Negative Deindustrialization: Japanese Experiences

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Abstract

The strongest yen's appreciation in 2011 made many Japanese companies choose overseas operations. The general public is worrying that this choice may put them out of work. Contrary to this public debate, an orthodox academic debate argues that deindustrialization is the natural outcome of a successful economic development in advanced economies, emphasizing the success of the service economy in the USA. However, there are several evidences to prove that current Japanese deindustrialization is a negative one. Why does Japanese economy fail to realize a positive deindustrialization along the lines of the USA, Netherlands, or Norway? This paper develops a system dynamics model and examines important features of negative deindustrialization. Foreign direct investment largely affects manufacturing employment and productivity in the non-industrial sector.

Keyword：deindustrialization, hollowing-out of industry, unemployment

1. Introduction

Deindustrialization or hollowing-out of industry is a controversial phenomenon[1]. As our economy apparently moves from an industrial society to a post-industrial society, there are some important questions: how the decline of employment or output in industry affects our lives, whether an economy can sustain itself by specializing in service-type activities or not, and what policies will be needed to sustain an economic growth.

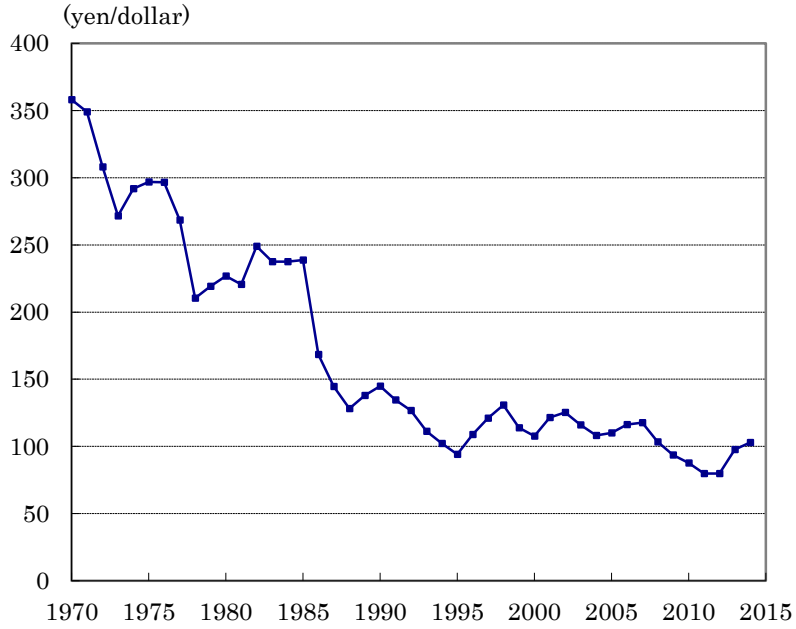
Under the strong yen appreciation, the issue of deindustrialization recurred in Japan (Figure 1)[2]. Many manufactures recorded deficits from exports and planned seriously transferring their factories overseas. My previous paper revealed that foreign direct investment (FDI) was a key factor of deindustrialization in recent years and deindustrialization was a negative phenomenon under the home currency appreciation. A system dynamics simulation revealed an important result that the yen depreciation would recover the manufacturing employment for a while but would not for a longer term. This

[1] " Hollowing-out" was first used to describe the implications of off-shoring by U.S. manufacturers in 1970s.

[2] The issue of deindustrialization was first discussed at the end of 1980s and second at the middle of 1990s under the rapid yen appreciation phases in Japan. The third argument started from 2011.

prediction coincides with the current recovery of export accompanied by the larger import under the exchange policy by 'Abenomics[3]'.

The remaining question is to find out the reason why the economic shift from the manufacturing sector to the service sector does not work well. This paper extends the previous model and attacks this question.



Source: OECD, *Economic Outlook.*

Figure 1 Exchange rate of the Yen

2. Positive and negative deindustrialization

Although the manufacturing sector in a number of advanced economies shows the decline in output and employment, it does not mean the decline of the economy as a whole. A shift from the manufacturing sector to the service sector is a typical economic development process, predicted by the Petty-Clark's Law[4].

Rowthorn and Wells (1987) examined the merits and demerits of deindustrialization of the economy; they distinguished between deindustrialization explanations that saw it as a positive process of maturity of the economy and those that associated deindustrialization with negative factors like poor economic performance. Positive deindustrialization accompanies full employment and rising real incomes; whilst negative deindustrialization accompanies rising unemployment and stagnant real incomes. They suggested deindustrialization might be both an effect and a cause of poor economic performance.

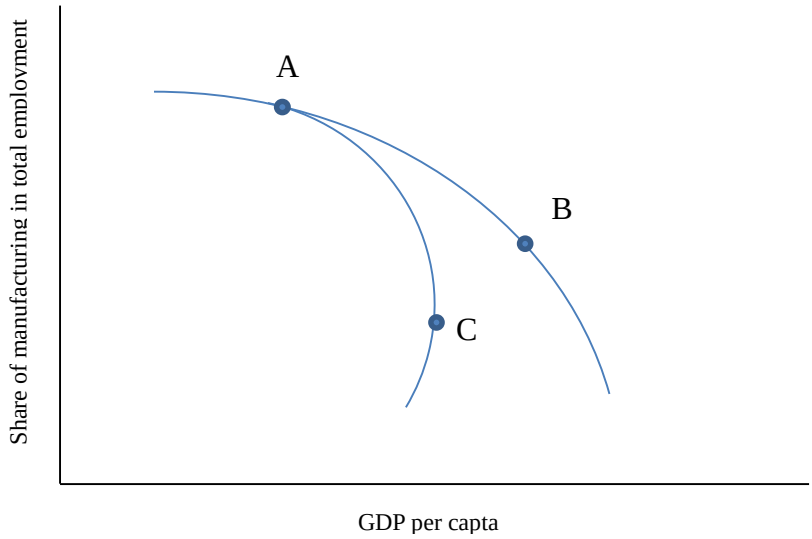
Basen and Thirlwall (1992) explain that employment in manufacturing declines when rate of growth of output is lower than the rate of labor productivity. If employment is falling

[3] Abenomics refers to the economic policies advocated by Shinzō Abe, Prime Minister of Japan. It is based upon "three arrows" of fiscal stimulus, monetary easing and structural reforms

[4] Clark (1940) examined the significance of this tendency and called "Petty's Law" after Sir William Petty who first found this type of tendency in *Political Arithmetic* (1690). This theory is now referred to as "Petty-Clark's Law".

because a high rate of growth of productivity is being outstripped by a higher rate of productivity, it is desirable. This is positive deindustrialization. However, if employment is falling because a mediocre rate of growth of productivity is being surrendered by a low growth of output, it is not desirable. This is negative deindustrialization.

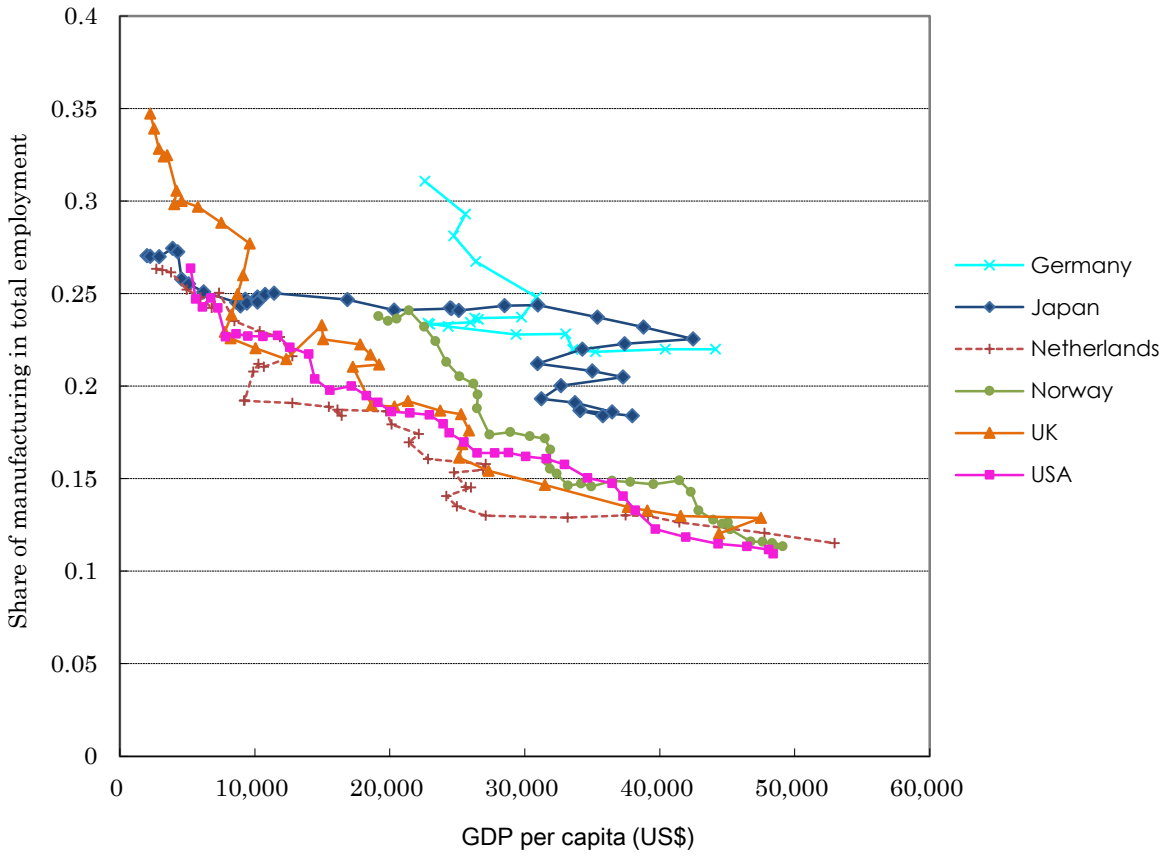
Positive deindustrialization occurs when the share of employment in manufacturing falls because of rapid productivity growth. Economy sustains its growth while displaced labor in the manufacturing sector is absorbed into the non-manufacturing sector. This can be seen by the movement from A to B in Figure 2. On the other hand, negative deindustrialization results from a slow growth or decline in demand for manufacturing output. The labor in manufacturing is displaced in unemployment rather than being absorbed into the non-industrial sector. This is represented by the movement from A to C in Figure 2.



Source: Basen and Thirlwall (1992).

Figure 2 Positive and negative deindustrialization

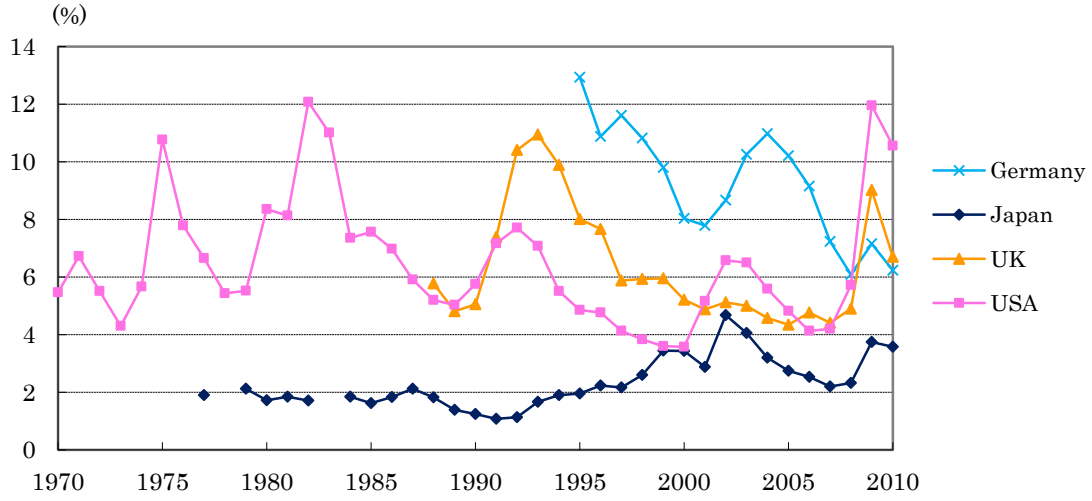
Figure 3 shows the share of employment in manufacturing and the GDP per capita in advanced economies. We can confirm that deindustrialization in the USA, Netherlands, or Norway is a positive one. The UK experienced negative deindustrialization phases several times. Recently, Japan experiences long negative deindustrialization.



Source: ILO, *Labour Statistics.* OECD, *Economic Outlook.*

Figure 3　Comparison of deindustrialization

Most of the argument in Japan focuses on the recent rise of unemployment in manufacturing because the manufacturing sector had a low unemployment rate comparing other industries for a long time (Figure 4).



Source: ILO, *Labour Statistics.*

Figure 4　Unemployment rate in the manufacturing industry

However, Figure 3 suggests that deindustrialization in Japan does not bring a successful transition to the non-industrial economy. Table 1 shows annual growth rates of labor productivity over the period 1997-2010. Productivity is defined as value added at constant 2005 market prices divided by total employment.

Table 1 Average labor productivity growth, 1997-2010 (%)

	Primary industry	Secondary industry	Tertiary industry
Germany	2.096	1.967	0.427
Japan	2.073	2.411	-0.367
Netherlands	2.504	1.699	0.928
Norway	5.004	-0.688	1.351
UK	0.657	2.281	1.697
USA (since 2000)	3.352	3.296	0.917

Source:: OECD, *Economic Outlook.*

The pattern that emerges is that the growth rates of labor productivity are highest in the secondary industry and lowest in the tertiary industry. If the non-industry sector is growing, absorption of labor from the industry sector will not be a negative transition.

3. Exchange Rates and Deindustrialization

One of the central issues in the debate of deindustrialization is what factors are responsible for the observed decline in manufacturing employment. Several explanations are available.

The first explanation rests on a strong link between the degree of economic maturity and the structure of employment. Clark (1940) suggested that, in the initial phase of development, as per capita income rises, the pattern of demand shifts away from food (primary products) towards industrial products. In the later stages of development, the pattern of demand shifts away from industrial products towards services. This development process changes economic structure and the pattern of employment.

The second explanation relies on the difference of productivity growth among sectors. Clark (1940) argued that productivity gains in the manufacturing sector exceed those in the service sector. Rowthorn and Ramaswamy (1997) confirmed this argument and argued that productivity in the manufacturing sector grows faster than in the service sector. Productivity growth in the manufacturing sector has been exceeding those in other sectors, and this phenomenon will shift employment away from the manufacturing sector into the service sector.

High productivity in the manufacturing sector leads to labor saving production, and the excess labor is absorbed in the tertiary industry. The exception is productivity growth in Japan in the tertiary industry, which shows minus growth rates. There is less space for the excess labor in Japan than in other advanced economies. The manufacturing sector has long promised the stable employment and relatively high wages in Japan. Therefore, people are

worrying about a recent rise of the unemployment rate.

The third explanation focuses on globalization. There are several factors that we must consider. In North-South trade, South is specializing in labor-intensive manufacturing goods. Facing these cheap imports, North needs to change the industrial structure. Outsourcing of labor-intensive activities previously carried out within the manufacturing sector to countries with cheaper labor is another explanation. In 1970s, under the pressure of dollar depreciation, off-shoring was adopted among US manufacturers. This tendency hollowed out the manufacturing sector by closing home factories and removing employees from the job. Scaling down of the manufacturing sector was compensated by the expansion of the service sectors. Off-shoring production was put into practice with large outward FDI. Bluestone and Harrison (1982) offered the influential account. FDI was once a complement of domestic investment. However, it is now a substitute of domestic investment.

Outcomes of FDI depend on types of investment, product, and host country. Horizontal FDI substitutes exports, and hence reduces domestic production. Vertical FDI induces capital goods exports and intermediate goods exports while it introduces reimports[5].

Figure 5 summarizes these arguments. Domestic factors, such as expand of the non-industry sector and growth of productivity, reduce employment in the manufacturing sector. External factors, North-South trade and outsourcing, accelerate import which reduces home production. FDI accelerates overseas production which substitutes home production.

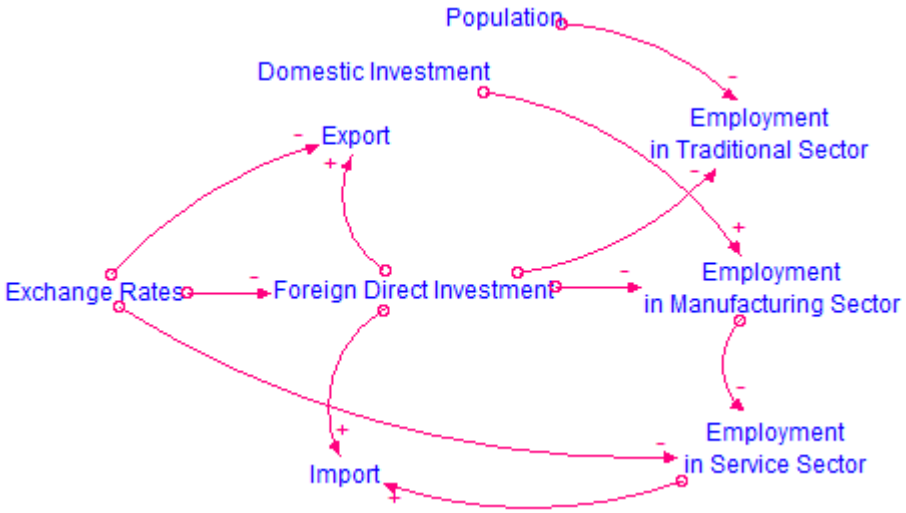


Figure 5 Causes of deindustrialization

4. Structure of the model

The macroeconomic model was developed with three sectors (traditional, manufacturing, and service sector) those were connected with each other through FDI, exchange rates, and labor immigration.

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[5] Vertical FDI is FDI by a firm to establish manufacturing facilities in multiple countries, each producing a different input to, or stage of, the firm's production process.

4.1 Macroeconomic sector

The standard Keynesian aggregate demand model can be applied to the national economy. Gross domestic expenditure (GDE_t) consists of private final consumption expenditure (CP_t), private capital formation (I_t), government expenditure (G_t), exports (EX_t), and imports (IM_t).

$$GDE_t = CP_t + I_t + G_t + EX_t - IM_t \tag{3.1}$$

A subscript means time t.

Private final consumption expenditure

Private final consumption expenditure is a large and stable component in GDE. Private final consumption expenditure function is assumed as a Keynesian type function in which the level of consumption depends on the gross domestic product (GDP_t).

$$CP_t = CP_t(GDP_t) \tag{3.2}$$

Gross private fixed capital formation

The gross private fixed capital formation depends on the previous capital formation and GDP.

$$I_t = I_t(I_{t-1}, GDP_t) \tag{3.3}$$

Government Expenditure

The government expenditure grows with population.

$$G_t = G_t(POP_t) \tag{3.4}$$

POP_t is a medium-fertility population projection by National Institute of Population and Social Security Research for 2011-2025.

Exports

The exports to other countries are assumed to depend on the exchange rate (EXR_t), (export-related) employment in the manufacturing sector ($EMP2_t$), and the flow of FDI in manufacturing ($FDIM_t$) which reflecting that overseas operation induces export of machine tools; thus we assumed following regional imports function.

$$EX_t = EX(EXR_t, EMP2_t, FDIM_t) \tag{3.5}$$

Imports

Imports are dependent on the flow of FDI in manufacturing ($FDIM_t$) reflecting outsourcing and employment in the service-sector ($EMP3_t$)s.

$$IM_t = IM_t(FDIM_t, EMP3_t) \tag{3.6}$$

Figure 6 shows the causal relation of the macroeconomic sector.

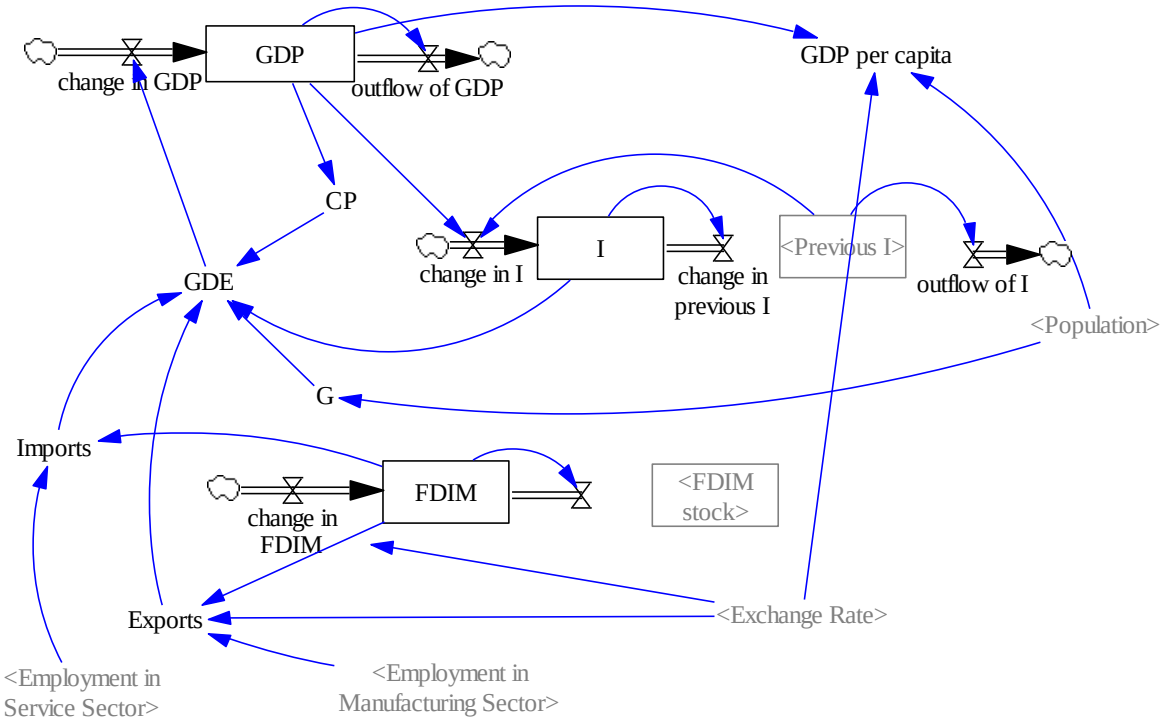

Figure 6 Macroeconomic sector

4.2 Foreign direct investment

The volume of FDI in the manufacturing industry is dependent on the exchange rate.

$$FDIM_t = FDIM_t(EXR_t) \tag{3.7}$$

4.3 Employment sector

Before examining employment dynamics, we have divided three types of economic sectors.

First, the traditional sector consists of Agriculture, Hunting, Forestry and Fishing, Mining, Electricity, Gas and Water, and Construction. Employment of traditional sector ($EMP1_t$) depends on the stock of FDI in manufacturing and population.

$$EMP1_t = EMP1_t(\sum_t FDIM_t, POP_t) \tag{3.8}$$

Second, the manufacturing sector consists of Manufacturing. Employment ($EMP2_t$) depends on domestic capital formation (I), working-age population, and the stock of FDI in manufacturing ($FDIM_t$).

$$EMP2_t = EMP2_t(I_{t-1}, WAPOP_t, \sum_t FDIM_t) \tag{3.9}$$

Third, the service sector consists of Transport and Communication, Finance, Insurance, Real Estate, Business Services, Wholesale and Retail Trade, Restaurants and Hotels, Community, and Social and Personal Services. Employment ($EMP3_t$) is explained by the exchange rate and the employment shift from the manufacturing sector.

$$EMP3_t = EMP3_t(EXR_t, EMP2_t, MB_t) \tag{3.10}$$

MB_t is a barrier to labor mobility which prevents the employment shift.

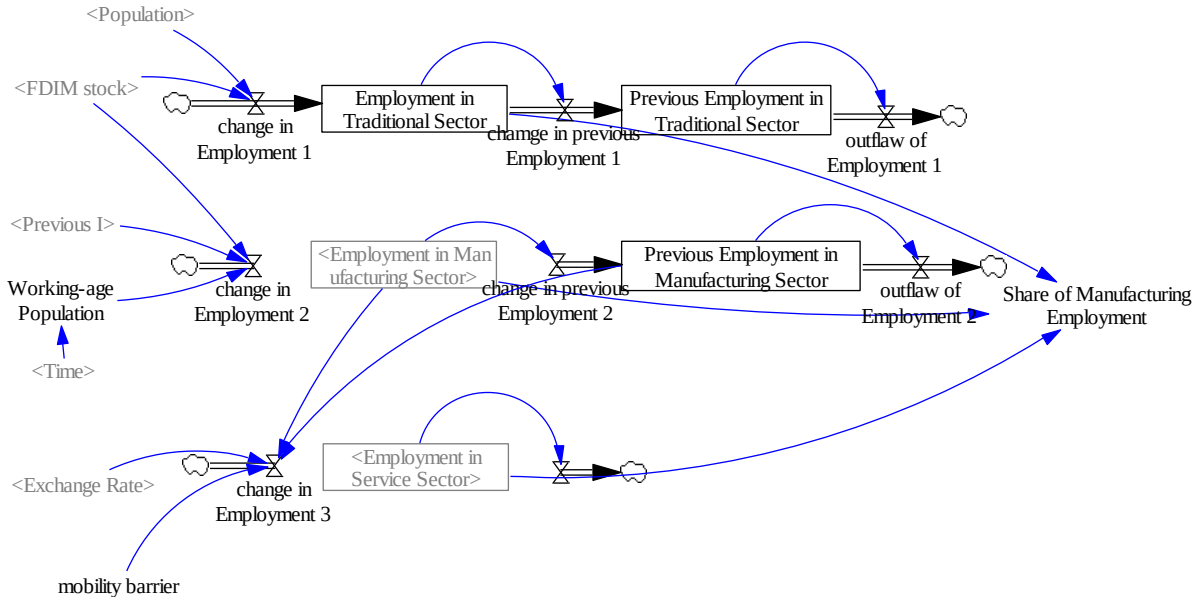

Figure 7 Employment sector

5. Simulation

Let us examine simulations. Based on the data from 1970 to 2010, several scenarios were simulated from 2011 to 2025.

5.1 Exchange rate and deindustrialization

There are two scenarios: yen appreciation[6], yen depreciation (102 yen/dollar) from 2012 to 2025[7]. Figure 8 summarizes the results.

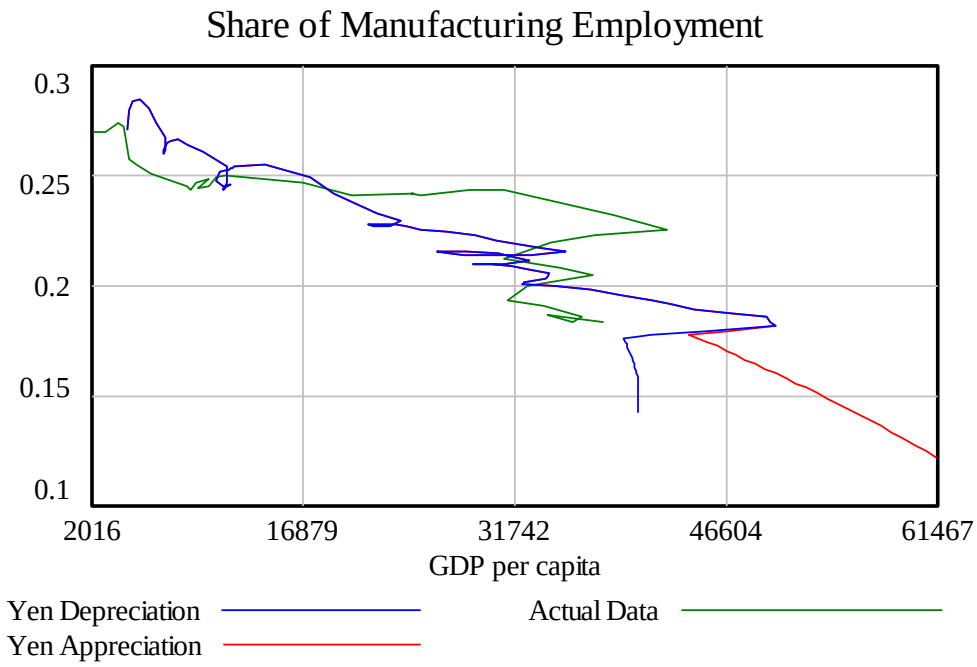

Figure 8 Exchange rate and deindustrialization

[6] *OECD Economic Outlook* estimated 77.0 yen per dollar for 2012 and 2013 in November 2011. Yen appreciation scenario extends this trend using a logarithmic function from 2012 to 2025.
[7] 95 yen per dollar are the assumed exchange rate by major companies for the 1st quarter 2014.

The results of this model show an important implication on exchange rate policy. The share of manufacturing employment is higher under the yen depreciation scenario than under the yen appreciation scenario. However, contrary to the public belief, yen depreciation does not bring a successful macroeconomic outcome (Figure 8). Yen depreciation tones down FDI and decreases FDI-related exports, because capital goods or intermediate goods to overseas production bases are essential components of exports under the vertical FDI network.

5.2 Mobility barriers

According to "Petty-Clark's Law", the redundant worker in the manufacturing sector moves into the non-manufacturing sector. However there are barriers to inter-industry labor mobility.

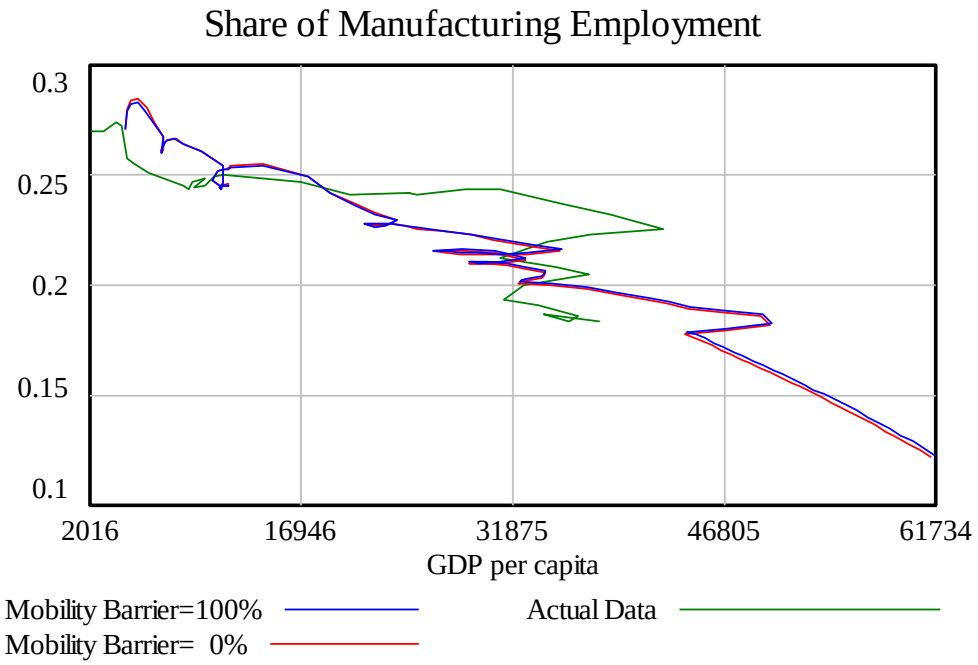

Figure 9 Barriers to labor mobility and deindustrialization

Figure 9 tells us that barrier between industry sector and non-industry sector affects the path of deindustrialization. A smooth employment shift ($MB=0$) reduces the share of manufacturing employment faster than a slow shift ($MB=1$).

Furthermore, one should distinguish dynamic services such as Financing, Transport and Communications from non-dynamics services such as Wholesale and Retail Trade, Restaurants and Hotels. Labor mobility does not improve a macroeconomic performance because not all activities in the non-industrial sector enjoy higher productivities than those in the manufacturing sector.

Positive deindustrialization in the USA depends on the successful transition to capital or ICT intensive Financing, Communications, Business services from Manufacturing. In negative deindustrialization, barriers prevent employment shift from Manufacturing to those dynamically growing services.

6. Conclusion

The findings of this paper are summarized as follows:

1) Under the home currency appreciation, deindustrialization is a negative phenomenon.

2) FDI, particularly vertical FDI, is a key factor in understanding the negative aspect of deindustrialization. It indirectly affects the non-industrial employment.

3) System dynamics model highlights an important result that is unpredictable in other economic forecasting. Currency depreciation will recover the manufacturing employment for a while but will not for a longer term.

Although overseas transfer of production is a formula for deficit-ridden manufacturers, it will hollow out the economy in the long-run to prevent healthy transition from the manufacturing sector to the non-industrial sector.

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Appendix: Estimation of the macroeconomic sector

A data set was assembled for the years from 1970 to 2010. A value in parentheses under the coefficient is t-distribution, R^2 is a coefficient of determination, $\overline{R}^2$ a coefficient of determination adjusted for the degrees of freedom.

$$CP_t = \underset{(7.846)}{20626.8898} + \underset{(81.604)}{0.5365}\, GDP_t \quad R^2 = 0.9942$$

$$I_t = \underset{(1.588)}{6561.9492} + \underset{(6.595)}{0.7309}\, I_{t-1} + \underset{(1.959)}{0.03573}\, GDP_t \quad \overline{R}^2 = 0.8808$$

$$G_t = \underset{(-22.554)}{-468416.5462} + \underset{(26.757)}{4.5771}\, POP_t \quad R^2 = 0.9483$$

$$EX_t = \underset{(5.852)}{123412.3216} - \underset{(-2.607)}{58.0079}\, EXR_t - \underset{(-4.182)}{5.5753}\, EMP2_t + \underset{(4.330)}{6.1317}\, FDIM_t \quad \overline{R}^2 = 0.7868$$

$$IM_t = \underset{(-3.510)}{-21954.9236} + \underset{(3.160)}{3.0096}\, FDIM_t + \underset{(8.192)}{1.6990}\, EMP3_t \quad \overline{R}^2 = 0.8823$$

$$\log(FDIM_t) = \underset{(16.724)}{16.8224} - \underset{(-9.810)}{1.9344}\log(EXR_t) \quad R^2 = 0.7116$$

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