Insurance, Real Estate, Transportation or Communication sector may increase much higher than this forecast.

The Service industry occupy 60% share of total output and this low level of productivity should help the absorption of labor force. The productivity of Commerce, Finance/Insurance, Real-estate, Transportation, Communication /Information and Education/Research are staying at the same level, however Business service and Personal service get relatively high growth (Fig. 1-6) which may owe to the growing shortage of workers. The Business service include the outsourcing of software and IT. The productivity of Personal service is affected by aging population and increase the number of double income family.

[4] Internet Technology
[5] Artificial Intelligence



Against these productivity trends, how is the wages situation? The wages in real term which are converted by household consumption deflator. Looking at the index based on 2015, in 2035 the Total wages is 90.0, Manufacturing industry is 87.2, and Service industry is 91.2. Almost all sectors, the wages are decreased (Tab. 1-6). These reductions are caused mainly by shrinking employment.

If we look at the wages per employment, Total industry almost keep the same level 98.9. Manufacturing industry is 99.4 which go over slightly the Total industry, while the Service sector is 98.9 which is almost equal to the Total industry (Tab. 1-7).

Tab. 1-6. Wages in Real Term (2011=100)

	Historical					Forecast				1995～2015 Annual	2015～35 Annual growth
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	104.8	106.1	99.4	94.3	100.0	104.7	100.7	96.0	90.0	−0.24	−0.52
Agricultur/Forestry/fishery & Mining	110.2	97.6	91.1	89.7	100.0	101.5	95.6	89.8	82.5	−0.48	−0.95
Manufacturing Total	119.2	114.4	101.2	88.8	100.0	104.4	99.7	94.4	87.2	−0.87	−0.68
Foods/Beverages	106.4	100.9	94.4	95.4	100.0	101.3	100.2	98.6	96.1	−0.31	−0.20
Textile/Pulp/Furniture	181.5	153.4	119.9	100.2	100.0	97.8	86.7	75.8	63.5	−2.94	−2.25
Chemicals/Petroleum/Rubber/Ceramics	121.2	112.1	106.0	98.9	100.0	103.5	96.3	89.1	81.0	−0.96	−1.05
Iron/Steel/Non-Ferrous/Metal Prod.	127.2	116.9	111.3	98.1	100.0	105.0	99.2	93.7	87.0	−1.19	−0.70
Machinery	113.9	121.0	106.2	85.4	100.0	106.9	102.6	97.6	90.1	−0.65	−0.52
Transportation Equipments	75.6	80.4	82.1	82.2	100.0	106.6	104.2	101.2	96.3	1.41	−0.19
Other Manufacturing	110.6	110.1	86.4	96.3	100.0	99.5	96.8	93.6	89.5	−0.50	−0.55
Construction/Civil Engineering	125.5	116.1	95.6	79.4	100.0	103.7	98.9	93.0	84.9	−1.13	−0.82
Electricity/Gas/Water	119.2	122.5	123.0	114.0	100.0	108.7	106.6	103.9	99.6	−0.88	−0.02
Service industry Total	99.2	103.0	98.8	96.5	100.0	104.9	101.2	96.7	91.2	0.04	−0.46
Commerce/Finannce/Real Estate	128.4	119.4	107.0	94.1	100.0	102.8	96.6	90.0	82.9	−1.24	−0.94
Transport/Communicat/Information	112.0	120.9	116.4	113.6	100.0	103.8	98.9	93.9	88.0	−0.57	−0.64
Public Admin./Education/Medical	80.9	89.7	89.2	94.9	100.0	109.2	108.0	105.6	100.9	1.06	0.05
Business Service	75.2	81.2	88.9	91.7	100.0	101.8	97.5	92.1	88.0	1.44	−0.64
Personal Service	104.3	117.5	103.9	93.8	100.0	99.3	95.3	90.8	85.6	−0.21	−0.77

*Wages are converted to real terms by household consumption deflator.
*85 sectors in the model are aggregated to 15 sectors.

Tab. 1-7. Wages in Real term per Employee (2011年価格、千円)

	Historical					Forecast				1995～2015 Annual	2015～35 Annual growth
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	104.1	108.0	101.3	96.1	100.0	103.6	102.8	101.4	98.9	−0.20	−0.06
Agricultur/Forestry/fishery & Mining	61.5	67.3	67.0	79.5	100.0	101.2	99.8	97.0	92.0	2.46	−0.42
Manufacturing Total	89.0	94.3	92.7	87.1	100.0	103.4	103.4	102.3	99.4	0.58	−0.03
Foods/Beverages	100.3	98.8	96.7	90.5	100.0	98.4	100.4	102.0	102.9	−0.01	0.14
Textile/Pulp/Furniture	94.8	99.5	101.9	96.1	100.0	102.2	98.8	93.2	83.6	0.27	−0.89
Chemicals/Petroleum/Rubber/Ceramics	89.7	92.3	99.0	96.5	100.0	102.5	100.1	96.2	90.8	0.54	−0.48
Iron/Steel/Non-Ferrous/Metal Prod.	103.3	107.2	111.0	97.2	100.0	104.4	105.2	104.5	101.9	−0.16	0.09
Machinery	83.4	95.6	98.1	81.8	100.0	102.9	103.6	103.7	102.1	0.91	0.10
Transportation Equipments	88.9	101.5	90.1	85.0	100.0	102.2	100.5	98.3	94.7	0.59	−0.27
Other Manufacturing	79.9	88.6	79.5	96.3	100.0	96.3	97.0	97.3	97.3	1.13	−0.14
Construction/Civil Engineering	91.6	92.1	81.2	79.4	100.0	104.3	103.9	102.2	98.3	0.44	−0.09
Electricity/Gas/Water	122.7	124.8	127.9	114.7	100.0	104.0	104.4	104.7	104.6	−1.02	0.23
Service industry Total	115.7	116.6	106.7	100.4	100.0	103.7	102.6	101.2	98.9	−0.72	−0.05
Commerce/Finannce/Real Estate	125.9	122.2	108.7	94.7	100.0	99.7	96.6	94.2	92.4	−1.14	−0.39
Transport/Communicat/Information	128.9	135.8	120.5	112.2	100.0	101.0	99.2	97.0	93.6	−1.26	−0.33
Public Admin./Education/Medical	124.1	124.3	109.6	105.4	100.0	106.8	108.1	108.7	107.8	−1.07	0.38
Business Service	89.3	91.9	92.8	99.6	100.0	105.2	103.9	102.1	98.0	0.57	−0.10
Personal Service	117.8	123.4	110.6	95.0	100.0	100.7	97.9	94.6	90.5	−0.81	−0.50

Though the labor productivity increased relatively high (Tab. 1-5), why the wages per employee keep the same level? It is because the labor share reduced (Tab. 1-8). Comparing the labor share of total industry 54.4% in 2035 with 58.6% in 2015, the former reduction is by 4.2% from 2015. The share of Manufacturing industry reduced 4.1% much more than Service industry which reduced 3.5%. The Manufacturing industry of which targeted market is mainly domestic, such as Foods/Beverage, Iron/Non-Iron, Metal Products increase the labor share, but such industry confronted world competition as Machinery, Transportation Equipment, Other Manufacturing, decrease the labor share significantly. The labor share of Commerce/Finance/Real Estate which has the biggest share of 30% with total industry, decrease 3%.

Tab. 1-8. Labor Share (Real Wages/Real Value Added) (%)

	Historical					Forecast				2015/1955 difference ratio (%)	2035/2015 difference ratio (%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	61.4	60.1	55.6	57.1	58.6	58.6	57.4	56.0	54.4	95.4	92.9
Agricultur/ Forestry/ fishery & Mining	15.3	15.7	18.8	20.5	27.8	26.6	26.0	25.1	23.7	181.5	85.1
Manufacturing Total	48.9	49.3	50.6	51.0	58.3	57.7	56.9	55.8	54.2	119.3	92.9
Foods/ Beverages	32.2	29.9	31.3	33.0	39.9	39.6	40.6	41.3	41.5	124.0	104.0
Textile/ Pulp/ Furniture	57.3	54.8	53.1	56.1	67.8	67.2	66.2	64.6	61.8	118.3	91.2
Chemicals/ Petroleum/ Rubber/ Ceramics	27.0	27.7	32.1	32.5	37.6	37.3	35.9	34.4	32.6	139.1	86.7
Iron/ Steel /Non-Ferrous/ Metal Prod.	36.0	36.0	40.7	45.0	47.3	49.1	50.7	52.1	53.2	131.4	112.4
Machinery	70.4	72.2	67.2	61.0	65.3	62.2	60.4	58.0	55.6	92.7	85.2
Transportation Equipments	60.8	66.1	57.7	60.4	64.7	65.3	64.3	63.1	61.5	106.5	95.0
Other Manufacturing	59.0	63.9	59.5	63.3	81.0	75.4	73.7	71.1	68.5	137.3	84.5
Construction/ Civil Engineering	68.6	68.6	71.6	74.5	77.8	78.8	78.6	78.1	76.8	113.4	98.7
Electricity/ Gas/ Water	27.6	27.8	32.5	34.0	41.7	38.6	36.6	35.0	33.6	151.0	80.5
Service industry Total	58.7	56.9	51.4	53.8	52.7	52.9	51.8	50.5	49.2	89.9	93.3
Commerce/ Finannce/ Real Estate	46.0	43.6	36.6	34.0	34.0	34.1	33.0	31.9	31.0	73.9	91.2
Transport/ Communicat/ Information	66.3	61.3	54.8	54.3	50.1	49.7	48.5	47.3	46.0	75.6	91.9
Public Admin./ Education/ Medical	83.0	79.2	73.7	87.4	90.2	92.1	91.9	91.3	90.0	108.7	99.8
Business Service	67.4	62.5	59.5	61.9	56.9	52.6	48.8	44.9	42.1	84.4	74.0
Personal Service	47.6	49.6	47.6	51.9	49.2	48.9	47.8	46.3	44.4	103.5	90.1

*The value added by sectors are converted to real tem by domestic demand deflator.

The Annual Spring Wage Negotiation in 2018, with the recommendation of Prime Minister Abe and also with the support of Japan Business Federation, go end to relatively high wage increase. Against this result, they say that the shortage of workers in Japan beginning to apparent. In our model, the wage equation rely on the explanatory variables, the productivity with hours worked and time trend. Accordingly the forecasted wage is affected by the low increase since 2000 when the long stagnation continued. In the forecast after 2015, the wage obliged to stays relatively low level. In the future, if labor shortage becomes clearer, the labor share may increase higher than this forecast.

1-1-3. Shrinking Consumption and Investment

The low increase of wages, the limited labor share, the declining and aging population, all these are the cause of shrinking consumption. Even with the per capita consumption, it is also shrinking (Tab. 1-9). After 2015, consumption of every sector decrease. Looking at 2035/2015 difference ratio, in the Manufacturing sectors such as Textile/Pulp/Wooden products, Iron/Non-Iron/Metal products, Other Manufacturing and Electricity/Gas/Water decrease significantly, while in the Service sectors, Commerce/Finance/Real-Estate decrease considerably.

Tab. 1-9 Household Consumption] (Price in 2011, Trillion Yen)

	Historical					Forecast				2015/1955 difference ratio (%)	2035/2015 difference ratio (%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	271.0	281.2	283.5	276.3	281.5	286.9	279.7	269.1	255.1	103.9	90.6
Agricultur/ Forestry/ fishery & Mining	4.1	3.7	3.7	3.7	3.5	3.6	3.5	3.4	3.2	86.7	89.8
Manufacturing Total	73.4	70.0	67.0	64.5	63.0	64.8	62.8	60.2	57.0	85.9	90.4
Foods/ Beverages	31.9	29.9	28.0	26.4	25.0	25.6	25.0	24.3	23.6	78.4	94.1
Textile/ Pulp/ Furniture	7.1	6.4	4.6	3.7	4.0	3.9	3.9	3.7	3.4	55.6	84.6
Chemicals/ Petroleum/ Rubber/ Ceramics	11.4	11.9	11.4	10.7	9.2	9.5	9.2	8.9	8.6	80.1	93.7
Iron/ Steel /Non-Ferrous/ Metal Prod.	0.9	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.3	46.0	80.4
Machinery	4.2	4.5	5.4	6.8	7.2	7.6	7.4	7.1	6.7	171.1	93.3
Transportation Equipments	5.8	4.7	5.5	4.8	6.5	6.7	6.6	6.4	6.2	111.8	94.9
Other Manufacturing	3.9	3.3	2.9	2.2	2.3	2.5	2.4	2.2	2.0	60.1	88.0
Construction/ Civil Engineering	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.
Electricity/ Gas/ Water	8.1	8.8	8.7	9.4	8.4	8.6	8.0	7.2	6.2	103.7	73.5
Service industry Total	193.6	207.5	212.9	208.1	215.0	218.5	213.4	205.5	195.0	111.1	90.7
Commerce/ Finannce/ Real Estate	107.4	111.2	115.2	112.5	125.2	126.2	123.0	117.6	110.0	116.6	87.9
Transport/ Communicat/ Information	19.3	22.8	23.9	26.7	23.5	23.8	23.4	22.8	22.3	122.3	94.6
Public Admin./ Education/ Medical	17.6	17.1	19.8	22.4	20.6	21.8	21.7	21.2	20.4	116.9	98.9
Business Service	6.6	7.5	7.9	8.4	7.8	8.0	7.9	7.7	7.5	118.7	95.6
Personal Service	42.7	48.9	46.1	38.0	37.9	38.6	37.5	36.2	34.9	88.6	92.2
Household Consumprion per Capita (Million Yen)	215.8	223.5	224.7	218.4	222.2	226.0	219.7	211.1	199.9	103.0	90.0
Household consumtion ratio against GDP(%)	56.9	57.2	57.2	55.8	57.9	58.6	58.5	57.1	53.4		

The ratio of household consumption against GDP is declining gradually however if the investment can compensate the shortage of demand, then the level of GDP can keep its level. Looking at the investment by purchasing side, the 2035/2015 difference ratio of the total private investment in 2035 decrease to 87.5, the total manufacturing to 89.8 and the total service to 86.4 (Tab.1-10). Decrease of the Service industry investment is more than manufacturing. The difference 3.5% between the growth of Manufacturing investment and Services caused by the low growth of Commerce/Finance/Real Estate sector which takes the largest share of total Service investment more than 40%.

Looking at the ratio of investment against GDP, it gradually shrink after the peak in 2020 (Tab. 1-10). The investment is one of the basic factors of output however the output now is shrinking, then the investment should also shrink in parallel. But if the ratio of investment against GDP also decrease, we should worry about it from the view of international competitiveness. To adopt the shrinking demand, the labor-saving and also productivity increasing investment are indispensable for surviving Japanese industry.

The investment equation of this model is mainly consist of the output difference against preceding year and the capital stock of preceding year but for the forecast, the past gradual shrinking of investment since 1995 to 2014 affect significantly to the forecast of investment and as the result, the investment decrease gradually. The world economy is now turning point caused by big social change such as AI or IT, for catching up this great change, aggressive strategy for investment is required to Japan.

Tab. 1-10 Investment (Capital Goods Purchasing side) Price 2011 Trillion Yen)

	Historical					Forecast				2015/ 1955 difference ratio (%)	2035/ 2015 difference ratio (%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	94.6	89.8	89.7	74.9	80.4	82.5	78.8	75.0	70.3	85.0	87.5
Agricultur/ Forestry/ fishery & Mining	2.2	2.0	2.2	1.7	1.6	1.8	1.8	1.7	1.5	71.8	94.1
Manufacturing Total	27.8	27.6	27.1	23.7	24.9	25.3	24.4	23.5	22.3	89.6	89.4
Foods/ Beverages	2.0	2.1	1.8	1.6	1.6	1.6	1.5	1.4	1.4	79.2	86.5
Textile/ Pulp/ Furniture	2.3	2.0	1.6	1.4	1.5	1.6	1.5	1.4	1.3	67.6	82.7
Chemicals/ Petroleum/ Rubber/ Ceramics	3.0	2.7	2.6	2.0	2.2	2.3	2.2	2.1	1.9	73.2	86.0
Iron/ Steel /Non- Ferrous/ Metal Prod.	2.6	1.9	2.0	1.8	2.0	2.0	1.9	1.9	1.8	76.3	89.5
Machinery	2.0	2.2	2.5	2.6	2.7	2.7	2.6	2.5	2.3	135.7	86.6
Transportation Equipments	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.6	135.6	91.2
Other Manufacturing	0.4	0.7	1.0	0.9	1.0	0.9	0.9	0.9	0.8	228.1	86.7
Construction/ Civil Engineering	2.6	2.5	3.3	2.4	2.8	3.1	3.0	2.9	2.6	107.9	92.9
Electricity/ Gas/ Water	0.7	0.9	1.1	0.3	0.1	0.1	0.1	0.1	0.1	20.4	91.4
Service industry Total	131.1	121.7	120.5	99.2	108.0	111.2	105.7	100.2	93.4	82.4	86.5
Commerce/ Finannce/ Real Estate	75.3	71.2	69.8	58.8	63.4	65.0	61.8	58.7	54.9	84.2	86.7
Transport/ Communicat/ Information	32.3	25.3	23.2	17.3	20.1	19.5	18.2	16.9	15.6	62.1	77.9
Public Admin./ Education/ Medical	10.2	11.2	11.1	9.2	10.5	11.4	10.9	10.3	9.4	102.9	90.0
Business Service	2.6	2.9	2.8	1.5	1.3	1.3	1.2	1.2	1.2	49.0	93.3
Personal Service	10.7	11.0	13.6	12.3	12.8	14.0	13.6	13.0	12.2	119.3	95.2
Ratio of Private Investment Against GDP (%)	19.9	18.2	18.1	15.1	16.5	16.9	16.5	15.9	14.7		
Ratio of Government Investment Against GDP (%)	8.6	8.7	7.7	8.0	8.5	7.7	7.7	7.4	6.4		
Ratio of Total Investment against GDP (%)	28.4	26.9	25.8	23.2	25.0	24.6	24.2	23.3	21.2		

The capital stock in this model is calculated by the benchmark year method, namely capital stock of preceding year depreciated by depreciation rate and added current year investment. The capital equipment ratio is calculated by dividing capital stock by employment (Tab.1-11). The capital equipment ratio is reducing year by year. Looking at the difference of Capital equipment ratio, the difference ratio between 2015 and 2035 is higher than between 1995 and 2015, to adopt the reducing market, Japanese industry is decreasing the size of capital stock but the speed of decreasing of capital stock is much higher than the decrease of employment. This is the reason of decrease of the capital equipment ratio. Only Textile/Pulp/Furniture increase the capital equipment ratio and left all decrease.

Tab. 1-11 Capital Equipment Ratio (=Capital stock/ Employment)

	Historical					Forecast				2015/ 1955 difference ratio (%)	2035/ 2015 difference ratio (%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	230.6	180.5	145.2	119.9	100.0	92.6	89.4	86.2	82.6	43.4	82.6
Agricultur/ Forestry/ fishery & Mining	144.3	153.9	74.0	80.9	100.0	86.0	79.7	73.3	66.7	69.3	66.7
Manufacturing Total	208.4	219.8	163.0	124.3	100.0	98.0	98.4	97.0	94.4	48.0	94.4
Foods/ Beverages	220.4	347.4	204.7	123.5	100.0	95.9	94.3	91.2	87.0	45.4	87.0
Textile/ Pulp/ Furniture	117.5	177.0	126.4	116.0	100.0	103.4	108.1	109.6	108.7	85.1	108.7
Chemicals/ Petroleum/ Rubber/ Ceramics	211.8	230.0	171.7	125.1	100.0	97.5	97.9	96.0	92.5	47.2	92.5
Iron/ Steel /Non- Ferrous/ Metal Prod.	167.0	182.4	154.2	120.3	100.0	97.4	98.7	97.2	94.1	59.9	94.1
Machinery	115.7	174.0	156.9	122.8	100.0	94.9	95.8	95.5	95.0	86.4	95.0
Transportation Equipments	218.4	217.6	114.2	115.3	100.0	94.2	89.9	84.9	79.3	45.8	79.3
Other Manufacturing	114.5	193.0	227.7	141.4	100.0	100.2	102.0	101.5	99.2	87.3	99.2
Construction/ Civil Engineering	165.8	187.3	184.0	136.1	100.0	100.1	100.9	100.4	98.6	60.3	98.6
Electricity/ Gas/ Water	792.8	1585.3	1276.1	290.8	100.0	93.9	92.0	89.9	87.3	12.6	87.3
Service industry Total	260.4	169.9	160.0	128.7	100.0	93.7	90.8	87.9	84.7	38.4	84.7
Commerce/ Finannce/ Real Estate	215.2	160.4	152.0	124.3	100.0	92.2	90.0	88.4	87.7	46.5	87.7
Transport/ Communicat/ Information	373.8	167.5	129.2	111.4	100.0	91.4	88.2	84.5	80.6	26.7	80.6
Public Admin./ Education/ Medical	99.2	148.9	272.1	180.9	100.0	92.4	89.8	87.3	84.6	100.8	84.6
Business Service	81.3	318.1	222.3	140.5	100.0	97.8	94.8	92.2	86.0	123.0	86.0
Personal Service	69.4	143.4	126.1	114.9	100.0	98.7	95.6	91.5	86.6	144.1	86.6

* Capital stock is the total of private investment and government investment

Defining the new investment as deducting the depreciation of preceding year from the capital current year stock (total of private and government) and adding the current year investment, it is calculated by the model (Tab.1-12). The size of market is shrinking, accordingly the investment for production facilities should be also decrease. Accordingly the new investment, that is to say the expansion investment is seldom done in future. After 2015, looking at the annual growth rate, the new investment appears all minus except Agriculture/Forestry/Fishery/Mining. This exception is caused by governmental assistance for agriculture.

Tab. 1-12 New Investment (Private and Government Capital Goods Purchasing side) (Price 2011, Trillion Yen)

	Historical					Forecast				1995–2015 Annual growth rate(%)	2015–35 Annual growth rate(%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	58.27	79.81	82.72	72.10	81.98	84.74	80.95	77.41	73.30	1.72	-0.56
Agricultur/ Forestry/ fishery & Mining	17.49	17.97	6.14	5.18	8.60	9.75	9.88	9.71	9.40	-3.49	0.45
Manufacturing Total	9.59	16.30	21.74	21.19	22.43	22.75	21.42	20.28	18.99	4.34	-0.83
Foods/ Beverages	1.25	1.35	1.42	1.42	1.28	1.31	1.24	1.18	1.12	0.09	-0.68
Textile/ Pulp/ Furniture	1.52	1.23	1.25	1.28	1.35	1.38	1.30	1.25	1.18	-0.60	-0.67
Chemicals/ Petroleum/ Rubber/ Ceramics	1.82	1.86	2.12	1.81	1.97	2.01	1.88	1.77	1.65	0.40	-0.87
Iron/ Steel /Non-Ferrous/ Metal Prod.	1.45	1.05	1.52	1.58	1.61	1.62	1.52	1.45	1.37	0.52	-0.81
Machinery	1.11	1.23	1.95	2.25	2.48	2.55	2.40	2.28	2.14	4.10	-0.75
Transportation Equipments	-0.02	0.12	0.49	0.57	0.65	0.65	0.62	0.59	0.57	n.a.	-0.71
Other Manufacturing	0.23	0.52	0.92	0.90	0.97	1.00	0.95	0.91	0.86	7.37	-0.57
Construction/ Civil Engineering	1.63	1.57	2.59	2.08	2.31	2.34	2.17	2.02	1.86	1.74	-1.08
Electricity/ Gas/ Water	0.44	0.63	0.88	0.26	0.63	0.65	0.62	0.59	0.56	n.a.	-0.58
Service industry Total	1.16	0.77	0.95	1.47	1.59	1.56	1.45	1.36	1.26	1.62	-1.16
Commerce/ Finannce/ Real Estate	31.91	52.20	62.37	54.14	59.58	60.97	57.98	55.41	52.49	3.17	-0.63
Transport/ Communicat/ Information	8.59	19.10	17.35	12.27	15.76	16.22	15.65	15.18	14.65	3.08	-0.36
Public Admin./ Education/ Medical	7.05	10.29	16.31	13.27	13.45	13.92	13.12	12.35	11.49	3.28	-0.78
Business Service	1.94	1.84	2.15	1.19	1.09	1.12	1.07	1.03	0.99	-2.83	-0.51
Personal Service	7.48	7.61	11.09	10.83	11.87	11.99	11.23	10.59	9.89	2.34	-0.91

1-2. Export drives Japanese economy, reducing trade deficit

Under the reducing consumption and investment, the export is the only component which increase. The world economy is encountered with the many problem such as tariff increase by selfish U.S. President Trump, instability of North Korea, continued conflict in the Middle East however Japan should rely on the export which is the traction force of Japanese economy. Looking at the index based on 2015, in 2035 total export increase to 103.3, Manufacturing to 106.8, on the contrary total Service decrease to 93.3 (Tab. 1-13). In spite of Consumption and Investment decrease from 2015 t0 2035, tangible goods export increse so as to be only driving power of Japanese economy. From 1995 to 2020, the share of Manufacturing export in the total export decreased from 79.5% to 74.1%, however after 2020 to 2035, it again slightly increase from 73.7% to 76.7% (Tab. 1-14). The main cause of the increase is the big waited sector such as machinery and transportation equipment. The industrialization of East Asia demand to Japan plenty of production facilities and also high-performance intermidiate element.

Confronting shrinked domestic market, many industries obliged to develop overseas market or to move production to foreign countries. Japan is not able to prepare enough engineer or qualified person for overseas activities accordingly it should be very important how much human and capital resource to apply for that.

Tab. 1-13. Export by Sectors (Price 2011, Trillion Yen)

	Historical					Forecast				2015/1955 difference ratio (%)	2035/2015 difference ratio (%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	43.07	53.84	73.51	73.10	79.00	86.92	85.76	83.89	81.61	183.4	103.3
Agricultur/ Forestry/ fishery & Mining	0.04	0.07	0.08	0.11	0.12	0.12	0.12	0.12	0.11	305.3	96.6
Manufacturing Total	34.24	42.47	56.53	56.55	58.57	64.08	63.98	63.49	62.54	171.1	106.8
Foods/ Beverages	0.20	0.23	0.31	0.34	0.50	0.52	0.53	0.53	0.53	250.3	106.4
Textile/ Pulp/ Furniture	0.87	0.98	1.07	0.92	1.07	1.05	0.95	0.85	0.76	122.4	71.1
Chemicals/ Petroleum/ Rubber/ Ceramics	5.35	6.35	9.59	10.26	11.63	13.01	12.94	12.77	12.46	217.4	107.2
Iron/ Steel /Non-Ferrous/ Metal Prod.	4.41	5.11	6.34	6.57	6.61	7.19	7.21	7.21	7.15	150.1	108.2
Machinery	13.90	17.77	22.40	22.71	23.88	26.95	27.04	26.91	26.54	171.8	111.2
Transportation Equipments	8.95	11.33	16.00	14.76	14.18	14.65	14.62	14.53	14.41	158.5	101.6
Other Manufacturing	0.54	0.68	0.78	0.97	0.63	0.62	0.61	0.61	0.60	115.8	95.2
Construction/ Civil Engineering	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.a.	n.a.
Electricity/ Gas/ Water	0.03	0.03	0.05	0.04	0.08	0.09	0.09	0.08	0.08	272.4	100.0
Service industry Total	8.79	11.31	16.90	16.44	20.32	22.72	21.66	20.29	18.96	231.1	93.3
Commerce/ Finannce/ Real Estate	3.36	5.12	9.67	9.21	10.21	11.37	10.56	9.57	8.61	304.1	84.3
Transport/ Communicat/ Information	4.38	5.04	5.58	4.89	6.99	7.56	7.05	6.48	5.93	159.7	84.9
Public Admin./ Education/ Medical	0.02	0.03	0.04	0.36	0.19	0.22	0.22	0.22	0.22	940.0	117.6
Business Service	0.60	0.67	0.62	1.08	1.74	2.06	2.12	2.13	2.13	292.1	122.8
Personal Service	0.44	0.44	0.98	0.90	1.19	1.51	1.71	1.89	2.07	269.2	173.5

Tab. 1-14. Export Distribution Ratio (%)

	Historical					Forecast			
	1995	2000	2005	2010	2015	2020	2025	2030	2035
Total industry	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agricultur/ Forestry/ fishery & Mining	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Manufacturing Total	79.5	78.9	76.9	77.4	74.1	73.7	74.6	75.7	76.6
Foods/ Beverages	0.5	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.6
Textile/ Pulp/ Furniture	2.0	1.8	1.5	1.3	1.4	1.2	1.1	1.0	0.9
Chemicals/ Petroleum/ Rubber/ Ceramics	12.4	11.8	13.0	14.0	14.7	15.0	15.1	15.2	15.3
Iron/ Steel /Non-Ferrous/ Metal Prod.	10.2	9.5	8.6	9.0	8.4	8.3	8.4	8.6	8.8
Machinery	32.3	33.0	30.5	31.1	30.2	31.0	31.5	32.1	32.5
Transportation Equipments	20.8	21.0	21.8	20.2	17.9	16.9	17.0	17.3	17.7
Other Manufacturing	1.3	1.3	1.1	1.3	0.8	0.7	0.7	0.7	0.7
Construction/ Civil Engineering	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electricity/ Gas/ Water	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Service industry Total	20.4	21.0	23.0	22.5	25.7	26.1	25.3	24.2	23.2
Commerce/ Finannce/ Real Estate	7.8	9.5	13.2	12.6	12.9	13.1	12.3	11.4	10.5
Transport/ Communicat/ Information	10.2	9.4	7.6	6.7	8.8	8.7	8.2	7.7	7.3
Public Admin./ Education/ Medical	0.0	0.1	0.1	0.5	0.2	0.3	0.3	0.3	0.3
Business Service	1.4	1.2	0.8	1.5	2.2	2.4	2.5	2.5	2.6
Personal Service	1.0	0.8	1.3	1.2	1.5	1.7	2.0	2.2	2.5

The factor of increasing export depend on the world economy however this model include world demand and World price which are forecasted by BTM (Bi-lateral Trade Model of INFORUM).

The import function is composed by import share function. The dependent variable is the share of import against domestic demand and the explanatory variables are relative price and time trend. The import decrease in parallel with the decrease of domestic demand. The consumer goods and intermediate decrease relatively large, on the contrary, Machinery ad Transportation equipment decrease not so much (Tab. 1-15). The share of machinery import gradually increase and it means the horizontal international specialzation or deepning the international cooperation. Japan has no production of energy resources, accordingly, they should be imported. But the share of underground resources is about 30% of the total import and it does not change (Tab. 1-16).

Tab. 1-15. Import by Sectors (Price 2011 Trillion Yen)

	Historical					Forecast				2015/ 1955 difference ratio (%	2035/ 2015 difference ratio (%
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	68.29	74.93	82.52	79.18	92.96	94.24	91.63	87.46	82.79	136.1	89.1
Agricultur/ Forestry/ fishery & Mining	27.87	27.86	27.93	26.16	27.23	28.76	28.12	27.37	26.36	97.7	96.8
Manufacturing Total	31.15	37.20	44.18	42.96	54.31	54.35	52.67	49.86	46.88	174.4	86.3
Foods/ Beverages	5.80	6.64	6.71	5.41	6.43	6.28	6.10	5.76	5.40	110.8	83.9
Textile/ Pulp/ Furniture	4.63	5.54	6.12	5.45	6.01	5.87	5.68	5.34	4.90	129.8	81.4
Chemicals/ Petroleum/ Rubber/ Ceramics	8.04	9.35	9.75	9.88	13.20	12.75	12.25	11.55	10.87	164.3	82.4
Iron/ Steel /Non-Ferrous/ Metal Prod.	4.84	4.84	5.60	4.56	5.81	5.33	4.79	4.22	3.68	120.1	63.4
Machinery	3.86	6.82	10.94	13.27	17.11	18.26	18.12	17.51	16.83	443.6	98.4
Transportation Equipments	1.99	1.95	2.63	2.29	3.37	3.40	3.32	3.16	2.98	169.8	88.3
Other Manufacturing	1.99	2.05	2.43	2.10	2.37	2.47	2.41	2.32	2.22	119.0	93.7
Construction/ Civil Engineering	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.a.	n.a.
Electricity/ Gas/ Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.a.	n.a.
Service industry Total	9.27	9.87	10.42	10.06	11.42	11.13	10.83	10.23	9.55	123.1	83.6
Commerce/ Finannce/ Real Estate	1.12	1.35	1.37	1.81	2.56	2.37	2.18	1.92	1.64	229.1	64.2
Transport/ Communicat/ Information	3.59	4.29	4.43	3.97	4.73	4.65	4.53	4.29	4.03	131.9	85.1
Public Admin./ Education/ Medical	0.03	0.06	0.10	0.70	0.31	0.30	0.28	0.26	0.24	956.3	76.8
Business Service	1.09	1.30	0.96	1.20	2.79	2.87	2.95	2.96	2.92	255.9	104.6
Personal Service	3.45	2.86	3.57	2.39	1.03	0.95	0.89	0.81	0.73	29.9	70.3

Tab.1-16. Import distribution Ratio (%)

	Historical					Forecast			
	1995	2000	2005	2010	2015	2020	2025	2030	2035
Total industry	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agricultur/ Forestry/ fishery & Mining	40.8	37.2	33.8	33.0	29.3	30.5	30.7	31.3	31.8
Manufacturing Total	45.6	49.7	53.5	54.3	58.4	57.7	57.5	57.0	56.6
Foods/ Beverages	8.5	8.9	8.1	6.8	6.9	6.7	6.7	6.6	6.5
Textile/ Pulp/ Furniture	6.8	7.4	7.4	6.9	6.5	6.2	6.2	6.1	5.9
Chemicals/ Petroleum/ Rubber/ Ceramics	11.8	12.5	11.8	12.5	14.2	13.5	13.4	13.2	13.1
Iron/ Steel /Non-Ferrous/ Metal Prod.	7.1	6.5	6.8	5.8	6.2	5.7	5.2	4.8	4.4
Machinery	5.6	9.1	13.3	16.8	18.4	19.4	19.8	20.0	20.3
Transportation Equipments	2.9	2.6	3.2	2.9	3.6	3.6	3.6	3.6	3.6
Other Manufacturing	2.9	2.7	2.9	2.7	2.6	2.6	2.6	2.7	2.7
Construction/ Civil Engineering	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electricity/ Gas/ Water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Service industry Total	13.6	13.2	12.6	12.7	12.3	11.8	11.8	11.7	11.5
Commerce/ Finannce/ Real Estate	1.6	1.8	1.7	2.3	2.8	2.5	2.4	2.2	2.0
Transport/ Communicat/ Information	5.3	5.7	5.4	5.0	5.1	4.9	4.9	4.9	4.9
Public Admin./ Education/ Medical	0.0	0.1	0.1	0.9	0.3	0.3	0.3	0.3	0.3
Business Service	1.6	1.7	1.2	1.5	3.0	3.0	3.2	3.4	3.5
Personal Service	5.0	3.8	4.3	3.0	1.1	1.0	1.0	0.9	0.9

Looking at the trade balance, against the increse of export, the import decsrease as the result the deficit of trade gradually decrease (Tab. 1-17). The primary industry which include raw fuels the trade deficit continues constant level but the surplus of manufacturing industry increase. Especially the surplus of Chemicals/Petro-products/ Rubber/Ceramics, Iron/Steel/NonFerrous/Metal prod, Machinery/Transportation equipment continue to increse. While the growing big market of China, Japanese enterprize adopting the movement of globalization, taking thw strategy of tranferb of production facilities and reconstruction of world market.

Tab. 1-17. Trade Balance (Price 2011, Trillion Yen)

	Historical					Forecast			
	1995	2000	2005	2010	2015	2020	2025	2030	2035
Total industry	-25.22	-21.09	-9.02	-6.08	-13.95	-7.32	-5.87	-3.57	-1.18
Agricultur/ Forestry/ fishery & Mining	-27.83	-27.79	-27.85	-26.05	-27.12	-28.63	-28.00	-27.25	-26.25
Manufacturing Total	3.09	5.26	12.35	13.59	4.26	9.73	11.31	13.63	15.66
Foods/ Beverages	-5.61	-6.41	-6.40	-5.08	-5.93	-5.76	-5.57	-5.23	-4.87
Textile/ Pulp/ Furniture	-3.76	-4.56	-5.05	-4.53	-4.94	-4.82	-4.74	-4.49	-4.14
Chemicals/ Petroleum/ Rubber/ Ceramics	-2.69	-3.00	-0.16	0.38	-1.58	0.26	0.69	1.22	1.59
Iron/ Steel /Non-Ferrous/ Metal Prod.	-0.43	0.26	0.74	2.02	0.80	1.86	2.42	3.00	3.47
Machinery	10.04	10.94	11.46	9.43	6.78	8.68	8.92	9.40	9.72
Transportation Equipments	6.96	9.38	13.37	12.47	10.80	11.26	11.30	11.37	11.43
Other Manufacturing	-1.45	-1.38	-1.65	-1.13	-1.74	-1.85	-1.80	-1.72	-1.62
Construction/ Civil Engineering	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electricity/ Gas/ Water	0.03	0.03	0.04	0.04	0.08	0.09	0.08	0.08	0.08
Service industry Total	-0.48	1.44	6.48	6.38	8.90	11.59	10.82	10.06	9.41
Commerce/ Finannce/ Real Estate	2.24	3.77	8.31	7.41	7.66	9.00	8.38	7.65	6.96
Transport/ Communicat/ Information	0.79	0.75	1.16	0.93	2.26	2.91	2.52	2.19	1.90
Public Admin./ Education/ Medical	-0.01	-0.03	-0.06	-0.35	-0.12	-0.08	-0.06	-0.04	-0.01
Business Service	-0.50	-0.63	-0.34	-0.12	-1.05	-0.80	-0.84	-0.82	-0.78
Personal Service	-3.00	-2.42	-2.59	-1.49	0.16	0.56	0.82	1.08	1.34

1-3. Value Added and Intermediate Input

Looking at the distribution ratio of value added sectors, the share of manufacturing decrease gradually and service sectors increase (Fig. 1-7, Tab. 1-18). In the 2015, the share of service sector is 25.8% but it decrease in 2035. to 25.1%. On the contrary, total service sector increase or almost flat from 73.0% to 73.6%. In the manufacturing sector, Foods/Beverage, Transportation Equipment continue to be flat but the other sector decrease. In Electricity/Gas/Water sector, the Electricity has the largest wait but with the damage of East Japan greatb Earth quake in 011, it decreased but now it regained gradually (Tab. 1-19).

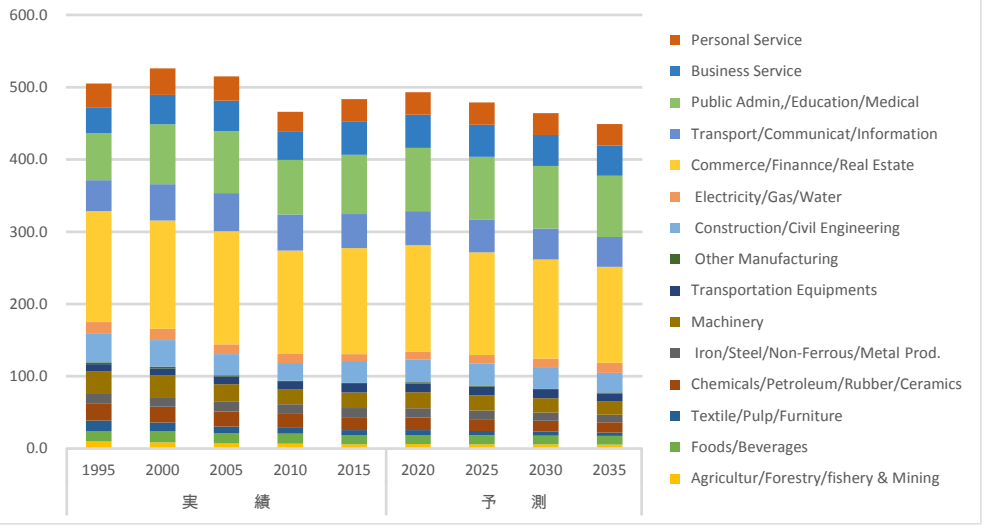
In the service sectors the most heavy weighted sector Commerce/Finance/Real Estate slightly decrease from 30.4% to 29.6%, Transportation/Communication /Information from 9.7% to 9.2%, Business Service from 9.4% to 9.3% on the contrary Public Administration/Education/Medical Service increase from 17.0% to 18.0%.

Looking at the value-added rate which is calculated with dividing value added by output, it is almost constant from 2015n to 2035 however Manufacturing slightly increase and Service decreased (Tab. 1-18). In the Historical period, except Construction /Civil Engineering, Transportation/Communication/Information and Business Service, Others are decreased. In the forecast of 2015 to 2035, the value added rate of Agriculture/Forestry/Fishery & Mining and Manufacturing increased. In the Manufacturing sectors, the increase of Textile/Pulp/Furniture is appearent. The Textile industry is obliged to make rationalization and the selection of excellent enterprise and it converted high value added industry. In the Transportation sector, including the Automotive industry make effort to keep investment to adopt the big technological change such as Automatic driving, sift of energy source from gasoline to electricity. The increase of Construction/Civil Engineering due to the recession caused by the shrink of government investment from the begining of 2000.

Tab. 1-18. Value Added Distribution Ratio (%)

	Historical					Forecast			
	1995	2000	2005	2010	2015	2020	2025	2030	2035
Total industry	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agricultur/ Forestry/ fishery & Mining	2.0	1.6	1.4	1.5	1.2	1.2	1.2	1.2	1.3
Manufacturing Total	32.7	29.9	26.6	26.6	25.8	25.9	25.8	25.6	25.1
Foods/ Beverages	2.8	2.9	2.7	3.0	2.7	2.6	2.6	2.6	2.7
Textile/ Pulp/ Furniture	2.9	2.3	1.9	1.7	1.4	1.3	1.2	1.1	1.0
Chemicals/ Petroleum/ Rubber/ Ceramics	4.6	4.2	4.0	4.3	3.6	3.5	3.4	3.3	3.2
Iron/ Steel /Non-Ferrous/ Metal Prod.	2.9	2.5	2.6	2.7	2.6	2.6	2.5	2.4	2.3
Machinery	5.9	5.7	4.7	4.4	4.4	4.5	4.4	4.2	4.0
Transportation Equipments	2.0	1.8	2.1	2.3	2.4	2.4	2.5	2.5	2.5
Other Manufacturing	0.5	0.4	0.3	0.4	0.4	0.3	0.3	0.3	0.3
Construction/ Civil Engineering	8.0	7.0	5.7	5.2	6.3	6.3	6.3	6.2	6.0
Electricity/ Gas/ Water	3.0	3.0	2.6	2.7	1.9	2.2	2.5	2.8	3.1
Service industry Total	65.3	68.5	72.0	71.9	73.0	72.8	73.0	73.2	73.6
Commerce/ Finannce/ Real Estate	30.4	28.5	30.4	30.7	30.4	29.9	29.7	29.5	29.6
Transport/ Communicat/ Information	8.4	9.5	10.2	10.7	9.7	9.6	9.4	9.3	9.2
Public Admin./ Education/ Medical	12.9	15.8	16.7	16.2	17.0	17.8	18.2	18.6	18.9
Business Service	7.0	7.7	8.2	8.3	9.4	9.3	9.3	9.2	9.3
Personal Service	6.7	6.9	6.5	6.0	6.5	6.3	6.4	6.5	6.7

Fig. 1-7. Value Added by Sectors (Nominal , Trillion Yen)



In this model, the intermediate inmput coefficient is not constant but from the historical value extract the trend index and forecast it from them. The intermediate input is calculated by multiplying intermediate input ratio by output. The intermediate input ratio is calculated by dividing intermediate input by output (Tab. 1-20).

Comparing the growth rate difference of intermediate input ratio from 1995 to 2015 with from 2015 to 2035, the latter ratio is smaller than the former. Looking at total industry, the former is 104.9 against the latter 99.9, the Manufacturing is 110.0 against 99.1, the Service is 105.3 against 103.5. The output is the total of the intermediate input and value added, then the reduction of intermediate input means the increase of value added. The Japanese industry is transforming high value added ones.

Tab. 1-19 Value Added Rate by Sectors (=Value Added/ Output) (%)

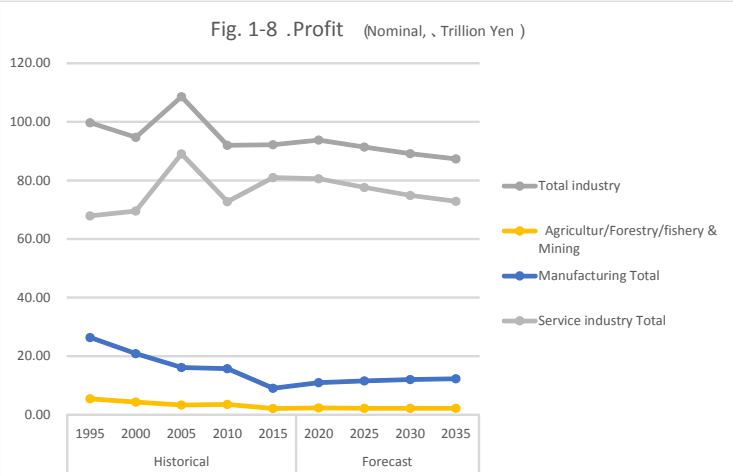
	Historical					Forecast				2015/ 1955 difference ratio (%)	2035/ 2015 difference ratio (%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	53.9	55.4	53.3	52.1	51.6	52.0	52.0	51.9	51.7	95.7	100.2
Agricultur/ Forestry/ fishery & Mining	56.4	56.4	53.0	50.8	47.4	48.1	48.3	48.6	49.0	84.0	103.3
Manufacturing Total	39.1	38.8	34.8	33.6	33.0	33.7	33.9	33.9	33.7	84.2	102.1
Foods/ Beverages	36.9	38.8	38.0	38.7	36.2	36.0	36.2	36.4	36.4	98.1	100.5
Textile/ Pulp/ Furniture	40.2	42.0	41.3	40.0	36.6	38.3	39.2	39.6	39.1	91.1	106.7
Chemicals/ Petroleum/ Rubber/ Ceramics	39.1	36.1	31.3	30.8	28.8	28.3	27.6	26.8	25.8	73.6	89.7
Iron/ Steel /Non-Ferrous/ Metal Prod.	34.7	36.3	30.0	26.1	26.3	26.8	26.7	26.4	26.0	75.8	98.9
Machinery	36.4	35.3	31.6	30.9	32.3	32.1	31.5	30.8	29.6	88.8	91.8
Transportation Equipments	24.0	23.3	20.9	20.7	22.6	23.2	23.3	23.3	23.2	93.9	102.8
Other Manufacturing	36.6	37.0	38.6	40.2	34.7	33.3	32.6	31.8	30.8	94.9	88.8
Construction/ Civil Engineering	46.1	47.4	46.3	47.7	49.3	52.1	53.6	55.0	55.9	107.0	113.4
Electricity/ Gas/ Water	57.9	55.7	48.1	45.4	31.7	35.4	37.7	40.0	42.1	54.8	132.8
Service industry Total	66.4	67.9	66.3	65.5	64.6	64.6	64.3	63.9	63.4	97.3	98.1
Commerce/ Finannce/ Real Estate	75.7	75.5	73.7	73.8	72.6	72.5	72.3	72.3	72.3	95.9	99.6
Transport/ Communicat/ Information	54.5	61.1	60.2	58.3	57.0	56.5	55.7	54.8	53.6	104.6	94.2
Public Admin./ Education/ Medical	67.9	70.6	66.7	65.4	63.0	64.1	64.2	64.2	63.8	92.7	101.4
Business Service	58.9	62.2	61.7	61.0	62.4	61.4	60.2	58.8	57.4	106.1	92.0
Personal Service	55.5	54.6	53.9	52.2	53.9	54.0	54.1	54.2	54.0	97.1	100.1

Tab. 1-20 Intermediate Input Ratio by Sectors (=Intermediate Input/ Output) (%)

	Historical					Forecast				2015/ 1955 difference ratio (%)	2035/ 2015 difference ratio (%)
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	46.1	44.6	46.7	47.9	48.4	48.0	48.0	48.0	48.3	104.9	99.9
Agricultur/ Forestry/ fishery & Mining	43.6	43.6	47.0	49.2	52.5	51.8	51.7	51.4	51.0	120.5	97.1
Manufacturing Total	60.9	61.2	65.2	66.4	67.0	66.3	66.1	66.1	66.4	110.0	99.1
Foods/ Beverages	63.1	61.2	62.0	61.3	63.7	63.9	63.8	63.6	63.7	100.9	99.9
Textile/ Pulp/ Furniture	59.8	58.0	58.7	60.0	63.3	61.7	60.8	60.4	60.9	105.9	96.2
Chemicals/ Petroleum/ Rubber/ Ceramics	60.9	63.9	68.7	69.2	71.2	71.6	72.4	73.2	74.2	116.9	104.3
Iron/ Steel /Non-Ferrous/ Metal Prod.	65.3	63.7	70.0	73.9	73.5	73.2	73.3	73.6	74.0	112.6	100.7
Machinery	63.6	64.7	68.4	69.1	67.6	67.9	68.5	69.2	70.4	106.3	104.1
Transportation Equipments	76.0	76.7	79.1	79.3	77.3	76.7	76.7	76.7	76.8	101.8	99.4
Other Manufacturing	63.4	63.0	61.4	59.8	65.2	66.7	67.4	68.2	69.2	102.9	106.1
Construction/ Civil Engineering	53.9	52.6	53.7	52.3	50.6	47.9	46.4	45.0	44.1	93.9	87.1
Electricity/ Gas/ Water	42.1	44.3	51.9	54.6	68.2	64.6	62.3	60.0	57.9	162.2	84.8
Service industry Total	33.6	32.1	33.7	34.5	35.4	35.4	35.7	36.1	36.6	105.3	103.5
Commerce/ Finannce/ Real Estate	24.3	24.5	26.3	26.2	27.4	27.5	27.7	27.7	27.7	112.9	101.1
Transport/ Communicat/ Information	45.5	38.9	39.8	41.7	43.0	43.5	44.3	45.1	46.4	94.4	107.8
Public Admin./ Education/ Medical	32.1	29.4	33.3	34.6	37.0	35.9	35.8	35.8	36.2	115.4	97.7
Business Service	41.1	37.8	38.3	39.0	37.5	38.6	39.8	41.2	42.6	91.3	113.4
Personal Service	44.5	45.4	46.1	47.8	46.1	45.9	45.8	45.8	46.0	103.5	100.0

1-4. Profit and Decrease of Profit Ratio

In pararell with the decrease of economic size, the profit also decrease (Fig. 1-8).In forecast period, the profit of total industry decrease from the peak in 2020. Agriculture/Forestry/Fishery,/Mining sector in which the Agriculture occupies the largest share, continue the almost same level, and the Manufacturing turns to increase from 2015 but in the same epoch the Service sector decrease. Transportation equipment slightly increase and Electricity/Gas/Water in which Electricity has a largest share, recover the damage of East Japan Great Earthquake. Service sectors except Personal service all decrease (Tab. 1-21).



Tab. 1-21. Profit by Sectors (Nominal, Trillion Yen)

	Historical					Forecast			
	1995	2000	2005	2010	2015	2020	2025	2030	2035
Total industry	99.71	94.73	108.54	91.99	92.18	93.80	91.40	89.10	87.35
Agricultur/ Forestry/ fishery & Mining	5.44	4.33	3.32	3.55	2.16	2.31	2.22	2.18	2.19
Manufacturing Total	26.39	20.86	16.15	15.73	9.05	10.95	11.57	12.04	12.29
Foods/ Beverages	2.83	4.20	4.07	4.43	3.07	2.99	2.86	2.77	2.63
Textile/ Pulp/ Furniture	2.97	2.25	1.71	1.34	0.19	0.25	0.21	0.14	0.04
Chemicals/ Petroleum/ Rubber/ Ceramics	4.19	3.02	2.51	2.50	1.68	1.61	1.41	1.18	0.95
Iron/ Steel /Non-Ferrous/ Metal Prod.	2.40	2.09	2.75	1.56	2.80	2.78	2.48	2.16	1.83
Machinery	5.63	3.97	1.33	1.86	0.74	1.03	0.95	0.80	0.59
Transportation Equipments	1.23	-0.12	0.65	0.97	0.78	0.82	0.85	0.88	0.91
Other Manufacturing	0.50	0.38	0.28	0.20	0.00	0.00	0.00	0.00	0.00
Construction/ Civil Engineering	3.08	2.55	1.82	0.57	1.31	1.41	1.37	1.31	1.22
Electricity/ Gas/ Water	3.56	2.53	1.03	2.31	-1.50	0.05	1.45	2.81	4.12
Service industry Total	67.88	69.53	89.08	72.72	80.98	80.54	77.61	74.88	72.87
Commerce/ Finannce/ Real Estate	45.70	46.23	61.09	51.84	55.75	55.21	53.11	51.14	49.68
Transport/ Communicat/ Information	5.28	6.81	9.58	6.75	9.53	9.34	8.79	8.33	8.02
Public Admin./ Education/ Medical	2.25	1.32	2.56	3.04	2.77	2.83	2.79	2.74	2.69
Business Service	5.27	6.83	7.59	5.67	6.30	6.31	6.06	5.75	5.46
Personal Service	9.37	8.33	8.26	5.41	6.62	6.86	6.87	6.91	7.01

The number of model sectors itself has 85 sectors and looking at 85 sectors, from 2011 to 2014, many sectors such as Textiles, Organic Chemicals, Petro refinery, Synthetic resins, Metal for construction, Electronic parts, Computers, and Automotive parts turned their profit to minus. These minus should owe to the domestic market and with the profit from overseas activities their profit total may register surplus.

Looking at the gross profit ratio which is calculated with dividing profit by output, total manufacturing sector the 2015/1955 difference ratio is minus 61.7% against 2035/2015 is plus 52.9 (Tab. 1-22). It will be significannt improvement. On the contrary, the service sectors, except such as Public Administration/Education/Medical service and Personal service, many sectors tend to get worth in forecast period compared with historical. The improvement of profit ratio owe to the effort to reduce intermediate input or wages in pararell with the reduction of output and in the manufacturing sector, the effort is not sufficient but it continue.

Tab. 1-22. Profit Ratio (=Profit/ Output)											(%
	Historical					Forecast				1995–2015 Annual growth	2015–35 Annual growth
	1995	2000	2005	2010	2015	2020	2025	2030	2035		
Total industry	10.64	9.97	11.22	10.29	9.84	9.89	9.93	9.97	10.05	-7.5	2.2
Agricultur/ Forestry/ fishery & Mining	31.13	28.40	24.57	26.36	17.28	18.35	18.29	18.49	19.05	-44.5	10.2
Manufacturing Total	6.25	5.16	4.10	4.26	2.39	2.88	3.18	3.44	3.66	-61.7	52.9
Foods/ Beverages	7.29	10.80	11.25	12.37	8.62	8.45	8.32	8.22	7.96	18.3	-7.6
Textile/ Pulp/ Furniture	8.17	7.72	7.29	6.73	1.00	1.42	1.35	1.06	0.36	-87.8	-63.7
Chemicals/ Petroleum/ Rubber/ Ceramics	7.07	4.97	3.85	3.81	2.74	2.64	2.38	2.07	1.73	-61.3	-36.9
Iron/ Steel /Non-Ferrous/ Metal Prod.	5.70	5.70	6.10	3.25	5.76	5.75	5.47	5.06	4.58	1.0	-20.4
Machinery	6.81	4.63	1.72	2.83	1.11	1.49	1.42	1.25	0.97	-83.8	-12.2
Transportation Equipments	2.93	-0.28	1.27	1.90	1.50	1.59	1.68	1.76	1.85	-48.6	23.1
Other Manufacturing	7.56	6.30	5.93	4.34	0.08	0.08	0.08	0.08	0.08	-98.9	0.6
Construction/ Civil Engineering	3.50	3.27	2.88	1.11	2.14	2.35	2.45	2.51	2.53	-38.9	18.4
Electricity/ Gas/ Water	13.45	9.10	3.68	8.41	-5.14	0.17	4.53	8.66	12.60	-138.2	-345.3
Service industry Total	13.65	13.11	15.92	14.21	14.82	14.49	14.27	14.08	13.96	8.6	-5.8
Commerce/ Finannce/ Real Estate	22.53	23.30	28.71	26.76	27.55	27.18	27.03	26.96	27.04	22.3	-1.9
Transport/ Communicat/ Information	6.75	8.30	10.99	7.89	11.53	11.17	10.86	10.59	10.41	70.7	-9.7
Public Admin./ Education/ Medical	2.35	1.12	1.99	2.63	2.13	2.07	2.05	2.03	2.02	-9.6	-5.0
Business Service	8.81	10.44	11.10	8.93	8.62	8.45	8.21	7.90	7.52	-2.2	-12.8
Personal Service	15.42	12.47	13.25	10.17	11.40	11.87	12.09	12.36	12.65	-26.1	10.9

Conclusion

In spite of increase of women's labor participation rate, Japanese labor force population decrease grdually because of the aging of Japanese population. On the other hand, the labor shortage will be barely avoided because of the increase of labor productivity.

Though the growth of labor productivity is higher than the growth of economy, the growth of real wage is lower than the labore productivity. It means the labor share is shrinking and it is the main reason of shrinking household consumption and that is the most important problem of Japanese economy.

Appendix I:

Part2: Structur

Summary

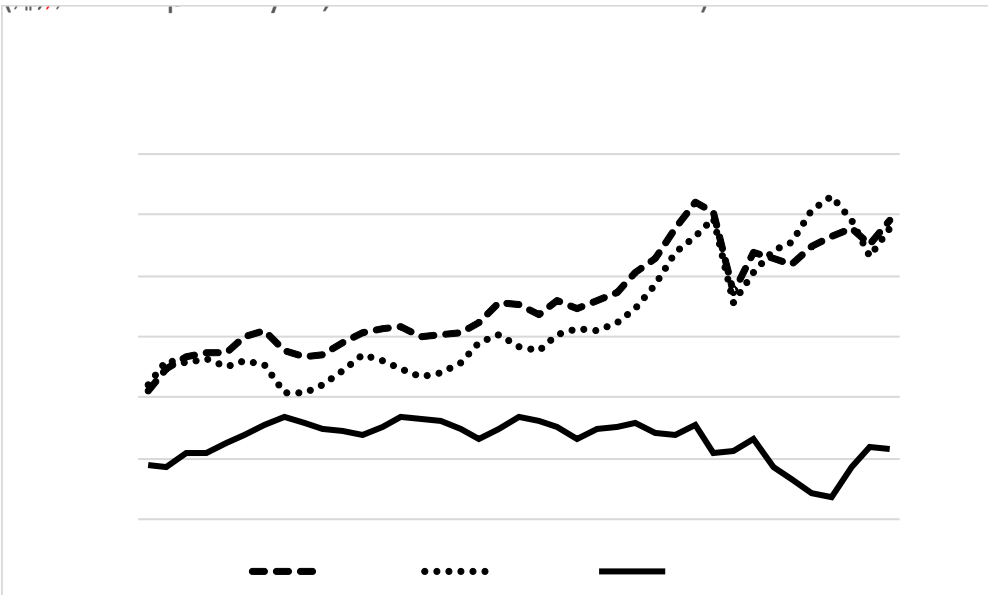
Base line assumption of JIDEA91 model simulation
--Economic structure from 1995 to 2014 assumed to be stable
--Recent year 2014 to 2015 the simulation result is controlled by actualor provisional data of SNA.
--The additional government investment and consumprion in 2014-2015 spent for East Japan Earthquake is included.
--The programmed increase of the consumer tax in2014 from 5% to 8% and in Oct. 2019 from 8% to10% are included.
--THe intermediate input coefficient matrix is extended by historical trend (1995-2014) until 2035.

The main exogenous variable
--The population forecasted by National Institute of Population and Social Securities Research on Dec. 2017 with medium mortality assumption.
--The labor participation rate and labor productivity are extended by historical growth rate.
--THe exchange rate is fixed until 2035 by monthly average rate 2017:1 dollar =112.16 yen
--The fossil fuel price is fixed at 2017 level until 2035: 1barrel=52.91 dollar
--The world import demend from Japan and Japanese import price from the world are prepared by BTM.
--Government investment is extended by one year lagged value.

Japanese trade balance at customs clearance base has accumulated surplus since late 1960's, except the periods of the oil crisis in 1973 and 1979. However, the highly appreciated yen initiated by the Plaza agreement in 1985, has prompted Japanese manufacturing firms to shift their domestic production facilities to overseas, and so-called reverse imports of Japanese firms have become popular, especially for consumer products for daily use. This put the Japanese trade surplus in diminishing trends though Japan still enjoyed surplus up to 2010. The East Japan Great Earthquake hit Japan in 2011, stopped operation of Japanese nuclear plants, forced to replace them with the fossil fuel one.
The huge imports demands for energy to generate by the fossil fuel changed the trade balance into deficits. Though trade surplus resumed owing to the fall of oil prices after 2016, it is predicted to change into deficits again if oil price resumes high.
The aim of this paper is to identify if the shrinking trends in trade surplus observed before the Great Earthquake still remaining even after Japanese population starts decreasing and less consuming aged population is increasing in number.
With the projection by JIDEA91, we find that Japanese trade surplus will be increasing in trends mainly because of the shrinking import demand as the domestic demands will diminish caused by the population decrease.

1. The diminishing trends of Japanese trade surplus

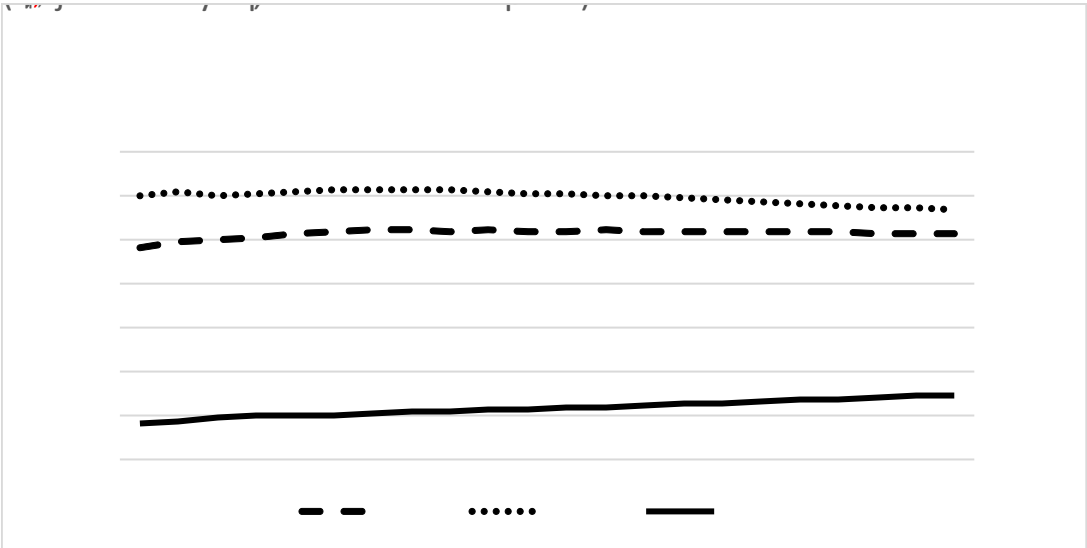
Japanese trade balance at customs clearance base has accumulated surplus since late 1960's, except the periods of the oil crisis in 1973 and 1979. However, the highly appreciated yen initiated by the Plaza agreement in 1985, has prompted Japanese firms to shift their domestic production facilities overseas, and so-called reverse imports of Japanese firms have become popular, such as consumer products for daily use replacing products of domestically made which lose their price competitiveness. This put the Japanese trade surplus in diminishing trends as companies started importing their products produced overseas replacing domestically produced ones though Japan still enjoyed surplus up to 2010.
The East Japan Great Earthquake hit Japan in 2011, stopped operation of Japanese nuclear power plants, forced to replace them with the fossil fuel ones.
The huge imports demands for fossil fuel changed the trade balance into deficits. Though trade surplus resumed owing to the fall of oil prices after 2016, it is predicted to change into deficits again if oil price (resumes) high. (Chart1)



Source: Baseline projection result by JIDEA91

2. Shrinking Japanese Economy

When projecting Japanese Economy toward 2035, it will shrink mainly as the consumption of which constitutes 80% of GDP, will be expected stagnant.
This attributes to the followings; 1. the real disposable income will be diminishing as labor contribution rate are expected to remain in downward trends as the globalization prevails, 2. as aged population increases, the consumption per capita will be expected to decrease, 3. total population in number is to decrease, 4. domestic investment are not expected as a driving force for economic growth as Japanese economy are mature with sufficient supplying capacity, and companies invest overseas instead of domestic markets.
Regarding export, the demands for Japanese products will be moderate as the growth of world economy is not gaining, and the developing economies are energetic in expanding their exports causing severe competition. In import, though we expect some increase up to 2020 when the Olympic games is held, it may decrease afterward as the population decrease.
As a result, the trade deficit in real term will gradually shrink from 9,006billion yen in 2017 to 1,181billion yen in 2035. On the contrary, trade balance in nominal term showed surplus in 906 billion yen, plunged into deficit in 2017 and is expected to resume surplus only in 2031. (Table1-3, Chart2)



Source: Baseline projection result by JIDEA91

Baseline projection assumption of JIDEA91 model
- The population forecasted by National Institute of Population and Social Securities Research in Dec. 2017. Medium mortality and Medium fertility assumption is adopted.
- The exchange rate is fixed by average rate in 2017; 1 dollar=112.16 yen, for the whole projection period.
- The fossil fuel price is fixed at 52.91 dollar per Barrel in 2017 and afterwards, which is derived from the actual import price of crude oil in 2017.
- World import demand from Japan and Japanese import price from the world are prepared by BTM[6].
- Government investment is extended by one year lagged value.
- The programmed increase of the consumer tax in Oct. 2019 (from 8% to 10%) are

[6] Bi-lateral Trade Model of INFORUM, see Qing Ma, “A Bilateral Trade Model for the INFORUM International System”, September 1996.

included.

Table1. Baseline Projection (Final Demand side) (Unit:2011 constant price, billion yen)

	2016	2017	2020	2025	2030	2035
Intermediate Total	475,283	477,434	489,023	483,741	479,749	473,773
Household Cons.	280,958	281,806	286,918	279,695	269,061	255,139
Outside Household Cons.	13,081	12,986	12,659	11,522	10,367	9,187
Government Cons.	89,054	88,657	89,699	87,632	85,161	82,049
Private Sectors Inv.	82,186	81,917	82,546	78,826	75,048	70,315
Public Sectors Inv.	23,616	23,299	22,219	20,229	18,168	16,090
Inventry Change	2,286	2,286	2,286	2,286	2,286	2,286
Export of Goods & Services	80,754	82,868	86,918	85,761	83,894	81,608
Import Goods & Services	△ 90,715	△ 91,874	△ 94,237	△ 91,630	△ 87,459	△ 82,789
Trade Balance	△ 9,960	△ 9,006	△ 7,319	△ 5,869	△ 3,565	△ 1,181
Output Total	956,501	959,377	978,030	958,059	936,271	907,652
GDP	481,221	481,945	489,009	474,321	456,526	433,884

Source: Baseline projection result by JIDEA91

Table2. Baseline Projection (Nominal:Final Demand side) (Unit: Billion yen

	2016	2017	2020	2025	2030	2035
Intermediate Total	432,009	451,637	454,768	441,507	429,353	419,762
Household Cons.	277,065	281,962	284,665	278,224	269,962	260,859
Outside Household Cons.	12,924	12,987	12,583	11,612	10,655	9,708
Government Cons.	93,309	93,787	95,187	93,950	92,343	90,464
Private Sectors Inv.	79,518	80,226	79,649	Household	69,923	64,905
Public Sectors Inv.	23,522	23,676	23,051	21,359	19,522	17,649
Inventry Change	2,238	2,258	2,233	2,214	2,197	2,202
Export of Goods & Services	85,015	88,947	92,457	90,190	87,143	83,904
Import Goods & Services	△ 84,109	△ 94,080	△ 96,433	△ 93,142	△ 87,496	△ 80,508
Trade Balance	906	△ 5,134	△ 3,976	△ 2,952	△ 353	3,396
Output Total	921,490	941,399	948,158	920,659	893,600	868,940
GDP	489,483	489,764	493,392	#VALUE!	464,250	449,182
Export of Goods	63,363	66,590	69,134	68,257	66,824	65,035
Import of Goods	73,626	83,121	85,061	82,002	76,924	70,613
Trade Balance(Goods)	10,264	16,531	15,927	13,745	10,100	5,577
Export*	**72,382**	**76,069**	**78,974**	**77,972**	**76,336**	**74,292**
Import*	**66,497**	**75,072**	**76,823**	**74,061**	**69,475**	**63,775**
Trade balance*	**5,885**	**997**	**2,151**	**3,911**	**6,861**	**10,518**

* customs clearance base

Source: Baseline projection result by JIDEA91

Table3. Baseline Projection (Nominal:Value Added side) (Unit: Billion yen

	2016	2017	2020	2025	2030	2035
Compensation for emplyees	268,625	268,274	269,884	260,349	250,102	239,003
Outside Household Cons.	13,332	13,322	12,847	11,601	10,360	9,144
Operating surplus	92,610	93,789	93,803	91,399	89,102	87,346
Indirect taxes	33,527	34,028	35,662	34,825	34,029	33,413
Fixed capital depreciation	84,838	84,744	84,815	84,474	84,020	83,578
Current subsidies	△ 3,851	△ 3,842	△ 3,786	△ 3,601	△ 3,417	△ 3,243
Value added Total	489,082	490,315	493,225	479,047	464,195	449,241

Source: Baseline projection result by JIDEA91

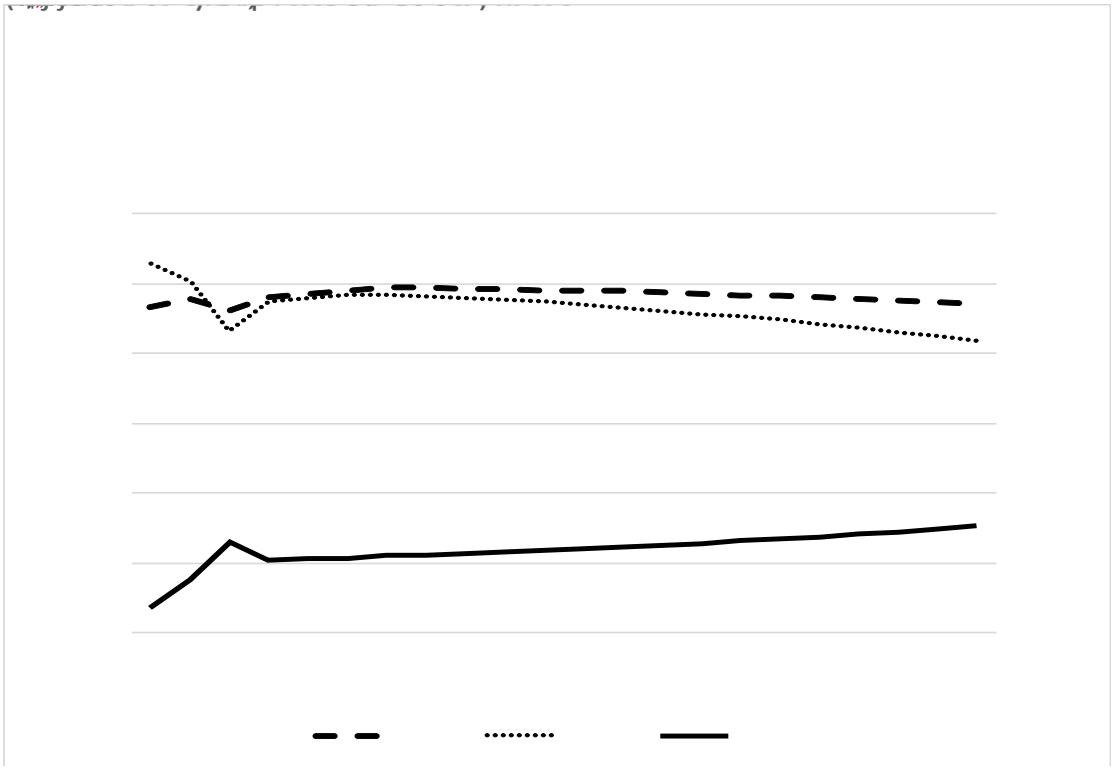
3. The trends of the expanding trade surplus adjusted for customs clearance base

Import is derived from domestic demands. In Japan, the number of population starts decreasing in 2006, simultaneously that of aged is increasing who consumes less. This means that Japan launches into new phase that domestic demands shrink making per capita consumption smaller.

Consumption = Per capita consumption * Population
Thus, Import = Per capita Import * population

Therefore we assume that reverse imports which became popular in1990s is to shrink as the domestic demand decreases.

The projection result of trade adjusted to customs clearance base shown at section2(nominal, final demand side) shows that trade balance changed into surplus in 2016 and is estimated to start increasing after 2018 as depicted at Table2 and Chart3.



Source: Baseline projection result by JIDEA91

Table4 shows the top 15 industries which contribute most to expansion of trade surplus/deficit for the projection period from 2017 to 2035

Looking into the industries that expand the trade surplus, Petro refin prod, Electric dev&pats, General machinery, Prod. Machinery, Non-ferrous metl, Medicaments, Apparel&tex. prod., Lumber&wood prod., Electronic device, Plastic prod, Iron & steel, Metallic ore, Misc manufct. prd, Miscl metal prod and Final chem prod are on the list.

Among these 15 industries, 9 industries excluding Electric dev&pats, Lumber&wood prod., Plastic prod, Iron & steel, Miscl metal prod and Final chem prod are the large scale importer recording per capita import exceeding 10 thousand yen in 2017. (see also Table5)

Table 6 shows the top ten industries which increase/decrease the export between 2017 and 2035. Total amount of the increase of the export during the period is 1,776 billion yen though that of the import is 11,297 billion yen.

This suggests that the decreases of import by these industries caused by the diminishing demands by decrease in population, have much affected the trade balance by shrinking deficit.

Table4. Top 15 industries of nominal trade balance (customs clearance base) whose incease/ decrease are the largest between

(Unit: billion yen)

No.	Industry name	2017	2020	2025	2030	2035	2035-2017
44	Computer&accessry	1,092	1,502	1,967	2,338	2,501	1,409
36	Business machinry	18	151	430	634	730	748
45	Motor vehicles	9,645	9,523	9,337	9,137	9,004	641
9	Beverage&tobacco	1,561	1,725	1,951	2,172	2,160	599
38	Electro component	1,818	1,802	1,599	1,413	1,263	555
47	Ships & repair	1,215	1,093	947	799	688	527
18	Petchem basic prod	815	843	781	717	635	180
11	Textile products	132	112	56	12	29	161
46	Motv. parts&accsr	4,733	5,008	4,908	4,790	4,640	93
26	Rubber product	342	347	308	284	265	77
50	Misc transp equip	175	176	167	162	160	15
20	Synthic resin&fib	695	720	700	689	688	6
3	Agric. servi	0	0	0	0	0	0
28	Cement&cement pr	18	19	19	21	22	4
40	Househol electric	571	611	641	623	567	4
22	Final chem prod	993	1,103	1,169	1,249	1,322	329
33	Miscl metal prod	223	297	395	484	561	339
51	Misc manufct. prd	2,275	2,375	2,287	2,112	1,922	353
6	Metallic ore	3,026	3,081	3,004	2,849	2,640	386
30	Iron & steel	3,737	4,003	4,068	4,133	4,165	429
25	Plastic prod	985	1,116	1,212	1,332	1,425	440
37	Electronic device	1,784	1,966	2,039	2,166	2,301	517
13	Lumber&wood prod.	955	876	708	553	421	534
12	Apparel&tex.prod.	4,211	4,097	4,032	3,784	3,395	816
21	Medicaments	1,681	1,569	1,344	1,067	790	892
31	Non-ferrous metl	760	723	423	71	317	1,077
35	Prod. machinery	6,559	7,140	7,513	7,815	7,698	1,139
34	General machinry	3,036	3,380	3,663	3,953	4,206	1,171
39	Electric dev&pats	2,698	3,080	3,444	3,791	4,082	1,384
23	Petro refin prod	1,597	1,207	479	253	887	2,484
	Total	997	2,151	3,911	6,861	10,518	9,521

Note: Colored cells indicate per capita imports exceed 10 thousand yen in 2017.

Source: Baseline projection result by JIDEA91

Table5. Top 15 industries of nominal Import (customs clearance base) whose incease/ decrease are the largest between 2017 and 2035.

(Unit: billion yen, million yen*)

No.	Industry name	2017	2020	2025	2030	2035	2035-2017	Per capita import	
								2017	2035
23	Petro refin prod	3,670	3,419	2,731	2,033	1,387	2,284	0.029	0.012
35	Prod. machinery	1,457	1,334	947	521	399	1,058	0.012	0.003
21	Medicaments	2,219	2,149	1,936	1,666	1,385	834	0.018	0.012
43	Houshol electrnic	3,560	3,681	3,441	3,118	2,743	817	0.028	0.024
12	Apparel&tex.prod.	4,346	4,236	4,174	3,931	3,546	801	0.034	0.031
39	Electric dev&pats	1,119	1,072	913	744	585	534	0.009	0.005
13	Lumber&wood prod.	994	917	749	594	461	533	0.008	0.004
51	Misc manufct. prd	2,895	2,957	2,831	2,619	2,404	491	0.023	0.021
6	Metallic ore	3,088	3,143	3,063	2,905	2,693	395	0.024	0.023
31	Non-ferrous metl	3,294	3,373	3,278	3,117	2,928	366	0.026	0.025
33	Miscl metal prod	688	651	541	431	334	354	0.005	0.003
49	Aircraft & repair	1,186	1,198	1,099	971	836	350	0.009	0.007
45	Motor vehicles	1,176	1,169	1,084	965	839	337	0.009	0.007
41	Applied electrnic	1,004	989	905	800	683	321	0.008	0.006
34	General machinry	1,298	1,316	1,236	1,116	977	321	0.010	0.008
40	Househol electric	863	916	940	914	847	16	0.007	0.007
47	Ships & repair	72	73	70	66	62	10	0.001	0.001
48	Rolling stock&rep	15	15	14	12	11	5	0.000	0.000
28	Cement&cement pr	16	17	16	14	12	4	0.000	0.000
50	Misc transp equip	133	141	141	137	130	4	0.001	0.001
2	Livestock	46	49	49	47	43	4	0.000	0.000
3	Agric. servi	0	0	0	0	0	0	0.000	0.000
18	Petchem basic prod	29	32	34	34	32	3	0.000	0.000
20	Synthic resin&fib	738	797	815	789	751	13	0.006	0.007
26	Rubber product	749	807	826	812	777	28	0.006	0.007
17	Chem.fert&Inorgnic	569	619	641	630	611	42	0.004	0.005
36	Business machinry	1,895	2,025	2,110	2,131	2,066	171	0.015	0.018
37	Electronic device	3,248	3,448	3,518	3,500	3,425	177	0.026	0.030
44	Computer&accessry	2,567	2,861	3,028	3,110	2,991	424	0.020	0.026
9	Beverage&tobacco	1,725	1,906	2,141	2,374	2,369	644	0.014	0.021
	Total	75,072	76,823	74,061	69,475	63,775	11,297	0.593	0.554

Note: Colored cells indicate per capita imports exceed 10 thousand yen in 2017.

Source: Baseline projection result by JIDEA91

Table6. Top 15 industries of nominal Export (customs clearance base) whose incease/ decrease are the largest between 2017 and 2035. (Unit: billion yen)

No.	Industry name	2017	2020	2025	2030	2035	2035-2017
44	Computer&accessry	1,475	1,359	1,061	772	490	985
45	Motor vehicles	10,821	10,692	10,420	10,102	9,843	978
38	Electro component	2,728	2,779	2,522	2,216	1,923	805
43	Houshol electrnic	950	855	645	460	311	638
36	Business machinry	1,914	1,874	1,680	1,497	1,337	577
47	Ships & repair	1,287	1,166	1,017	865	750	538
46	Motv. parts&accsr	5,980	6,259	6,100	5,880	5,616	364
11	Textile products	515	474	372	274	183	332
18	Petchem basic prod	844	875	816	751	667	177
42	Miscl electric m.	1,341	1,423	1,383	1,294	1,192	148
51	Misc manufct. prd	620	582	544	507	482	138
49	Aircraft & repair	1,077	1,133	1,121	1,074	1,011	66
29	Pottery&china	543	533	516	498	486	57
26	Rubber product	1,091	1,154	1,134	1,096	1,042	49
16	Printing&book bind	42	39	30	20	11	31
20	Synthic resin&fib	1,432	1,517	1,515	1,478	1,439	7
12	Apparel&tex.prod.	136	138	142	147	151	15
9	Beverage&tobacco	164	181	190	202	209	45
19	Orgnic chem. prod	2,259	2,381	2,384	2,348	2,309	50
21	Medicaments	538	580	591	599	596	58
17	Chem.fert&Inorgnic	444	480	495	507	516	71
35	Prod. machinery	8,016	8,473	8,460	8,337	8,096	81
22	Final chem prod	2,052	2,194	2,211	2,207	2,180	128
30	Iron & steel	4,740	5,026	5,033	5,017	4,924	184
23	Petro refin prod	2,074	2,212	2,252	2,286	2,274	200
25	Plastic prod	1,881	2,046	2,110	2,163	2,180	299
37	Electronic device	5,032	5,414	5,557	5,666	5,727	694
31	Non-ferrous metl	2,534	2,650	2,854	3,046	3,245	712
39	Electric dev&pats	3,818	4,152	4,357	4,535	4,667	849
34	General machinry	4,334	4,696	4,899	5,069	5,183	849
	Total	76,069	78,974	77,972	76,336	74,292	1,776

Source: Baseline projection result by JIDEA91

4. The effects of exchange rate change on the trade balance

Baseline projection is carried out by fixing exchange rate at 1 dollar=112.16 yen for the projection period. In order to find the effects of the exchange rate fluctuation, we conducted two simulations; Simulation1: appreciation by 20% gradually up to 2035, Simulation 2 : depreciation by 20% gradually up to 2035[7].

Appreciation case:

[7] Regarding the methodology of the exchange rate simulation, "Dollar Exchange Rate and the U.S. Current Account Adjustment: Macroeconomic and Industrial Impacts" ,by Jeffrey F. Werling p.9, is referred.

We obtained the following results;

Increase of domestic demand by expanding consumption, encouraged by the increase in real disposable income derived from lower consumption deflator triggered by import price down. (Table7)

Regarding foreign demand, it shrinks as export diminishes with decreasing price competitiveness by the appreciated yen, and import expands.

In this simulation of yen appreciated by 20% by 2035, foreign demand decrease exceeds slightly the increase of consumption, then real GDP shrinks though both domestic and foreign demand are nearly equal.

Depreciation case:

When depreciated by 20%, though foreign demands affect positively to economic growth by increasing export and reducing import, consumption is to shrink because of decreased real income affected by the rising domestic demand deflator, and investment because of decreased domestic demand. That the decrease of domestic demand surpasses the increase of foreign demand, leads to the decrease in real GDP.

In both cases, the real GDP shrinks however, the effects are larger in the case of appreciated yen simulation than in the case of depreciated yen simulation.

Contrary to the popular comments[8] in Japan, the simulation suggests that appreciated yen is favorable for economic growth.

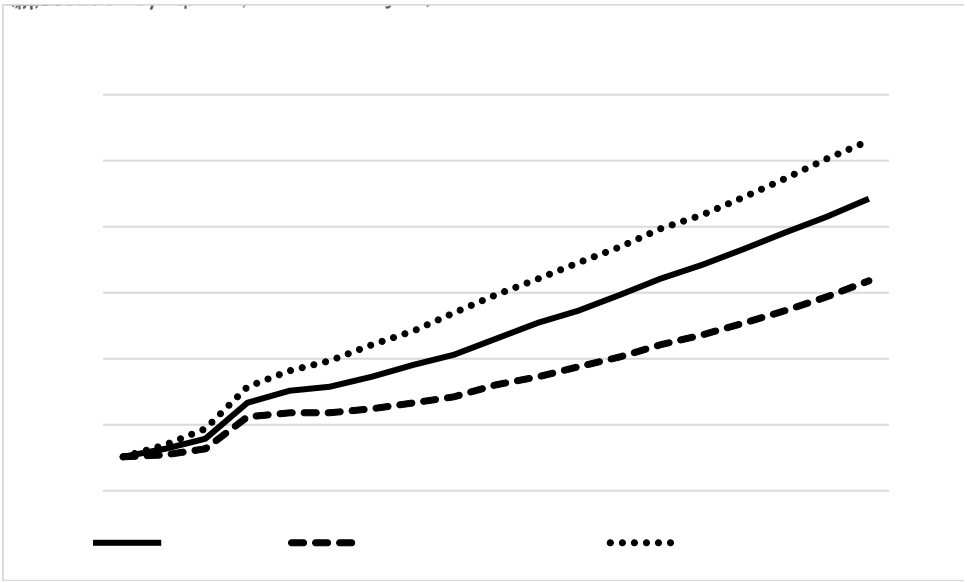
Table7. The effects of exchange rate changes on the real growth rate of GDP

(Unit: %)	Appreciation		Depreciation	
	Sign	Change	Sign	change
Domestic Demand	＋	0.4	－	△ 0.7
Consumption	＋	0.6	－	△ 0.8
Investment	－	△ 0.1	－	△ 0.3
External Demand	－		＋	
Export	－	△1.3	＋	0.8
Import	－	1.7	＋	△ 1.4
Real GDP growth rate	－	△ 0.1	－	△ 0.3

Note: Sign indicates the difference between baseline and simulation result in 2035.
Source: Simulation result by JIDEA91

Chart4 is the simulation results of the trade balance in real term by varying the exchange rates.

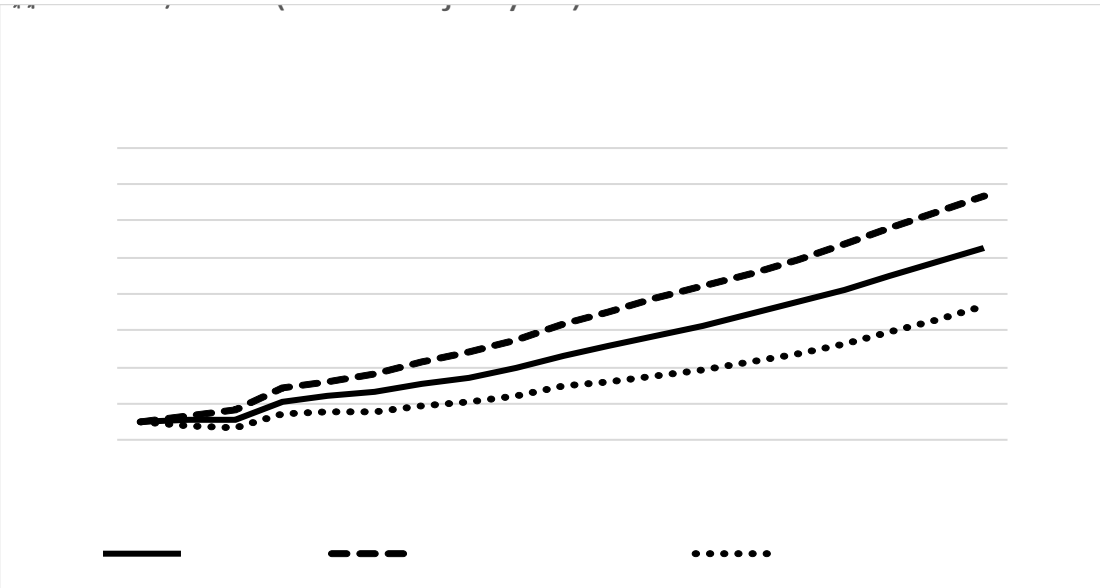
[8] Keidanren Growth Strategy 2011: Accelerating Growth through Private-Sector Dynamism states ” a strong yen have severely negative impacts on corporate business and employment.”



Source: Simulation result by JIDEA91

Chart5 depicts the simulation results of the nominal trade balance adjusted to the customs clearance base by varying the exchange rates.
Contrary to the real base simulation, the yen appreciation affects expanding trade surplus and the depreciated yen shrinking deficit in nominal term.
This is because the effects of price changes by exchange rate fluctuation is larger than that of quantitative changes in trade balance, the simulation results contradict in nominal and in real. (Table8)

Trade balance X M PxQx PmQm
Given to nominal export: PxQx, nominal import:M PmQm,
export price:Px, import price:Pm,
export quantity(real export):Qx, import quantity(real import):Qm



Source: Simulation result by JIDEA91

Table8. The influence for export and import by changing exchange rate in 2035

		Value(nominal)	Price	Quantity(real)
Appreciation by 20%	export	△ 0.081	△ 0.065	△ 0.017
	import	△ 0.139	△ 0.158	0.019
Depreciation by 20%	export	0.077	0.066	0.011
	import	0.139	0.153	△ 0.015

Note: 1. Figures in the table are difference in 2035 between baseline and projection.
2. Price are calculated by deducting quantity from value.

Source: Simulation result by JIDEA91

Reference

Jeffrey F. Werling ; Macroeconomic and Industry Impacts of Currency Valuation: A Global Modeling Analysis, 2005-06-01, http://www.inforum.umd.edu/papers/wp/wp/2005/wp05002.pdf
Jeffrey F. Werling ;Dollar Exchange Rate and the U.S. Current Account Adjustment: Macroeconomic and Industrial Impacts, 2004-08-01,
http://www.inforum.umd.edu/papers/wp/wp/2004/wp04001.pdf