

## Total War from the Economic Perspective\*

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### Introduction

To accomplish total war like the Second World War, not only economy is required to be quantitatively expanded but economic power is centralized qualitatively for the purpose of waging war. Broad economic power includes production, trade, amount of human resources and resource reserve from this perspective. There exist a number of advanced studies on the Second World War. However, the characteristics of World War II, compared to the First World War, are that production capacity of added value came to form the core of economic power and financing of war expenditure depended largely on it. In this paper, the author will mainly argue the relation between the Japanese production capacity of added value (national income or gross national product [GDP]) during World War II and war expenditure, which has attracted relatively low attention in the past, along with international comparison.

The analysis of international comparison in this report targets the period from the year 1939 when World War II broke out in the European front, or the period basically from the year 1941, as a start point, when Japan, the U.S. and the Soviet Union participated in the war to the year 1944, as an end point, when economic indicators are available. In the case of Japan, the author will present indicators from the year 1931 when the Manchurian Incident occurred as a subject of discussion.<sup>1</sup>

### 1. Economic Power in Total War

#### (1) Issues in interwar period

Economy in the title of this paper, “Total War from the Economic Perspective” refers to economic power for conducting total war, that is, capabilities of carrying out industrial mobilization and capital mobilization for the purpose of conducting total war. Arguments were developed from World War I to World War II with regard to this point. World War I is generally regarded as imperialistic war in a historical materialism perspective for the purpose of acquiring the world market under the development

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\* The quotation below does not reflect the original.

<sup>1</sup> Akira Hara argued, “the impact of military affairs is still small in the period around the Manchurian Incident from 1932 to 1936 so that it is basically considered as peacetime economy.” He considers that the entire Japanese economy shifted to wartime economy after 1937 (Akira Hara, “Nippon no Senji Keizai: Kokusai Hikaku no Shiten kara (Japanese Wartime Economy: From a Perspective of International Comparison),” in *Nippon no Senji Keizai: Keikaku to Shijo (Japanese Wartime Economy: Planning and Market)* (University of Tokyo Press, 1995), p. 5.

of monopoly capitalism and redistributing world resources. One may understand that the perspective of war of Carl von Clausewitz, who argues that war itself is susceptible to characteristics, conditions and restraints of each time, is in line with the historical materialism. Total war was theorized by Erich Ludendorff after World War I. Ichiro Nakayama, who has played a central role in this argument in Japan, recognizes the intervention of an imperialistic war based on the historical materialism between the Clausewitz's and the Ludendorff's perspective of war.<sup>2</sup> Although Clausewitz could present a course toward total war as an abstract theory, he could not argue a form of war more than national war as a specific theory due to restraints of the time in which he lived. That is to say, national war has turned into total war through a stepping stone of imperialistic war.

Nakayama discusses that World War I started due to the collapse of balance among imperialistic powers, whereas World War II started due to the establishment of new order. From this perspective, economic power of participating nations was an independent variable for total war in World War I, but that was a dependent variable for total war in World War II. "To battle World War II out as real total war, the active economic construction should be focused."<sup>3</sup> If we use expressions of Kaname Akamatsu, World War I is "war by military and other means for an economic purpose" and World War II is "war by economic means for military and political purposes."<sup>4</sup> This perspective that economic power is the dependent variable for the total war in World War II is also the premise of the argument of Mark Harrison.<sup>5</sup>

When applying this discussion to national income account and war expenditure subject to the author's argument in this report, the following is revealed: Large scale war always comes with a problem of how to finance war expenditure. As economic power was a given problem before World War II, the problem of how to finance war expenditure had been strived to be solved under their constraint conditions. However, economic power itself became subject to the policy for conducting total war during World War II. The problem of how to finance war expenditure is, therefore, regarded as part of wartime economy policies. That is, it is required to increase national income, on the other hand, the ratio of war expenditure to national income is expected to be raised as much as possible. Of course, the increase in national income is achieved not through the increase in production of civilian goods but through that of

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<sup>2</sup> Ichiro Nakayama, *Nakayama Ichiro Zenshu, Dai 10 kan: Senso Keizai no Riron (Nakayama Ichiro Collection, Vol. 10: Theories of War Economy)* (Kodansha, 1973), pp. 347-352.

<sup>3</sup> *Ibid.*, p.361. However, the sign of the theory that "economy is the independent variable of total war" is also seen in World War I (*Ibid.*, p. 371).

<sup>4</sup> Kaname Akamatsu, "Keizai Senso no Honshitsu to Sono Hen'yo (Reality of Economic War and its Transformation)," in *Hitotsubashi Ronso (Hitotsubashi Review)* Vol. 5, No. 5, p. 522.

<sup>5</sup> Harrison, Mark, "The Economics of World War II: an overview," Mark Harrison, ed., *The Economics of World War II* (Cambridge: Cambridge University Press, 1998), pp. 18-27. However, Harrison does not recognize a wide gap between World War I and World War II with regard to this point.

military goods. The economic policy at the time of World War II promoted the production of military goods in the existing facilities. Not only that, civilian goods manufacturing facilities were converted into military goods ones. New investments in the production of civilian goods were held down to give priority to new investment in the production of military goods. Private consumption was restrained to increase that effect (introduction of the rationing system), and savings which are used as capital to invest in production capacity and to borrow war expenditure were encouraged.

There were two points worthy of special mention related to discussions of this paper in terms of the history of economics between the two world wars. One is the development of the concept of national income by Colin Clark and the other is the establishment of macroeconomics based on the principle of effective demand by John Maynard Keynes. Discussions on war expenditure have come to be closely related to those on national income since then including the period of World War II. One of them is a problem of whether the financing of war expenditure should depend on bonds or tax increase and this controversy is still continuing to this day.<sup>6</sup> *The Political Economy of War*, one of the representative books of Arthur Pigou on the theory of war expenditure at that time, takes up additional issuance of currency in addition to bonds and tax increase with regard to discussions on the financing of war expenditure. However, Pigou points out that the distortion of income redistribution (expansion of income gap) is unavoidable after the war in any case (criticism from so-called “Pigou’s second proposition”<sup>7</sup>). Immediately after this, Keynes advocated the financing of war expenditure by compulsory savings (borrowing of fund allocated to war expenditure) for the purpose of compensating this defect.<sup>8</sup> However, war expenditure in any total war, in general, far exceeds expectation before war so that it is impossible to cover war expenditure by forced savings in actual fact. Jerome Cohen who was involved in the analysis of wartime economy of Japan after the war as a member of the U.S. Strategic Bombing Survey maintains that Japan had been able to tactfully control inflation by a combination of encouragement of savings and issuance of bonds (disseminated governmental fund flows into commercial banks as savings and this is used as capital for purchasing bonds) by the middle of 1944, but the flow of fund slowed down since then

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<sup>6</sup> For example, Stiglitz, Joseph E., and Linda J. Bilmes, *The Three Trillion Dollar War* (New York: W. W. Norton & Company, 2008) deals with costs of the war in Iraq; Hormats, Robert D., *The Price of Liberty* (New York: Henry Holt and Co., 2007) and Poast, Paul, *The Economics of War* (New York: McGraw-Hill/Irwin, 2006) deal with this issue from the historical perspective.

<sup>7</sup> A. C. Pigou (translated by Rikita Norita), *Senso Keizaigaku (The Political Economy of War)* (Kenkyusha, 1942), pp. 70-97 and 111-143.

<sup>8</sup> Keynes, J. M., *How to Pay for the War* (London: Macmillan, 1940) pp. 57-74. E. J. Riches agrees to the theory of Keynes from a perspective of the improvement of social welfare in wartime (E. J. Riches, “Senso Futanron: Keizu An no Bunseki [Theory of Burden of War Expenditure: Analysis of Keynes’ Idea],” J. G. Winant, ed., translated by R. Osumi, *Senso Keizai Kenkyu [Study of War Economy]* [Toko Shuppan, 1942], pp. 53-98). This is a view based on the theory of liquidity preference advocated by Keynes himself and a cause of inflation should be looked for by the quantity theory of money in the case of long-term wars.

(currency is stored away by the private sector) and Japan could not control inflation anymore.<sup>9</sup>

(2) Total war from the viewpoint of National Income Account

In the case where economic power is measured from a perspective of the ability to wage total war, it is necessary to consider from both aspects of stock and flow. Stock refers to capital (financial capital and facility capital) and is a source of production capacity together with input of labor force. However, as facility capital is depreciated over time, the same amount of new investment as depreciation is required to maintain production capacity. Flow is produced by this stock (capital) and labor force and added value is calculated by excluding overlapping (intermediate input). This is distributed as income of each factor of production (labors, facility capital and financial capital) and spent in the form of private consumption, government consumption and capital formation (investment). War expenditure is spent as part of government expenditure.

The above-mentioned relations are described using formulas as follows.<sup>10</sup> Added value (= national income ( $Y$ )) is a dependent variable stems from production using capital ( $K$ ) and labor force ( $L$ ) (see (1) below). In the process of economic circulation, national income is divided into consumption (war expenditure ( $W$ ) and normal consumption ( $C$ )) and savings ( $S$ ) (see (2) below). The normal consumption here includes both private and government consumption excluding war expenditure. In order to sustain total war or “large scale consumption,” war expenditure ( $W$ ) has to be increased through the decrease of savings ( $S$ ) and normal consumption ( $C$ ). However, since savings ( $S$ ) is the source of investment ( $I$ ) (see below (3)), its restriction limits the investment, which is necessary for arms production. In addition, if the savings ( $S$ ) is not sufficient to afford depreciation ( $D$ ), capital ( $K$ ) will be decreased (see (4) and (1) below) and it is going to deteriorate the national income ( $Y$ ) and eventually the capability of total war as well. Although the shrink of normal consumption ( $C$ ) enables the reallocation of resource to war expenditure ( $W$ ), it will force common people economic poverty. On the other hand, large scale conscription leads to the decrease of labor force ( $L$ ) that also diminishes national income ( $Y$ ) (see (1)

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<sup>9</sup> J. B. Cohen (translated by Hyoe Ouchi), *Senji Sengo no Nihon Keizai (Japanese Economy during and after the War)*, Vol. 1 (Iwanami Shoten, 1950), p. 130. At the time of the Russo-Japanese War, this scheme functioned very well for selling domestic bonds (Keishi Ono, *Nichiro Senso Kenkyu no Shin Shiten [New Perspective of Study on the Russo-Japanese War]* [Seibunsha, 2005], pp. 11-114; Ono, Keishi, “Japan’s Monetary Mobilization for War,” *The Russo-Japanese War in Global Perspective: World War Zero*, vol. II [Leiden: Brill, 2007], pp. 262-26). See Yoshimasa Shibata, *Senji Nippon no Tokubetsu Kaikei (Special Account in Wartime Japan)* (Nihonkeizai Hyoronsha, 2002), pp. 89-141 for the operation of selling bonds by funds of the Deposit Bureau of the Ministry of Finance during World War II (most part of capital was postal savings).

<sup>10</sup> Chifuyu Masaki cites the increase in production, saving of personal consumption, restriction on new investment and non-depreciation of existing facilities as means for financing war expenditure. The argument here relates to the last three factors (Chifuyu Masaki, *Senso keizairon [Theory of War Economy]* [Ichigensha, 1932], p. 144). As described later, the increase in production and restriction on new investment contradict in the long term.

below) resulting in erosion of a state's ability for long-term total war.

$$Y_n = f(K_n, L_n) \quad \dots(1)$$

$$Y_n = W_n + C_n + S_n \quad \dots(2)$$

$$S_n = I_n \quad \dots(3)$$

$$K_n = K_{n-1} - D_{n-1} + I_{n-1} \quad (D_{n-1} = \delta K_{n-1}; \delta \text{ is constant}) \quad \dots(4)$$

("n" stands for time)

Consideration on the following points with regard to facility capital (stock) is required. With respect to facility capital, facilities for producing civilian goods need to be converted to those for producing military goods concurrently with the entry into a wartime system. To this end, there is a method of concentrating investment in facilities for producing military goods without compensating for depreciation of facilities for producing civilian goods, in addition to the production of military goods utilizing existing facilities for producing civilian goods. Even if the total amount of capital facility ( $K$ ) does not change, a wartime system of production activities may be developed by changing its content of composition.

In total war, national income as flow needs to be divided rationally into war expenditure, consumption and investment (=savings). Although the purpose is to maximize war expenditure as one part of flow, the maximization of only war expenditure decreases stock (formed by investment) over time and results in the decrease in flow (that is, war expenditure) in the long term. Furthermore, the control of consumption imposes deprivation on the people in the long term. Thus, unless national income is divided (war expenditure, consumption and investment) rationally in long-term total war, it becomes impossible to maximize war expenditure to the end spending several years.

## 2. Economic Aspects of Total War from the Numeric Perspective

### (1) International comparison

Now let us review economic power and war expenditure of major participating states at the time of World War II. Table 1 shows the transition of gross national product (GNP) of major participating states of World War II. It reveals that the United States had the overwhelming economic power and the GNP of the United Kingdom, the Soviet Union and Germany had fluctuated around 50% to 25% of that of the United States, and the economic power of Japan was about 40% of the standard of the United Kingdom, the Soviet Union and Germany. The ratio of Japan's GNP to US GNP was 20% in 1938, but it had declined year by year and it was less than 13% in 1944.

Table 1: Transition of GNP of eight major participating states

(Values of constant price on a 1990 basis: 1938-1944)

|                     | 1938  | 1939  | 1940  | 1941  | 1942  | 1943  | 1944  |
|---------------------|-------|-------|-------|-------|-------|-------|-------|
| Japan               | 169   | 165   | 155   | 161   | 177   | 186   | 190   |
| Germany             | 351   | 384   | 387   | 412   | 417   | 426   | 437   |
| Austria             | 24    | 27    | 27    | 29    | 27    | 28    | 29    |
| Italy               | 141   | 151   | 147   | 144   | 145   | 137   |       |
| France              |       |       | 82    | 130   | 116   | 110   | 93    |
| Total of the Axis   | 685   | 727   | 798   | 876   | 882   | 887   | 749   |
| US                  | 800   | 869   | 943   | 1,094 | 1,235 | 1,399 | 1,499 |
| UK                  | 284   | 287   | 316   | 344   | 353   | 361   | 346   |
| Soviet Union        | 359   | 366   | 417   | 359   | 318   | 464   | 495   |
| France              | 186   | 199   | 82    |       |       |       |       |
| Italy               |       |       |       |       |       |       | 117   |
| Total of the Allies | 1,629 | 1,721 | 1,575 | 1,798 | 1,906 | 2,223 | 2,458 |

Source: Harrison, Mark, ed., *The Economics of World War II* (Cambridge: Cambridge University Press, 1998, p. 10); K. Ookawa et al., ed., *Choki Keizai Tokei, 1: Kokumin Shotoku* (Long-term Economic Statistics, Vol. 1: National Income) (Tokyo: Toyo Keizai, 1974); Okurasho, Showa Zaiseishi Henshushitsu (Editorial Office of Showa Financial History, Ministry of Finance), *Showa Zaiseishi 4: Rinji Gunjihi* (Showa Financial History, Vol. 4: Extraordinary War expenditure) (Tokyo: Toyo Keizai, 1955).

What attracts our attention is a rapid increase in the U.S. GDP. The growth rate of the U.S. GDP from 1941 when the U.S. started to participate in the war to 1944 was 37%. This is outstanding compared to other states (Japan 18%, Germany 6%, the U.K. 0.5%).<sup>11</sup> That increase alone is equal to the GNP of Germany and the double GNP of Japan. According to Cohen, this is not because a large quantity of non-operating resources had existed in the U.S. when the war started.<sup>12</sup> In those days, Japan and the U.S. had a fundamentally different view on mobilization of economic power during wartime. While “the U.S. interpreted economic mobilization as the substantive expansion of the entire level of production,” Japanese leaders thought that Japan already had necessary production capacity for immediate purposes. Thus, “a main concern was not the raising of the entire level of production but the diversion of resources from peacetime use to wartime use.” The U.S. GDP had always fluctuated around 40% of the total of eight major participating states. This indicates that the side with the U.S. enjoys an overwhelming

<sup>11</sup> The growth rate of the Soviet Union is 38%. This is because the Soviet GNP after 1940 had largely dropped due to the invasion of the German Army into the Soviet Union.

<sup>12</sup> Cohen, *Senji Sengo no Nihon Keizai (Japanese Economy during and after the War)*, pp. 76-78. Similar descriptions are found in the investigation report by the U.S. Strategic Bombing Survey Team, translated by Fuyuhiko Masaki, *Nippon Senso Keizai no Hokai (Collapse of Japanese War Economy)* (Nippon Hyoronsha, 1950), pp. 25-26.

advantage in terms of enforcing the total war.

Table 2 indicates the military expenditure of six major participating states during World War II.<sup>13</sup> The presence of the U.S. is absolutely overwhelming here as well and a room for increasing the military expenditure during the war time is large. As mentioned above, comparing 1941 and 1944, the U.S. military expenditure increased more than five times, but there is no state that shows such a high growth of military expenditure (values of Italy and Germany in 1944 are unknown though). One can understand this from a different perspective taking into account the fact that the war broke out in 1939 in Europe. For example, the military expenditure of Germany in 1943 is more than three times as much as that in 1939 and that of Italy in 1943 is also three times as much as that in 1939. The military expenditure of the U.K. in 1944 marked a high growth of five times as much as that in 1939, while the military expenditure of the Soviet Union at the peak in 1944 increased around three times compared to 1941. It is worthy of one's attention that the U.K. already achieved the increase in the military expenditure nearly five times in 1941 when two years had passed from its participation in the war. The military expenditure of Japan in 1944 marked an increase of nearly four times from the time of its participation in the war (1941), but the growth is relatively slow and it only doubled in 1943, two years from its participation in the war.<sup>14</sup>

What about the ratio to national income? Figure 1 shows the transition of the ratio of military expenditure to national expenditure of six states. Although the U.S. military expenditure was less than 50% of its national income, the ratio of the U.K., the Soviet Union and Germany was around 50% to 70% at its maximum (Germany in 1943). The quick response of the Soviet Union draws our attention. The ratio of military expenditure to national income in the second year since the participation in the war of the U.S. was 32%, while the U.K., Germany and the Soviet Union marked 44%, 40% and 61%, respectively. This is a characteristic of a state planning economy.

Apart from the U.S. and the Soviet Union, the U.K. and Germany secured the ratio of military expenditure to national income as high as 40% in the year following the year in which they started to participate in the war, while Japan reached that level two years after its participation in the war. As a result, the burden of war expenditure on the Japanese economy was relatively light so that the GNP growth in

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<sup>13</sup> Military expenditure includes current administrative costs related to the military in addition to direct costs (war expenditure) related to war. Though war expenditure is not necessary in peacetime, current administrative costs occur even in peacetime. In Japan, the latter was processed by general account under the jurisdiction of the Ministry of the Army and the Ministry of the Navy, while the former was processed as special account for extraordinary war expenditure independently of general account. However, as there is an overlapping in two accountings and the general account of the Ministry of the Army and the Ministry of the Navy were virtually stopped to be appropriated in the later stage of World War II (after 1942), current administrative costs of the two ministries started to be processed as special account for extraordinary military costs.

<sup>14</sup> Cohen argues that the wartime economic condition of Japan started after November 1942 in a true sense based on the analysis of economic indicators and postwar questionnaire surveys for senior government officials (Cohen, *Senji Sengo no Nihon Keizai [Japanese Economy during and after the War]*, p. 79).

1942 maintained as high as the level of 10% (the GNP growth rate of the U.K. was, indeed, 10% in the same year). However, the military expenditure of Japan reached 80% of national income in 1944 when three years had passed from its participation in the war. This was a high level not seen in other participating states including the socialistic state (Soviet Union). Major participating states are roughly divided into three groups based on their GNP level. The first group is only the United States and the second group consists of Germany, the U.K. and the Soviet Union and the third group consists of Japan, Italy and France. After World War II broke out, the second and the third groups in parallel had marked a decrease in their GNP ratio to the U.S. GNP. However, in 1944, although the Japan's base of economic power still belonged to the third group, Japan strived to draw its military expenditure closer to the second group level. Nevertheless, as its national income scale was small, the amount of military expenditure was lower than that of the U.K. and about half the level of the Soviet Union and less than one fourth the level of the U.S.

Table 2: Transition of military expenditure of six major participating states  
(Values of constant price on a 1990 basis: 1939-1944)

|              | 1939 | 1940 | 1941 | 1942 | 1943 | 1944 |
|--------------|------|------|------|------|------|------|
| Japan        | 30   | 30   | 40   | 50   | 80   | 150  |
| Germany      | 90   | 150  | 210  | 270  | 300  | ---  |
| Italy        | 10   | 20   | 30   | 30   | 30   | ---  |
| US           | 10   | 20   | 120  | 400  | 600  | 670  |
| UK           | 40   | 140  | 180  | 180  | 200  | 180  |
| Soviet Union | ---  | 70   | 100  | 190  | 280  | 260  |

Note: The values are rounded off to the nearest ten. This table intends to roughly compare the military expenditure of major states rather than present accurate values. The values of Japan are the total of domestic and overseas payments.

Source: Harrison, Mark, ed., *The Economics of World War II* (Cambridge: Cambridge University Press, 1998, p. 21) and others are the same as Table 1.

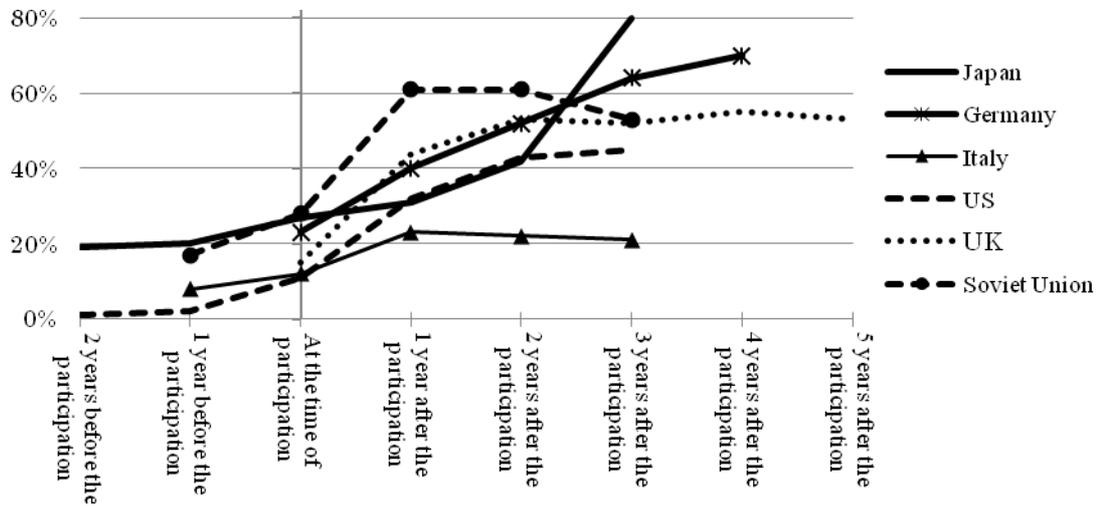


Figure 1: Transition of ratio of military expenditure of six major participating states to national income

Note: The time of participation is 1939 for Germany and the U.K., 1940 for Italy and 1941 for Japan, the U.S. and the Soviet Union. The original material calculates the values of the Soviet Union based on a real value and other values based on nominal values (although their calculation methods are different, there is no big difference in the calculation results).

Source: Created based on Table 1 and Table 2.

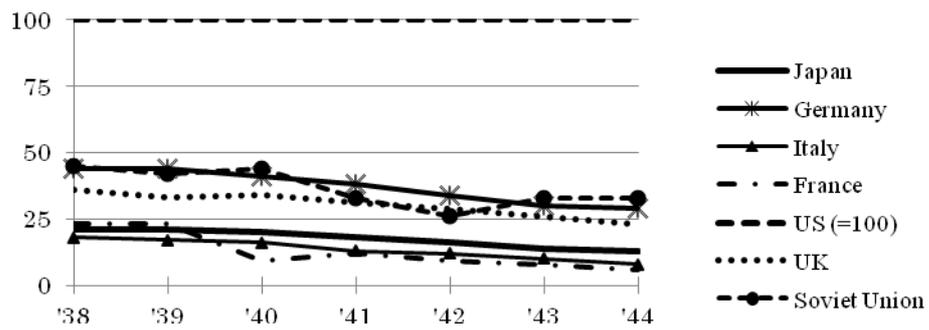


Figure 2: Transition of GNP of eight major participating states (U.S. GNP is set as 100)

Source: Same as Figure 1.

Table 3: Transition of macroeconomic indicators of Japan (1931-1944)

(Unit: ¥billion)

|      | Real GNE | Real private consumption expenditure | Military related expenditure A | Private consumption expenditure / GNE | Military related expenditure A / GNE | Military related expenditure B / Government expenditure |
|------|----------|--------------------------------------|--------------------------------|---------------------------------------|--------------------------------------|---|
| 1931 | 13.9     | 10.1                                 | 0.5                            | 72.7%                                 | 3.7%                                 | 23.8%   |
| 1932 | 14.0     | 10.2                                 | 0.8                            | 72.9%                                 | 5.4%                                 | 31.8%   |
| 1933 | 14.6     | 10.4                                 | 0.9                            | 71.1%                                 | 6.2%                                 | 36.0%   |
| 1934 | 16.2     | 10.9                                 | 1.0                            | 67.7%                                 | 6.1%                                 | 39.4%   |
| 1935 | 16.6     | 10.7                                 | 1.0                            | 64.7%                                 | 6.2%                                 | 39.6%   |
| 1936 | 17.1     | 11.0                                 | 1.0                            | 64.3%                                 | 6.1%                                 | 40.0%   |
| 1937 | 22.8     | 11.6                                 | 2.7                            | 51.1%                                 | 11.6%                                | 48.9%   |
| 1938 | 25.1     | 11.4                                 | 4.1                            | 45.4%                                 | 16.3%                                | 52.1%   |
| 1939 | 24.5     | 11.0                                 | 3.5                            | 44.9%                                 | 14.3%                                | 54.3%   |
| 1940 | 23.0     | 10.0                                 | 3.6                            | 43.7%                                 | 15.8%                                | 53.3%   |
| 1941 | 23.9     | 9.6                                  | 4.6                            | 40.2%                                 | 19.2%                                | 55.7%   |
| 1942 | 26.2     | 9.1                                  | 5.9                            | 34.7%                                 | 22.6%                                | 56.2%   |
| 1943 | 27.7     | 8.6                                  | 7.8                            | 31.0%                                 | 28.1%                                | 63.3%   |
| 1944 | 28.3     | 7.2                                  | 9.7                            | 25.4%                                 | 34.3%                                | 78.5%   |

Note: GNE stands for gross national expenditure and is equivalent to GNP. Military related expenditure is the total of special account expenditure for extraordinary war expenditure, general account expenditure under the jurisdiction of the Ministry of the Army and the Ministry of the Navy, conscription costs (general account under the jurisdiction of the Ministry of Interior), extraordinary event costs (general account under the jurisdiction of all ministries concerned) and various costs related to air defense (general account under the jurisdiction of all ministries concerned). The real values are based on 1934-1936. "Military related expenditure A" only refers to domestic payment and "military related expenditure B" refers to the total including overseas payment.

Source: Same as Table 1.

## (2) Interannual transition of Japan

Lastly, we will review the interannual transition of economic burden of Japan in the wartime system from the macroeconomic perspective (Table 3). The military-related expenditure (in real values) marked a decrease in 1939 and 1940 but marked a constant increase in other years. The reason for the exceptional decrease in military-related expenditure in those two years was the increase in the price level. The GNP deflator marked a significant growth of 23% in 1939 and 27% in 1940. Thus, while each macro indicator marked an increase in nominal values, it marked a decrease in real values in those two years. The private consumption expenditure had decreased continuously from 1937. This demonstrates the result of the policy to increase war expenditure by cutting general consumption as I mentioned in the paragraph "Total War from the Perspective of National Income Accounting." During this period (1937-1944), the

population had increased by about 5% so that the reduction in private consumption would be larger in terms of per capita.

The production index of each industry shows that the production of the heavy and chemical industries which are closely related to the conduct of total war significantly increases during war (Figure 3). The production of the steel and machine industries, in particular, marked an increase of four to five times in about 10 years by 1944 compared to the data of 1931 when the Manchurian Incident occurred.<sup>15</sup> The Machine Tool Manufacturing Business Act enacted in 1938 provided legal support and protection. The production of the mining industry which is related to the production of coal also marked a twofold increase.

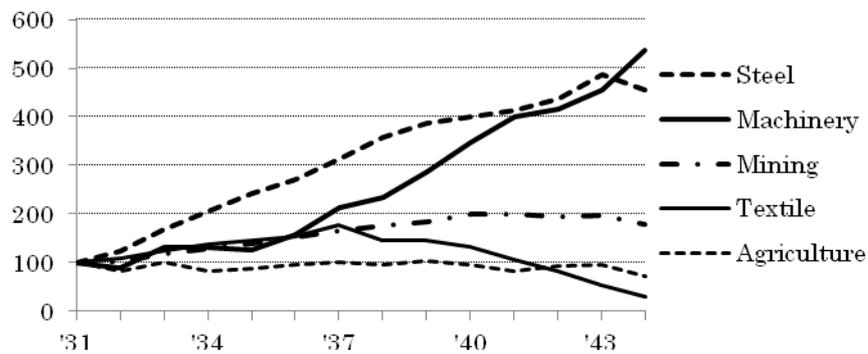


Figure 3: Transition of production index by industry (1931-1944)

Note: Each production index is calculated with 1931 as 100.

Source: Created based on Nippon Ginko, Tokei Kyoku (Statistics Bureau, Bank of Japan), *Meiji Iko Honpo Shuyo Keizai Tokei* (Major Economic Statistics of Japan after the Meiji Era) (Tokyo: Namiki Shobo, 1999), pp. 92-93.

While the production index of the heavy and chemical industries increased, that of the light industry that mainly produces civilian goods marked a significant decrease. For example, in 1944, the production index of the food industry was less than half the peak time (1939), and that of the textile industry was less than one-sixth the peak time (1937). As for the textile industry, the Textile Machinery Manufacturing

<sup>15</sup> The number of labors of the aircraft industry was 9,000 in 1930, but it rapidly increased to 2.04 million in 1944 (the number of labors of the automobile industry was 0.83 million in 2002) (Website of the Ohara Institute for Social Research, Hosei University [<http://oohara.mt.tama.hosei.ac.jp/m/senji1/msejji1-037.html>], accessed on September 10, 2011, website of the Environmental Restoration and Conservation Agency of Japan [[http://www.erca.go.jp/taiki/siryou/pdf/W\\_A\\_008.pdf](http://www.erca.go.jp/taiki/siryou/pdf/W_A_008.pdf)], accessed on September 10, 2011).

Regulations Order was enacted in 1938 and manufacturing of textile machineries was prohibited in principle. The chemical industry represented by the production of chemical fertilizers continued to increase its production by 1942, but it started to decrease since then. Although the agricultural production maintained 80%~90% of the 1931 level by 1943, it decreased to 71% of the 1931 level in 1944. As the population increased by 10% during that period and maritime transportation routes were virtually disconnected, the food supply per capita must have decreased significantly.<sup>16</sup> The transition of economic indicators demonstrates the fact that the production of military goods had been promoted at the expense of civilian goods.

## **Conclusion**

A total war depends on how available economic resources are used for the purpose of waging war to the maximum extent from the economic perspective. Problems related to national income account are the increase and financing of war expenditure, which are part of government expenditure in terms of consumption, and the increase in production of the secondary industries (especially the heavy and chemical industries) in terms of production. To solve those problems, it is necessary to sacrifice the private consumption expenditure and production of civilian goods. The ability of Japan to conduct total war at the time of World War II was not so high from the beginning from the perspective of economic power. Not to mention, there was an issue of resource reserve, although the author did not touch on this point in this paper and its production capacity fell woefully short of the level of the U.S., the U.K. and the Soviet Union. Under such a situation, Japan had financed war expenditure and manufactured military goods at the expense of private consumption expenditure and production of civilian goods.

In Japan, a certain total war system was developed in 1943 from the economic perspective judging from the ratio of military expenditure to national income. All states except the Soviet Union had waged the long-term war of several years by maintaining that ratio from 40% to 50%. If Japan had maintained the ratio under that level, the damage on people's life would have been kept at its minimum so that it could have endured the long-term war. We can say that the Japanese economic power faced its limit at this point to endure the long-term total war. However, in 1944, this value rose to 80%, which has never

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<sup>16</sup> According to the "Nutrient Requirement Standard of the Japanese" announced by the Ministry of Health and Welfare in 1944, the daily nutrient requirement standard (minimum requirement) per Japanese was 2,000 calories on average on a calorie basis (however, the calorie requirement is different depending on content of labor. The average selected was 2,400 calories for regular labors). However, the daily caloric intake per Japanese was 1,927 calories in 1944 and 1,793 calories in 1945 (the actual value of 1941 was 2,105 calories) (Website of the Ohara Institute for Social Research, Hosei University (<http://oohara.mt.tama.hosei.ac.jp/m/senji1/msenji1-148.html>), accessed on September 9, 2011).

been experienced by other participating states. The highest value of the Soviet Union under the reign of Stalin was 61% in 1942-1943. The income level increased by the year of 1944, and this was attributable to rising war expenditure in the course of the war. There had been a ground for triggering inevitable inflation due to a large-scale bond issue to cover those war expenditure and increased issuance of currency to finance those bonds. Japan had continued the war, imposing a huge sacrifice on the people's life in terms of production of civilian goods and food supply. Thus, it was impossible for Japan to be in such a situation for a few more years independently of the disconnection of resource supply from south. Though wartime mobilization in 1944 was a result of maximum efforts of the Japanese economy, to put it briefly, Japan just secured flow of war expenditure and production of military goods, eating up its stock and leaving a risk of inflation. Such measure is believed to have had a temporary effect.<sup>17</sup>

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<sup>17</sup> Please review the formula model mentioned in Paragraph 1 again.