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Recovery and Transition of the Japanese Economy after World War II:
Productivity implications of policy regime changes on the coal mining industry*

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Abstract

Immediately after World War II, under the occupation by the United States, the Japanese government implemented various policies aimed at initiating economic recovery through restoring production and suppressing inflation. Reflecting the policy of the U.S. government, Japanese policy regimes evolved through three phases: First, naïve economic controls were implemented that prioritized increasing production but disregarded productivity, second, economic controls aiming at increasing productivity, and finally a transition to a market economy. In this paper, we explored implications of this sequence of policy regime change, focusing on the coal mining industry. Analyzing mine-level panel data, we found that naive economic controls prioritizing increasing production, and particularly price control policies, distorted coal mining firms' incentives for increasing productivity. Specifically, the firms whose productivity was higher in the initial year lacked incentives to increase productivity, and consequently, productivity of those firms stagnated. Additionally, despite policy changes aiming at productivity increase implemented in 1948, the changes had no significant effect on productivity growth. In contrast, the transition to a market economy had a positive impact on productivity growth; however, this impact was heterogeneous, and only firms whose initial productivity was higher and whose incentives had been distorted under the system of economic control saw positive effects.

Keywords: Economic transition, economic control, productivity, coal mining, economic history, Japan

JEL classification: D22, L52, L72, N15, N45, N55, O25

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1. Introduction

World War II had huge impacts on the world, especially on major belligerent countries. According to the estimation of the Maddison Project, the total GDP of twelve West European countries declined 18.7% from 1938 to 1946, while that of Japan, a focus of this paper, declined 36.7% in the same period.

Economic recovery of major countries has been well documented including policies and policy regimes (Dow 1964; Milward 1984; Cairncross 1985; Woodward 2004; Crafts and Toniolo 1996, for instance). In addition, recent studies have quantitatively investigated and evaluated the impacts of the aids by the United States for economic recovery of war-damaged countries. The channels through which the aids contributed to the economic recovery were technology transfer (Giorcelli 2019), investment in infrastructure (Bianch and Giorcelli 2023) and import of machinery embodying new technologies (Marinez 2025).

This paper focuses on another device that the U.S. used for the recovery of a war damaged country, namely, market transition. Market transition was important because, during the war the governments of most belligerent countries extensively intervened with the economies using tools of planning and controls, like socialist countries, to increase munitions production, while mobilizing labor force to the war (Rockoff 1984, 2012; Harrison ed. 1998; Eloranta et al. eds 2014; Okazaki 2023; Broadberry and Harrison eds. 2025; Eloranta et al. eds, 2025).

Although planning and controls during the war have been extensively studied, transition from the wartime regime based on planning and control to a market economy and its economic implications have been unstudied, to my knowledge. An important exception is Higgs (1999), who stressed the impact of the transition from “central planning to the market” on the postwar prosperity of the U.S. economy, but the focus of Higgs (1999) is the impact on the macroeconomy. In contrast, this paper explores the micro-aspects of the transition to a market economy, focusing on Japan, more specifically Japan’s coal mining industry.

As we will see later, Japan experienced a serious economic crisis with sharp production decline and high inflation, just after the war. Under the occupation by the Allied Nations, de facto, by the U.S., the Japanese government at first dealt with the crisis using the system of planning and control, taken over from the wartime. As the U.S. government came to give priority to stabilizing inflation, the Japanese government modified the design of controls to stimulate productivity increase. Then, finally, the U.S. government decided to make the Japanese economy transit to a market economy at the end of 1948, to instruct the Japanese government to implement a policy package for this,

i.e. the Dodge Plan (Ministry of International Trade and Industry 1954; Economic Planning Agency 1964; Bank of Japan 1985).

This sequential policy regime change reflected in the policy regimes for the coal mining industry (Hokkaido Colliery and Steamship Co. ed., 1958; Ministry of International Trade and Industry, and Research Institute of International Trade and Industry eds.,1992). The coal mining industry is appropriate for the purpose of this research, not only because it was a focus of the policies for economic recovery, but also because it was little affected by the foreign exchange allocation policy after the transition to a market economy, as it did not depend upon imported raw materials. By newly constructing coal mine-level panel data, we evaluate the productivity implications of the sequential policy regime changes.

To preview the main findings, the system of economic controls prioritizing production increase, particularly, the price control, distorted incentives of coal mining firms for productivity increase. Specifically, the firms whose productivity was higher in the initial year lacked incentives to increase productivity. Consequently, productivity of those firms stagnated under the economic control, while that of the firms with lower initial productivity increased. Corresponding to the policy change of the U.S. government to give priority to economic stabilization, the Japanese government tried to resolve this problem by modifying the design of controls in 1948, but it was not effective to productivity increase. In contrast, the transition to a market economy in 1949 had a significant positive impact on productivity increase. The impact, however, was heterogeneous. That is, the transition to a market economy had a positive impact on productivity only for those firms whose initial productivity was higher and incentives were particularly distorted under the controlled economy.

In addition to the literature on the postwar economic recovery and the U.S. aids stated above, this paper relates to the large body of the literature on economic transition. The economic transition literature has made clear that a market transition is a key to efficiency improvement and economic growth by affecting incentives of players in the economy (Roland 1990; Braguinsky and Yavlinsky 2000; Turlyey and Like 2011). Also, in the context of Japan, there are a lot of researches on the postwar economic recovery and the coal mining industry in that process. Okazaki (2002) studies the so called “priority production policy” to point out its bright side (contribution to production recovery) and dark side (negative side effect on the non-priority industries and moral hazard in the priority industries). Shimanishi (2011) and Sugiyama (2012) stress that the priority production policy induced excess input of labor force and stagnation of labor productivity. Meanwhile, Cho (1994) stresses that the priority of the policy shifted from

production increase to productivity growth in 1948. Although these studies are insightful, this paper is the first attempt to quantify the productivity implications of the sequential policy regime changes using the micro-data.

The remainder of the paper is organized as follows. Section 2 overviews the sequential transition to a market economy in postwar Japan. Section 3 describes details of the changing policy regimes for the coal mining industry. In section 4 we explain the data, and present the results of descriptive and regression analyses. Section 5 concludes.

2. Sequential transition to a market economy

World War II and the postwar occupation by the Allied Nations gave a serious damage on the Japanese economy. Although a reliable estimate on GNP or GDP is not available for 1945, the real GNP in the 1946 FY was just 52.9% of that in 1938. According to the estimate by Angus Maddison, the same ratio for the twelve West European countries was 81.3%. Comparing the figures, we find how the negative shock of the war was serious for Japanese economy (Figure 1). Production index and inflation rate further illustrates the critical situation of the Japanese economy just after the war. That is, the production index of the mining and manufacturing industries was just 20-30% of the prewar level, while inflation rate surges to be higher than 400% (Figure 2).

Figure 1, Figure 2

A primary reason for the production decline was shortage of raw materials. Whereas around 25% of production equipment was destroyed by the strategic bombing, production capacity still remained almost at the same level as the prewar period (1934-1936), due to the investment in heavy and chemical industries related to munitions during the war. Meanwhile, real import in 1946FY was just 13.1% of the prewar level. Because Japanese industries heavily depended upon imported raw materials, the import decline directly affected production (Okazaki and Yoshikawa 1993).

Facing the critical situation, the Japanese government made every effort for production recovery. For this purpose, the government employed planning and controls similar to those during the wartime. That is, price controls and distribution controls were renewed in 1946. For price control, the Price Control Act was legislated in March 1946, according to which official controlled prices were set and enforced (Ministry of International Trade and Industry and Research Institute of International Trade and Industry eds., pp.142-146). In October 1946, the Emergency Supply and Demand Adjustment Act was legislated, according to which distribution controls by voucher

system were introduced (ibid, pp.151-153). Distribution controls were implemented based on the Supply and Demand Plan for each quarter, drawn up by the Economic Stabilization Board (ESB), founded in August 1946 (ibid pp.155-159). The Demand and Supply Plan allocated each commodity to the Allied Forces, export, government ministries, and individual industries.

Meanwhile, a new public financial institution specialized in financing for economic recovery, the Reconversion Finance Bank (RFB), was established. The RFB supplied loans to the firms in the industries strategic for economic recovery based on the fund allocation plans drawn up by the ESB. RFB loans were used not only for reconstruction of production equipment, but also for “deficit covering”. Under the high inflation, revision of official prices delayed to rise of production costs, which caused large deficits of firms. The shortage of fund due to the deficits was covered by RFB loans. The RFB raised fund by issuing RFB bonds directly purchased by the Bank of Japan, the central bank, which became one of the major channels of money supply and hence inflation (Okazaki and Ueda 1995).

Based on this framework, so called “priority production policy” was implemented. That is, the government gave priority to a few industries strategic for economic recovery, including coal mining and steel making, in resource allocation. Coal was regarded as strategic, because it was one of few domestic natural resources. As coal production declined sharply after the war, reconstruction of the coal mining industry was urgent, and for this purpose recovery of steel production was necessary as well. The priority production policy was supported by the occupation authorities (General Head Quarters, GHQ) and the government of the United States, which were shifting priority of the occupation policy of Japan from disarmament and democratization to economic recovery, reflecting the start of the Cold War.

Under the policy scheme above and the international environment, production in Japan began to recover in 1947, while inflation became slightly moderate (Figure 2). Given that the U.S. government started to request the Japanese government to draw a path to stabilize the inflation and the economy. A report by the Under Secretary of the Army, William H. Draper in April 1948, made clear the policy for promoting Japan’s economic independence. Based on the report, a mission headed by Ralph Young from the Federal Reserve Board visited Japan to publish a report in June 1948 that implementing a currency stabilization plan is necessary and that unification of foreign exchange rate is its essential part. At that time, exchange rates between Yen and U.S. dollar were determined ex post for each international transaction, and hence they are multiple, which isolated the Japanese economy from international competition. Receiving the

report, in July 1948, GHQ gave the Japanese government an informal memorandum, “Essentials of Economic Stabilization Program,” which instructed ten tasks for economic stabilization, and was called “Ten Principles for Economic Stabilization” (Bank of Japan 1985, p.202).

The pressure by the U.S. government and GHQ to stabilize the Japanese economy was spurred from the end of 1948. The first step was the statement of Chester W. Hepler, the chief of the Labor Division, Economic and Scientific Section of GHQ, in November 1948, prohibiting a wage increase based on government subsidy, deficit covering loan by RFB or raising official price, which was called “The Three Principles on Wage”. Until then firms easily made concessions to labor unions to raise wages expecting increase in labor cost would be covered ex post by these measures, which is a typical soft budget constraint under a controlled economy (Kornai 1979; Maskin 1996). By the “Three Principles on Wage” GHQ explicitly excluded the soft budget constraint (ibid, p.213; Ministry of Finance 1981, pp.81-82). The second step was instruction of “Nine-Part Interim Directive on Stabilization” to GHQ by the U.S. government. It directed nine measures including balancing the government budget for swift unification of the foreign exchange rate. Finally, the U.S. government dispatched Joseph M. Dodge to Japan as the Financial Advisor of GHQ in February 1949, in order to implement the stabilization policies based on the Nine-Part Interim Directives.

According to Dodge’s instruction, the Japanese government took three distinctive measures, i.e. making surplus in the 1949 FY budget, suspension of new loans from RFB in April 1949, unification of foreign exchange rates at 1 U.S. dollar = 360 Yen in April 1949 (ibid, pp.236-260). In addition, as these macro-measures excluded excess demand, price and distribution controls were abolished from April 1949 (Ministry of International Trade and Industry and Research Institute of International Trade and Industry eds., pp.174-181). In other words, April 1949 was an epoch when the Japanese economy transited from a controlled economy to a market economy². And it is notable that the U.S. government and GHQ committed to the transition from the end of 1948.

3. Recovery and market transition of the coal mining industry

² Controlled economies are inherently accompanied by black markets, and an essential issue is the extent to which black markets cover resource allocation. Concerning the coal market in late 1940s Japan, Kosai (2007) measures the extent by the difference between the coal allocation to and the coal consumption by manufacturing industries. According to his data, the ratios of coal allocation to the coal consumption were 80.0% and 104.2% in 1947 and 1948, respectively. It implies that the coverage of controlled allocation was fairly high.

The sequence of the recovery and transition of the coal mining industry almost corresponds to that of the whole Japanese economy. After Japan surrendered to the Allied Nations in August 1945, coal production declined very sharply. Whereas average monthly coal production in Japan was 3.60 million tons from January to March in 1945, it declined to 0.89 million tons in September, and then 0.59 million tons in October (Figure 3).

Figure 3

One apparent reason of the production decline was decline in labor force. At the final stage of the war, the Japanese coal mining industry heavily depended upon workers from the colonies and foreign countries³, and most of those workers exited from coal mines just after the war⁴. In addition, due to the reckless coal mining under shortage of material inputs during the war, conditions of coal mines and equipment was seriously deteriorated (Secretariat Research Division of the Minister of the International Trade and Industry 1954, pp.145-146; Nakamura 1957, p.208, 217; Hokkaido Colliery and Steamship Co. ed. 1958, pp.52-53). The company history of Hokkaido Tanko Kisen, one of the largest coal mining firms, wrote about the situation just after the war, “shortage of materials, such as mine timber, steel, and cement, was serious enough to paralyze coal production” (Hokkaido Tanko Kisen, 1958, p.233, the author’s translation)⁵. The deterioration of mines and equipment caused substantial decline in labor productivity. Indeed, coal production per worker was 68.8 tons in 1946, while it was 177.1 tons and 117.7 tons in 1940 and 1944, respectively⁶.

³ The percentages of Korean workers, Chinese workers and captives in the total coal mining workers in Japan was 32.9, 2.3, and 1.8, respectively (Ohara Institute for Social Research, Hosei University ed. 1964, p.44). When limited to underground workers, the percentage of those non-Japanese workers was as high as around 50% (Hokkaido Colliery and Steamship Co. ed. 1958, p.38).

⁴ In addition to voluntary exits, the Japanese government took measures to urge coal mining workers from ex-colonies and foreign countries to go back to their home countries, because they caused unrests due to the discontent with harsh labor management during the war (Nakamura 1957, p.208).

⁵ The company history of Mitsubishi Mining Cement wrote that during the war, they aggressively mined coal disregarding a rational limit, and they could not invest in maintenance of mines and search for new coal veins, which caused deterioration of mines and facilities and decline in coal production (Mitsubishi Mining and Cement Co. 1976, p.479).

⁶ Calculation by the data from Toyo Keizai Shinposha (1991). Kyushu Coal Mining Federation ed. (1957) wrote about the decline in the coal production and labor productivity, “It is obvious that the problems were not only in labor force but also in a

The priority production policy was launched focusing on the coal mining, given this critical situation. As stated above, the priority production policy was implemented using the system of economic controls (Okazaki 2002). Materials for coal mining, such as steel, mine timber and cement, were allocated to the coal mining industry in the Demand and Supply Plan by ESB. Then the Coal Agency of the Ministry of Commerce and Industry allocated them the regional Coal Bureaus, which in turn allocated them to individual coal mines (Mitsubishi Mining and Cement Co. 1976, pp.483-484). The allocation to each coal mine was based on previous allocation record and in this sense “all-inclusive approach” ignoring efficiency (Cho 1994, pp.91-94, Japan Coal Mining Federation 1949, p.39).

Figure 4 shows the indices of the quantity of materials received by coal mines. The quantity of steel increased from early 1946, and after a drop in 7-9 quarter of 1947, it continued to increase until the end of 1948. Meanwhile, the quantity of mine timber increased in 1-3 quarter of 1947, when the priority production policy started, and the quantity of cement increased sharply from late 1947. Figure 5 shows the outstanding of RFB loans to the mining industry. As high inflation was proceeding, the outstanding was indicated at the constant price in March 1947. As shown here, the RFB increased loans to the mining industry sharply, and the percentage of the mining industry in the total RFB loans was as high as around 40%.

Figure 4, Figure 5

Practical works of price and distribution controls were taken in charge by Japan Coal Corporation until June 1947, then by Coal Distribution Corporation. Japan Coal Corporation was founded in 1940 for controlling price and distribution during the war, while Coal Distribution Corporation was a public company founded by GHQ’s instruction. Both corporations purchased coals from mines at the price that covered the production cost of coal at each mine, and sold coals to firms and consumers at prices lower than the purchase prices. The gap between buying prices and sales prices were covered by the subsidy from the government (Japan Coal Association 1952, pp.8-10). Because a coal mine could sell coal at the price that covered its production cost, it had no incentive to improve efficiency and reduce cost, which is a typical moral hazard under the controlled economy. Intending to resolve this problem, a new method to determine buying prices

deeper production structure issue, i.e. deterioration of facilities due to underinvestment since the wartime, by the fact that recovery of productivity delayed for a long time after that” (p.2, the author’s translation).

was adopted. The main points were:

- a. Prices were determined at the average cost of 14 regional groups of coal mines
- b. Prices were determined in advance
- c. Quality of coal was reflected in the price for each mine

By determining buying prices in advance at the average cost of a group of mines, the government expected that mines would have incentives to reduce their costs. However, the incentives were not so large, because if the average cost declined, the decline would be reflected in the future buying price. Meanwhile, for those mines with higher production cost, reduction of production costs by enhancing productivity was essential, because the buying price was determined based on the average cost of each regional group, those mines fell into the deficit under that price. Although some additional price was paid to those mines, it did not cover all of the deficit (Hokkaido Colliery and Steamship Co. ed. 1958, pp.847-851).

As stated in the previous section, the U.S. government and GHQ started to give priority to stabilization of the Japanese economy around April 1948. This change in the macro-economic policy and the macro-economy was immediately reflected in the policy of them and the Japanese government on coal mining. Japan Coal Mining Association (1951) wrote “The economic situation from 1948 substantially changed the path of the coal mining industry, while it still remained under the controlled economy” (p.6). In May 1948, Chester W. Hepler, the chief of the Labor Division, Economic and Scientific Section of GHQ instructed that the number of coal mining workers should be pegged at the level on May 1st, and that the ratio of underground workers should be no less than 60%, and the Japanese government enforced this instruction by a Cabinet Ordinance (Hokkaido Colliery and Steamship Co. ed. 1958, p.608), which implies that GHQ and the Japanese government was giving priority to productivity or efficiency over production quantity. This policy shift was clearly reflected in the end of increasing trend of coal mining workers (Figure 3).

Corresponding to the restriction of number of workers, the government stressed rationalization of coal mining. In May 1948, the government decided “Measures for Rationalizing Coal mining Firms,” which stressed efficiency base allocation of materials and fund, mechanization and establishment of organization for labor dispute resolution (Fumoto 1961, p.194). Based on it, the method for firm-level allocation of materials was revised from 7-9 quarter in 1948. That is, the government evaluate each coal mine in terms of the quality of coal (calory per ton) (40%), material productivity (40%), and labor

productivity (20%), and allocated materials, i.e. steel, electric wire, mine timber, cement, steel wire, and explosive, more to the mines with higher evaluation points (Hokkaido Colliery and Steamship Co. ed. 1958, pp.699-700; Cho 1994). Concerning fund, the RFB reduced deficit covering loans of the coal mining industry to concentrate on financing investment for enhancing productivity (Cho 1994). Concerning price control, the system of official prices, including the coal price was revised in June 1948. Reflecting the progress of inflation since the previous revision in July 1947, both buying prices and selling prices were raised more than twice. Also, the regional groups to determine buying prices were merged to ten from fourteen, while price difference based on quality was expanded (Hokkaido Colliery and Steamship Co. ed. 1958, p.49, pp.851-855).

Finally, “national management of coal mines” was implemented in June 1948. Originally national management of coal mines was proposed by the Allied Council for Japan in September 1946. Many member countries of the Allied Council recommended not only nationalization of management but also of ownership, reflecting the global influence of the socialist ideology. As GHQ was neutral to this issue, nationalization of coal mining was left to Japan. In June 1947, the Japan Socialist Party, supporting nationalization of ownership became the largest party in the House of Representatives, but it did not have a majority, the coalition government proposed the bill for nationalizing management of coal mines (Coal Mines Nationalization Bill) in September 1947 to be approved in December 1947. The law was enacted in April 1948, and 42 coal mines, whose production share was larger than 50%, were designated for national management in June 1948 (Ministry of International Trade and Industry, and Research Institute for International Trade and Industry 1992, pp.88-111)⁷.

As this time line indicates, although the nationalization of management was devised for the priority production policy, it was materialized in the phase of economic stabilization. Furthermore, in a book titled *One Year of Coal Mines Nationalization*, the Coal Agency wrote that no essential transformation occurred in coal mining firms, and that the management systems introduced did not have specific impact on coal production (Coal Agency 1949, pp.3-4; Ministry of International Trade and Industry, and Research Institute for International Trade and Industry 1992, pp.115) .

It is notable that these policy changes in 1948 was within the framework of a controlled economy, and aimed at stimulating firm incentives and enhancing efficiency by modifying the design of controls. In contrast, from the ends of 1948, the U.S. government and GHQ explicitly committed to making the environment of the coal

⁷ In October 1948, 28 mines were added for nationalization of management (ibid, p.111).

mining industry transit to a market economy from a controlled economy. Indeed, Chester W. Hepler's "The Three Principles of Firms," stated above, was presented to management and labor union of coal mining firms negotiating on wage agreement (Asahi Shinbunsha 1949, p.79). By this, coal mining firms, which had depended upon government compensation and RFB's deficit covering loans, were obliged to change the management policy completely (Inaba 1950, p.3). In addition, according to the "Nine-Part Interim Directive on Stabilization" in December 1948, allocation of RFB loans to the coal mining industry was reduced in the 1-3 quarter of 1949. About this, Fukuoka Branch of the Bank of Japan⁸ reported that although some coal mining firms complaint on government's breach of promise, "anyway there is no other choice because of the present situation. As any petitions and appeals do not help, given the Nine-Part Interim Directive, coal miming firms are taking countermeasures desperately, and the momentum to rationalize mining is growing stronger" (Fukuoka Branch of the Bank of Japan, 1949, the author's translation). These anecdotes indicate how the commitment of the U.S. government and GHQ to a market transition changed the attitudes and activities of coal mining firms.

From April 1949, implementation of the macro-stabilization policy advised by Dodge affected the coal mining industry to eliminate excess demand of coal and stock of coal increased, which made price and distribution controls unnecessary. Given that, price control, distribution control, and hence the Coal Distribution Corporation were abolished in September 1949, according to the instruction by GHQ. Also, the Coal Mines Nationalization Act was formally abolished in May 1950 (Hokkaido Colliery and Steamship Co. ed. 1958, p.115, pp.609-610; General Head Quarters 1950, pp.48-49).

To see how policy regime changes affected productivity, Figure 6 indicates labor productivity (production per worker) and its annual change. It seems that the labor productivity was basically on a increasing trend from the middle of 1946. As stated above, the policy regime changed in early 1948 shifting the focus from production quantity to efficiency, but we cannot see a clear break point in the growth rate of labor productivity in 1948. Rather, from early 1949, the growth rate of labor productivity seems to shift upward. It suggests that the commitment to swift transition to a market economy by the U.S. government and GHQ had a larger positive impact on the productivity performance than the policies to enhance productivity within the framework of a controlled economy.

Figure 6

⁸ Fukuoka Prefecture was the center of coal mining besides Hokkaido Prefecture.

4. Productivity implications of the policy regime changes

In the previous section, we described the changes in the policy regimes and their impacts on labor productivity with aggregate time series data. Here we investigate the productivity implication of policy regime changes exploiting the mine-level panel data from 1946 to 1951. The data sources are 1947 and 1948 issues of *Sekitan Rodo Nenkan (Yearbook of Coal Mining Labor)* (Coal Mining Federation 1947, 1948), and 1948-1951 issues of *Honpo Kogyo no Susei (Mining Trends in Japan)* (Ministry of International Trade and industry 1949-1952) Both sources provide the mine-level data on coal production in each year and the number of workers at the end of each year. We constructed six years panel data using the mine name as a key identifier.

There are 179 coal mines whose data on the production and the number of workers, are completely available for six years from 1946 to 1951. Hence, we have 1,074 mine \times year observations. Using the data, we first observe the change in the sample mean of coal production, number of workers and labor productivity (production per worker) (Panel A, B, and C of Figure 7). Mean production indicates an upward trend from 1946 to 1951. That is, in the recovery process of aggregate coal production, production of each mine increased on average. Meanwhile, the movement mean number of workers looks different. While it increased sharply in 1947, the increase slowed down in 1948, and then declined from 1949. This is consistent with the aggregate data in Figure 3, which implies that the movement of the aggregate number of workers reflects that of each mine. Finally concerning labor productivity, while it increased gradually until 1948, the increase was accelerated in 1949, which is also consistent with the movement of aggregate labor productivity in Figure 6.

Panel A, B, and C of Figure 7

In the previous section, we found that the incentives of cost reduction or productivity increase were different between coal mines with lower cost and higher cost, and the latter mines would have greater incentives to enhance productivity, because the official coal prices determined based on the average cost of coal mines in a region, and hence mines with higher cost would run into deficit. To see the implication of this incentive structure, Panel A, B and C of Figure 8 divides the coal mines into those with labor productivity higher than the median value in the initial year, 1946, and the other mines, and shows the same set of graphs as Figure 7. Mean production of mines with lower initial productivity was smaller than those with higher productivity, but the

growth rate was basically higher until 1949, and then stagnated after that. On the other hand, whereas increase in mean production of mines with higher production was slower until 1949, it continued to grow after that. Concerning the number of workers, it is notable that on average the mines with lower initial productivity employed more than the mines with higher initial productivity. Meanwhile, the movements of mean number of workers look similar, with peaks in 1948.

What is most striking and interesting is the difference in the movements of labor productivity. The mines with lower initial productivity consistently increased labor productivity thorough the period of observation. In contrast, labor productivity of the mines with higher initial productivity was stagnant until 1948, and then started to grow. These movements of labor productivity of the two groups of mines are consistent with the difference in the incentives for productivity increase between them.

Panel A, B, and C of Figure 8

This observation is consistent with the evolution of incentives of coal mines. As stated above, under the price control, incentives for reducing costs by enhancing productivity were not so large, except for those mines with higher costs facing the threat of falling into deficit. The transition to a market economy would remove the distortion of incentives. Motivated by the observation and the inference, we conduct regression analyses of labor productivity growth of individual coal mines. The baseline specification is:

$$\text{LaborProductivityGrowth}_{it} = \beta_0 + \beta_1 \text{AboveMedian1946}_i + \beta_2 \text{AboveMedian1946}_i^* \gamma_t + \gamma_t + \delta_r + e_{it} \quad (1)$$

$\text{LaborProductivityGrowth}_{it}$ is labor productivity growth of mine i in year t . AboveMedian1946_i is a dummy variable which equals to 1 if the labor productivity of mine i was higher than the median value in 1946, and 0, otherwise. γ_t is a year fixed effect. δ_r represents a region fixed effect. We divide Japan into four regions, Hokkaido, East Honshu, West Honshu, and Kyushu, and used Hokkaido as the reference category. We are especially interested in β_2 for each year, expecting that β_2 increases by the sequence of policy regime changes from 1948, especially the market transition in 1949, as Figure 7 and 8 suggest.

Basic statistics is in Table 1, and estimation results are presented in Table 2. Column (1) indicates the estimation result of equation (1). First, year fixed effects

indicate that the regime changes in 1948 and in 1949 had no overall positive impact on labor productivity. Meanwhile, for the mines whose labor productivity was higher than the median value in 1946, the transition to a market economy after 1949 had a significant positive impact on labor productivity. It is notable that the absolute value of β_2 is larger than that of γ_t for 1949, 1950, and 1951. It is also noted that β_2 is positive, but not statistically significant for 1948, which indicates that the policy regime change aiming at productivity increase within the framework of a controlled economy, was not effective. Column (2) indicates the result where we divide sample mines into those with labor productivity higher than the sample mean in 1946 and those with labor productivity lower than the sample mean, instead of the median. The result is almost the same as that in column (1).

In column (3), we divide the sample mines into those with labor productivity higher than the median of a region in 1946, and those with labor productivity lower than the median of a region in 1946. This is motivated by the fact that the official prices were determined by the average cost in each region, although the regions here are different from the regions used for determining official prices. The numbers of sample mines in Hokkaido, East Honshu, West Honshu, and Kyushu regions are 38, 21, 19, and 101, respectively.

The estimation result is qualitatively the same as the baseline result. That is, the market transition from 1949 had a positive impact on the labor productivity growth of mines with relatively higher initial productivity, whereas the policy regime change in 1948 had no significant effect. Finally, column (4) indicates the result where we use the mean instead of the median in dividing higher and lower productivity mines in a region. The result is almost the same as that in column (3).

Table 1, Table 2

Three major takeaways emerge from the analyses of micro-data. First, the policy regime change within the framework of a controlled economy did not have a significant effect on labor productivity, although it aimed at enhancing productivity by concentrating resources to relatively efficient mines. Second, the transition to a market economy from 1949 had a significant positive impact on labor productivity. Third, however, the positive impact was limited to mines with higher initial productivity. Whereas labor productivity of those mines almost stagnated until 1948, unlike those with lower initial productivity, it started to increase in 1949. This suggests that the system of economic controls, in particular the scheme for price control distorted

incentives for those mines to enhance productivity, and that this distortion was removed by the market transition.

5. Conclusion

Just after the World War II, under the occupation by the United States, the Japanese government endeavored to increase production and suppress inflation for economic recovery. Reflecting the policy of the U.S. government, the policy regimes evolved through three phases, i.e. naïve economic controls giving priority to increase production increase disregarding productivity, economic controls aiming at productivity increase, and finally market transition. In this paper, we explored implications of this sequence of policy regime change, focusing on the coal mining industry.

Analyzing the mine-level panel data, we found that naive economic controls prioritizing production increase, particularly, the price control, distorted incentives of coal mining firms for productivity increase. Specifically, the mines whose productivity was higher in the initial year lacked incentives to increase productivity, and consequently, productivity of those mines stagnated. Given the policy change of the U.S. government to give priority to economic stabilization, the Japanese government modified the design of economic controls aiming at productivity increase in 1948, but it did not have a significant effect on productivity growth. In contrast, the transition to a market economy instructed by the U.S. government, had a positive impact on productivity growth, while the impact was heterogeneous. That is, the transition to a market economy had a positive productivity implication only for those firms whose initial productivity was higher and incentives were distorted under the system of economic control.

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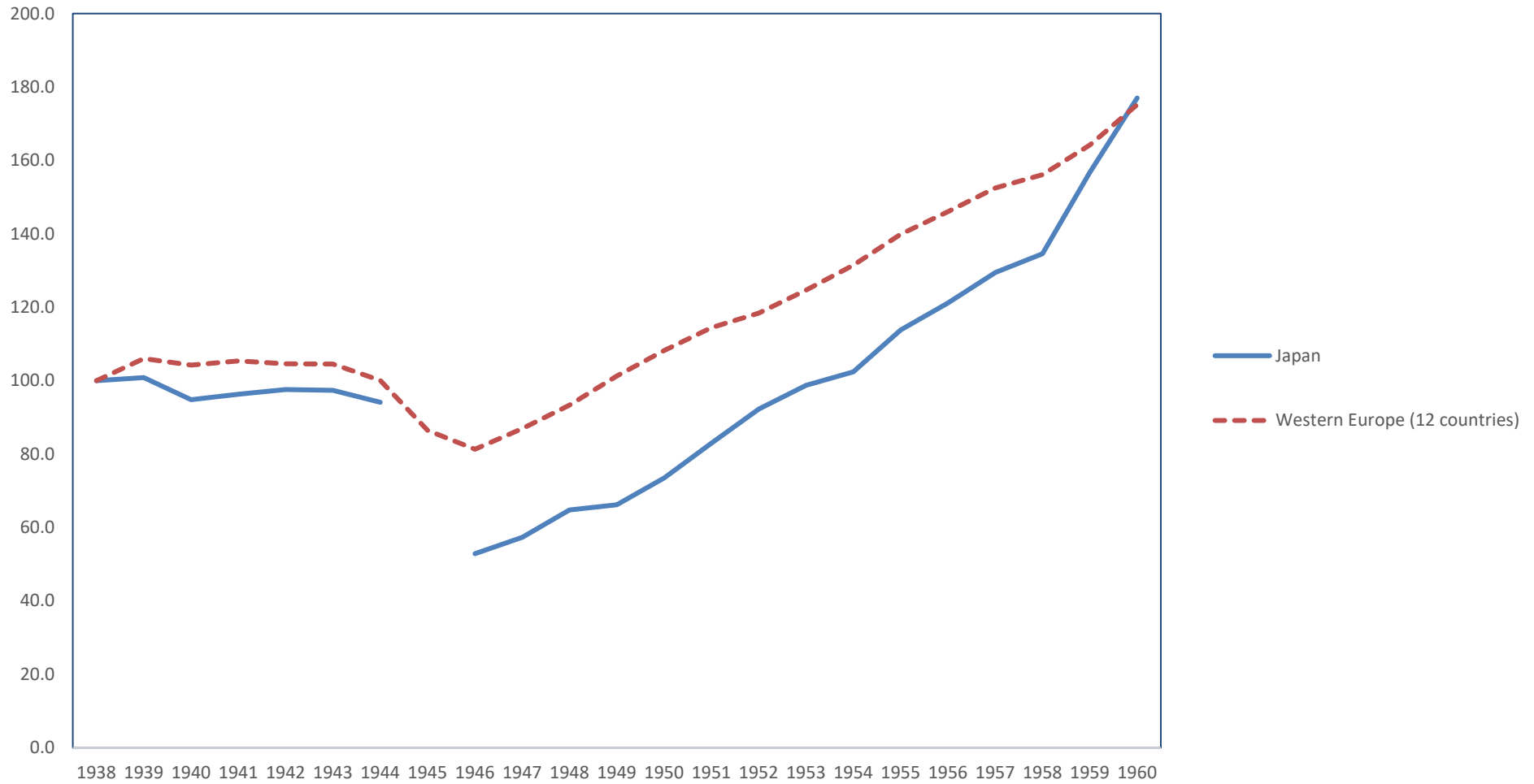
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Figure 1 War damage and economic recovery in Japan and Western Europe (real GDP, 1938=100)

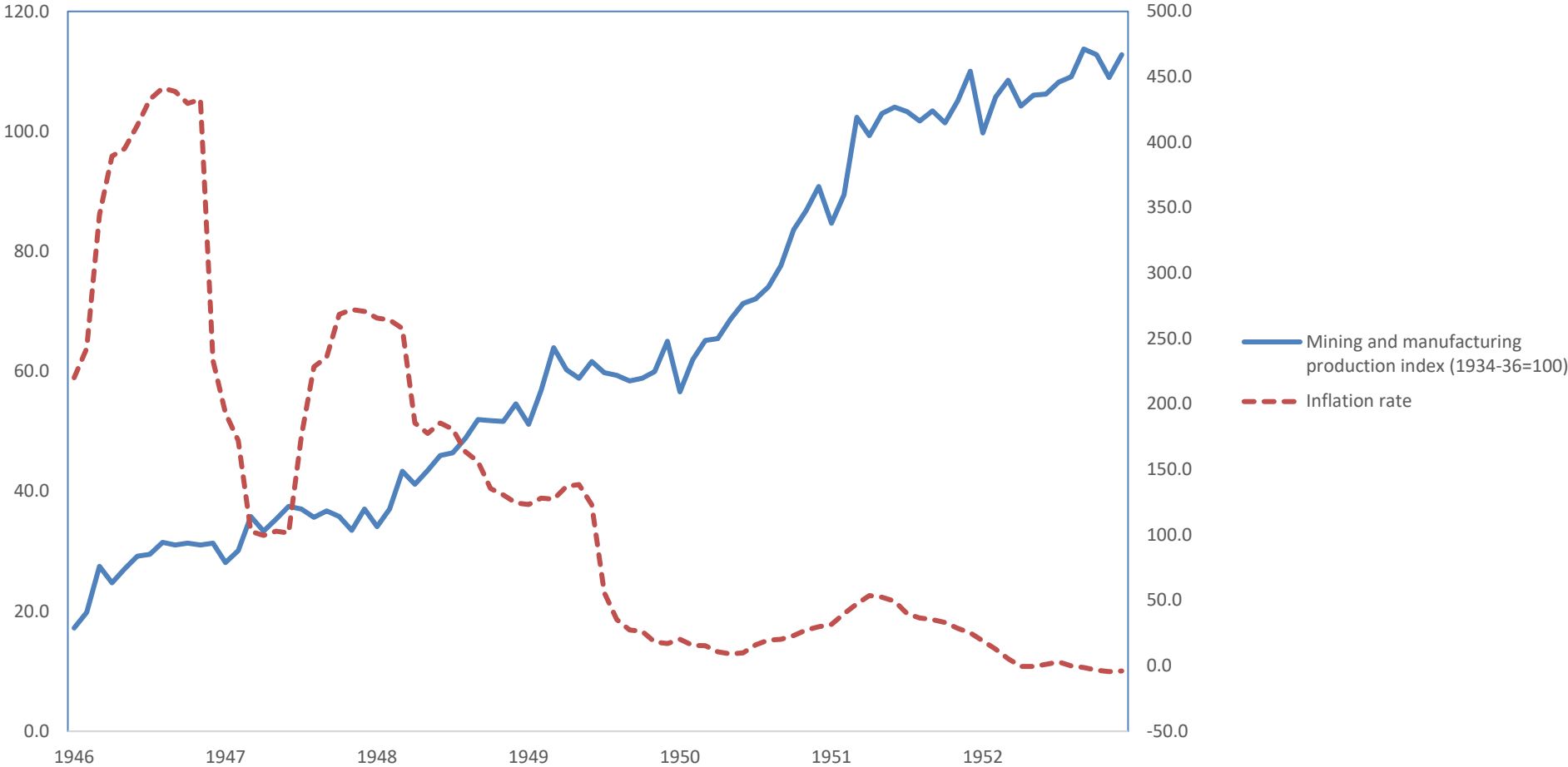


Source: Ministry of Finance (1978), p.28; Maddison Database 2010.

Figure 2 Postwar economic crisis and recovery

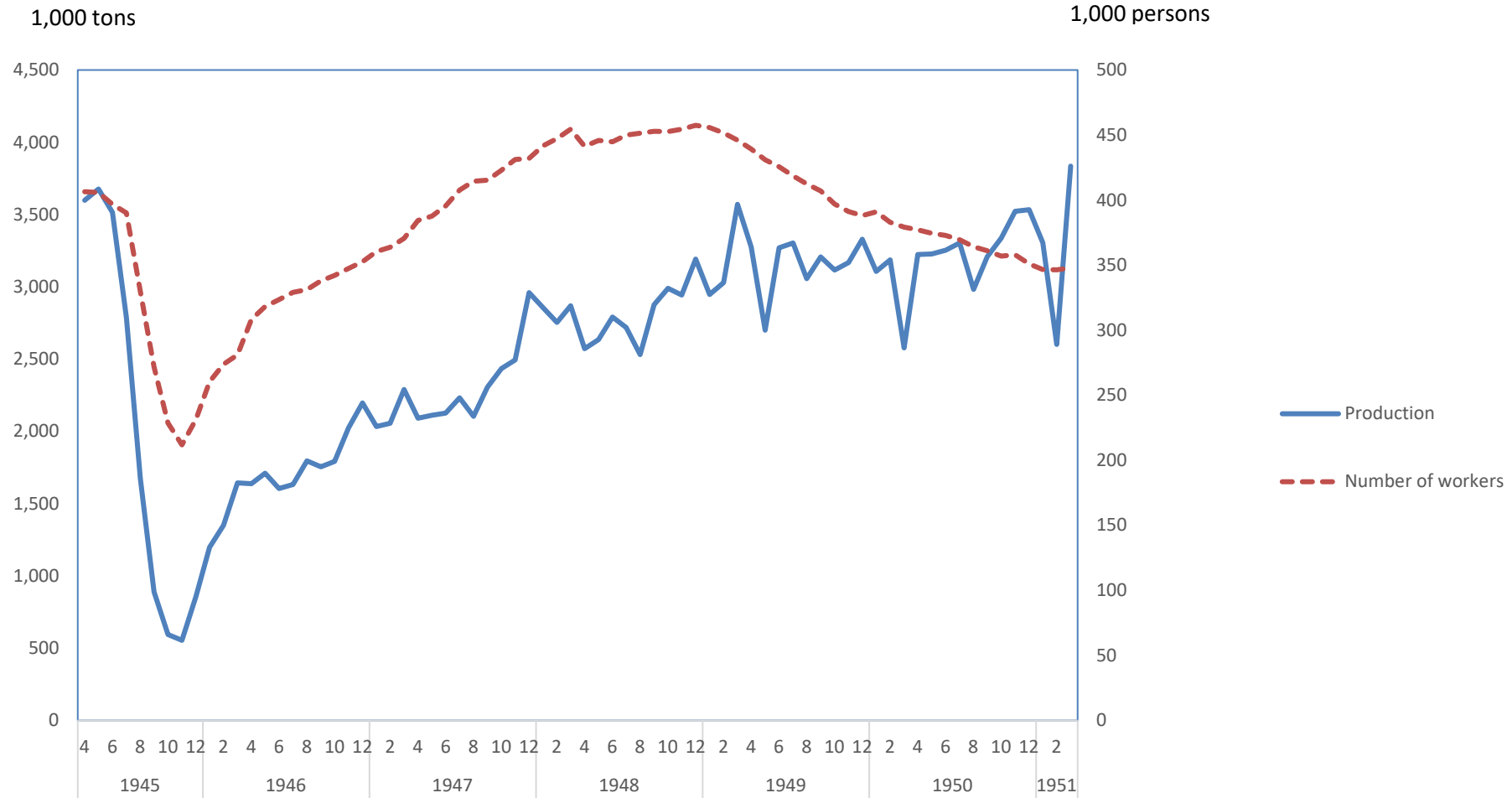
Mining and manufacturing production index (1934-36=100)

Inflation rate (%/year)



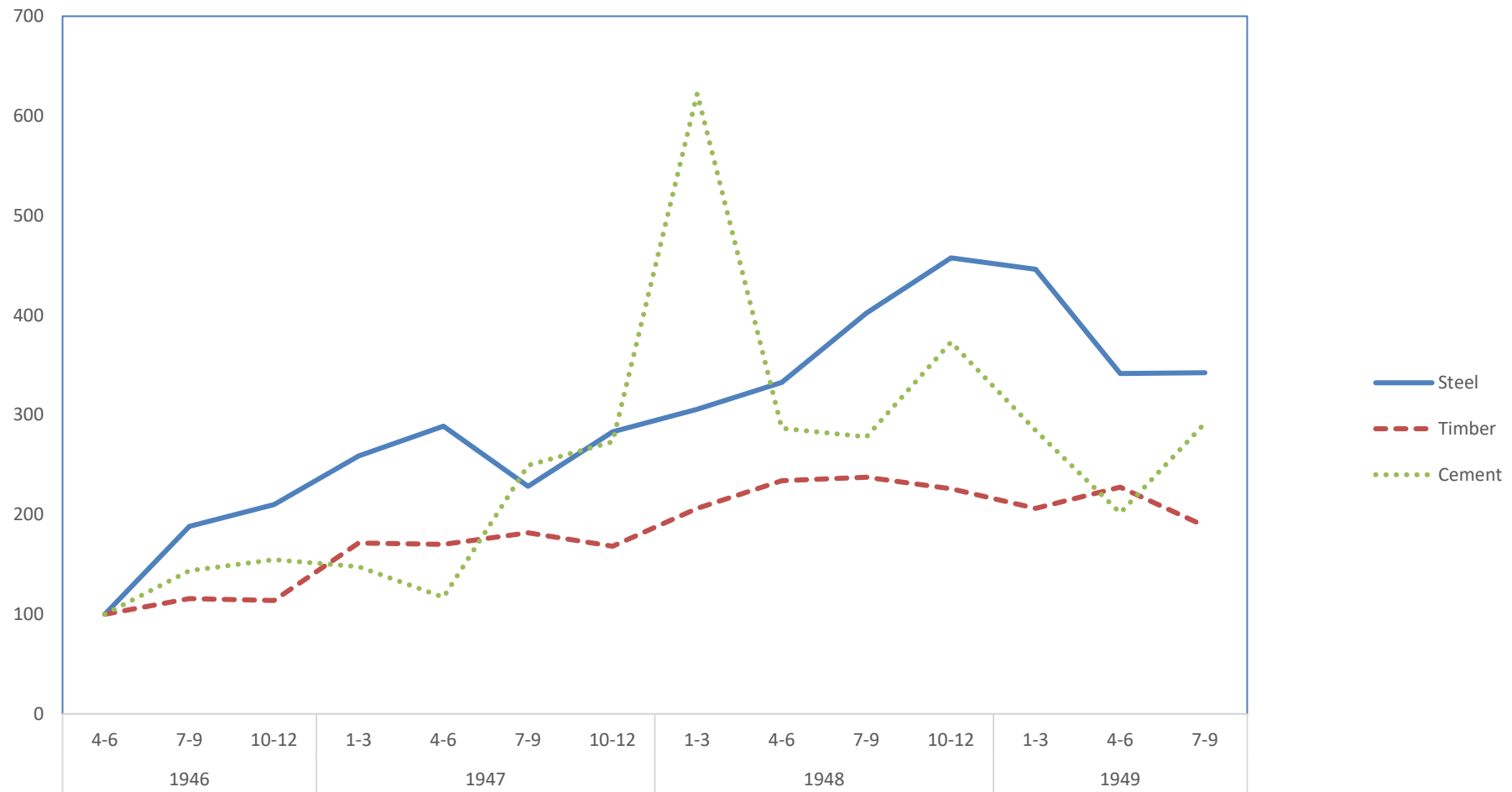
Source: Ministry of Finance (1978), p.62, pp.88-89.

Figure 3 Recovery of the coal mining industry



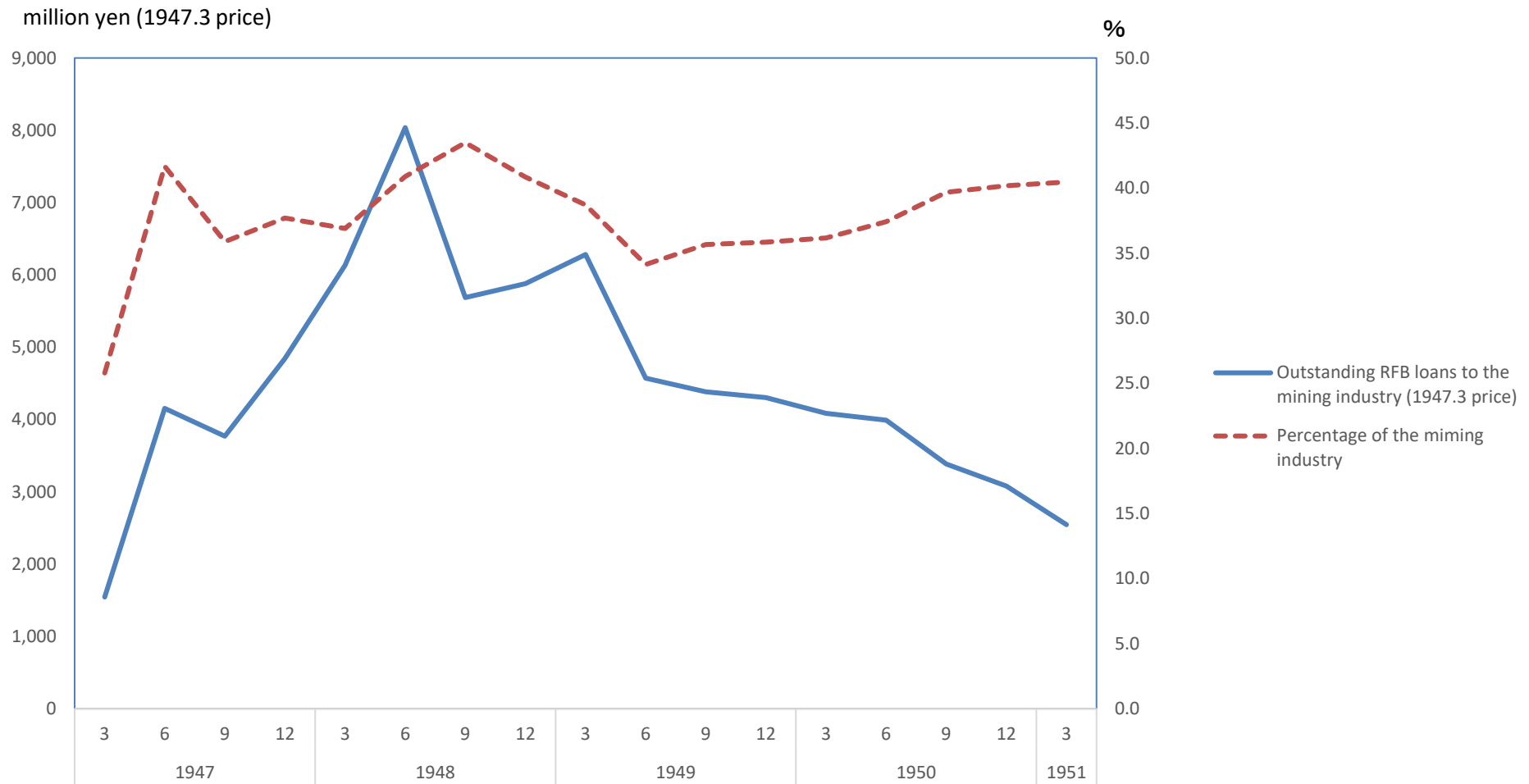
Source: Japan Coal Association (1950), pp.10-11, p.147; Japan Coal Association (1951), pp.1-3.

Figure 4 Quantity of materials received by coal mines (1946.4-6=100)



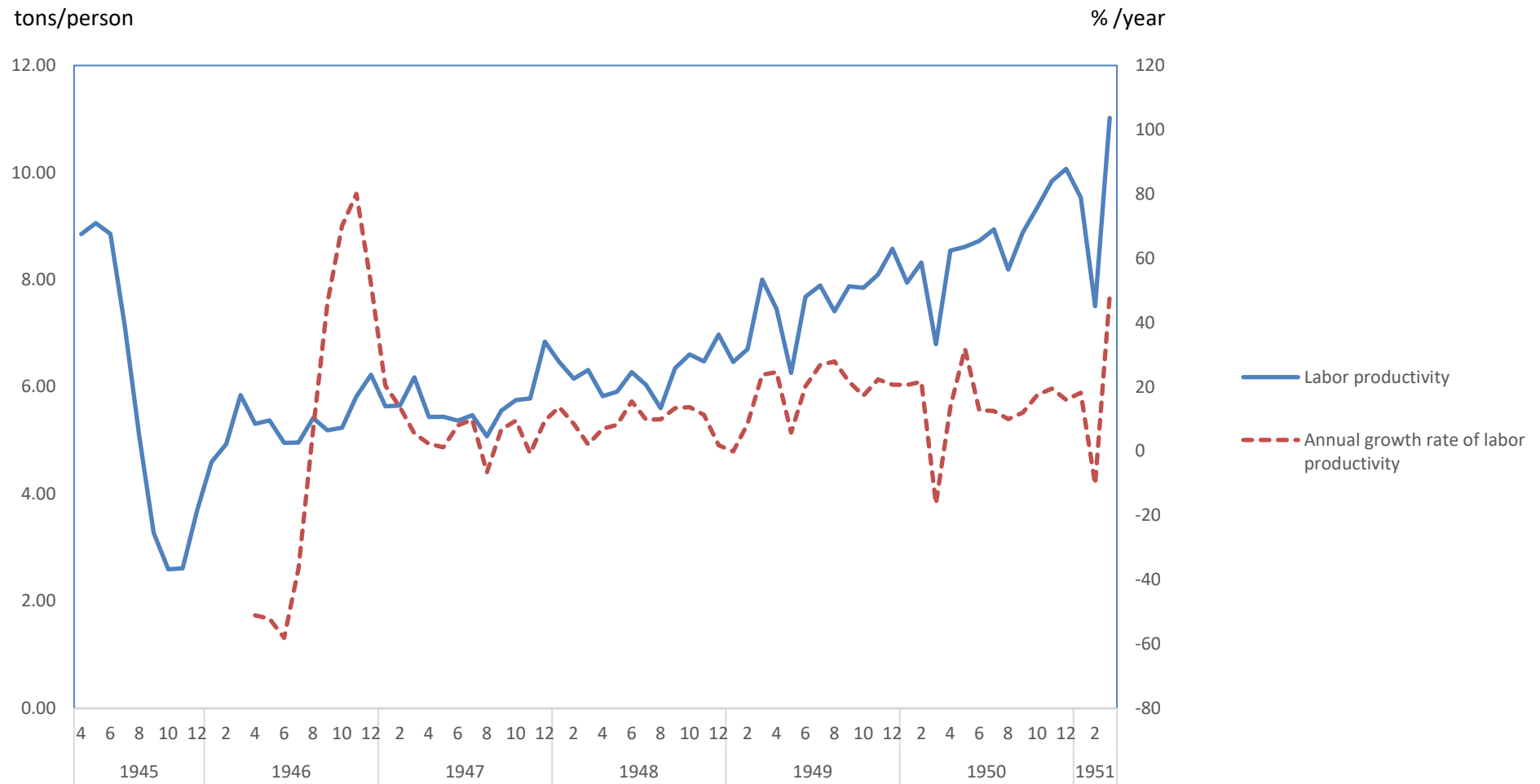
Source: Japan Coal Association (1950), pp.119-130..

Figure 5 Outstanding of RFB loans to the mining industry



Source: Ministry of Finance (1978), pp.38-39, pp.571-573.

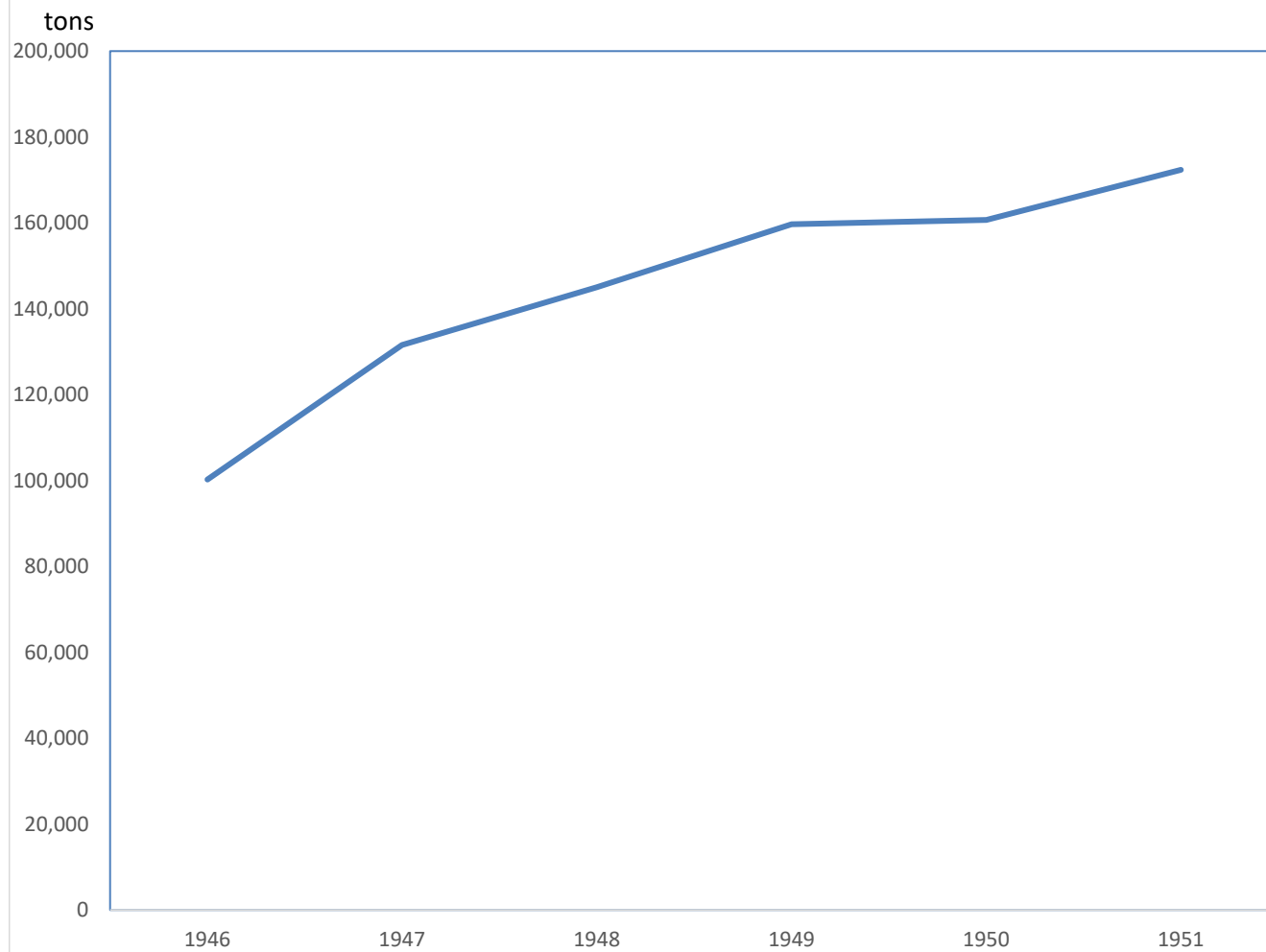
Figure 6 Labor productivity of the coal mining industry



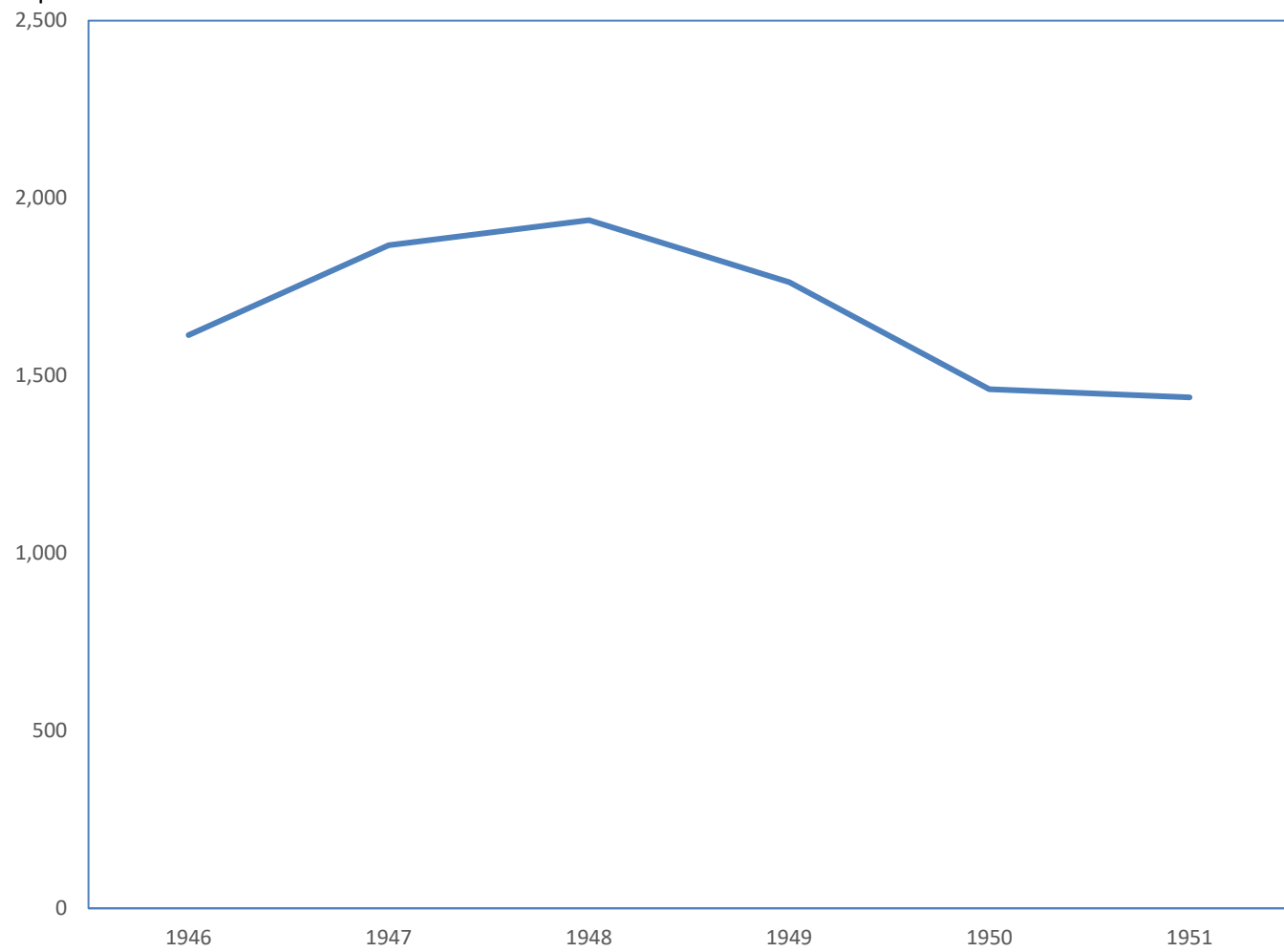
Source: Japan Coal Association (1950), pp.10-11, p.147; Japan Coal Association (1951), pp.1-3.

Figure 7 Sample means of production, number of workers, and labor productivity

A. Production



**B. Number of workers
persons**



C. Labor productivity
tons/person

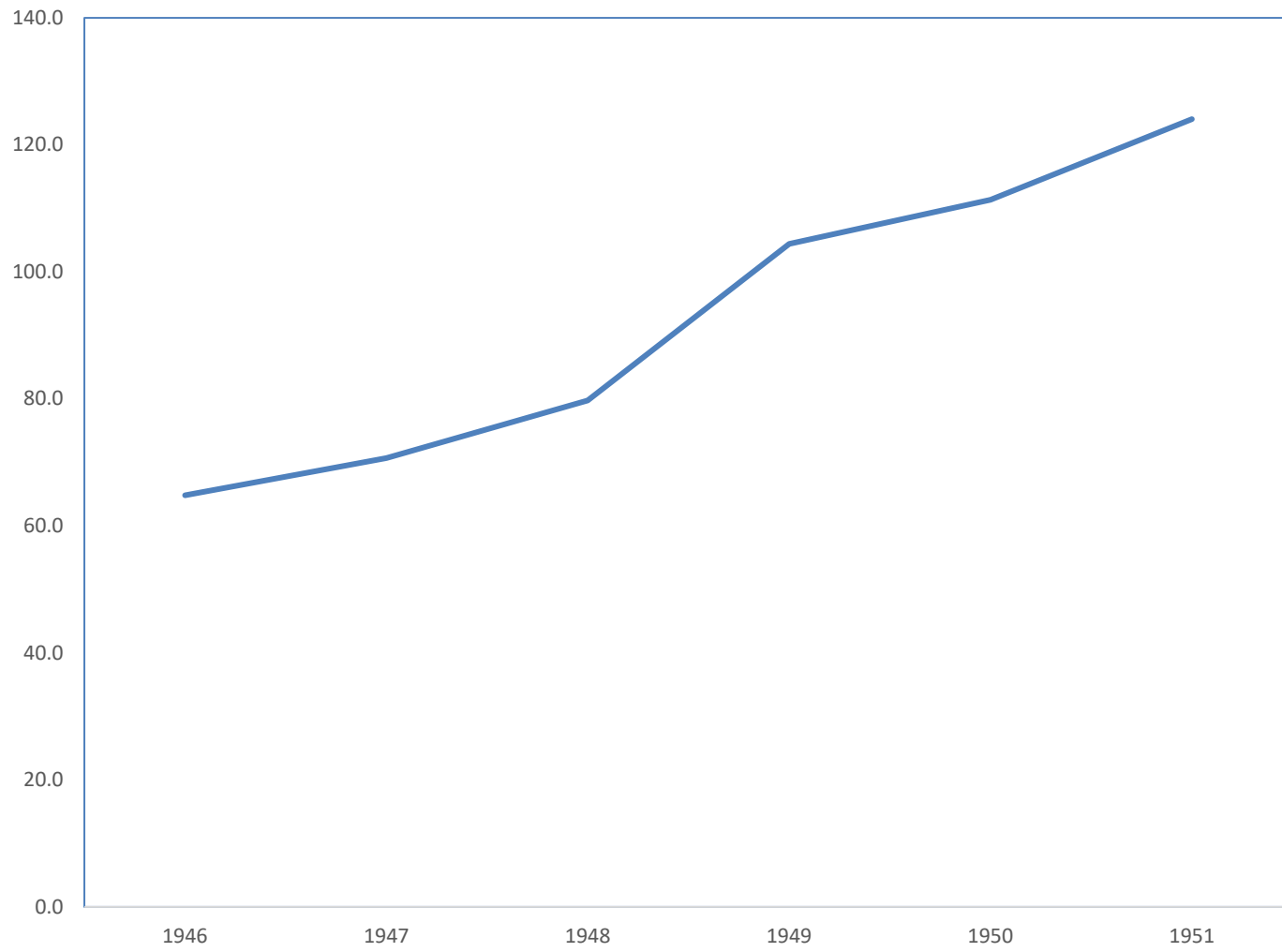
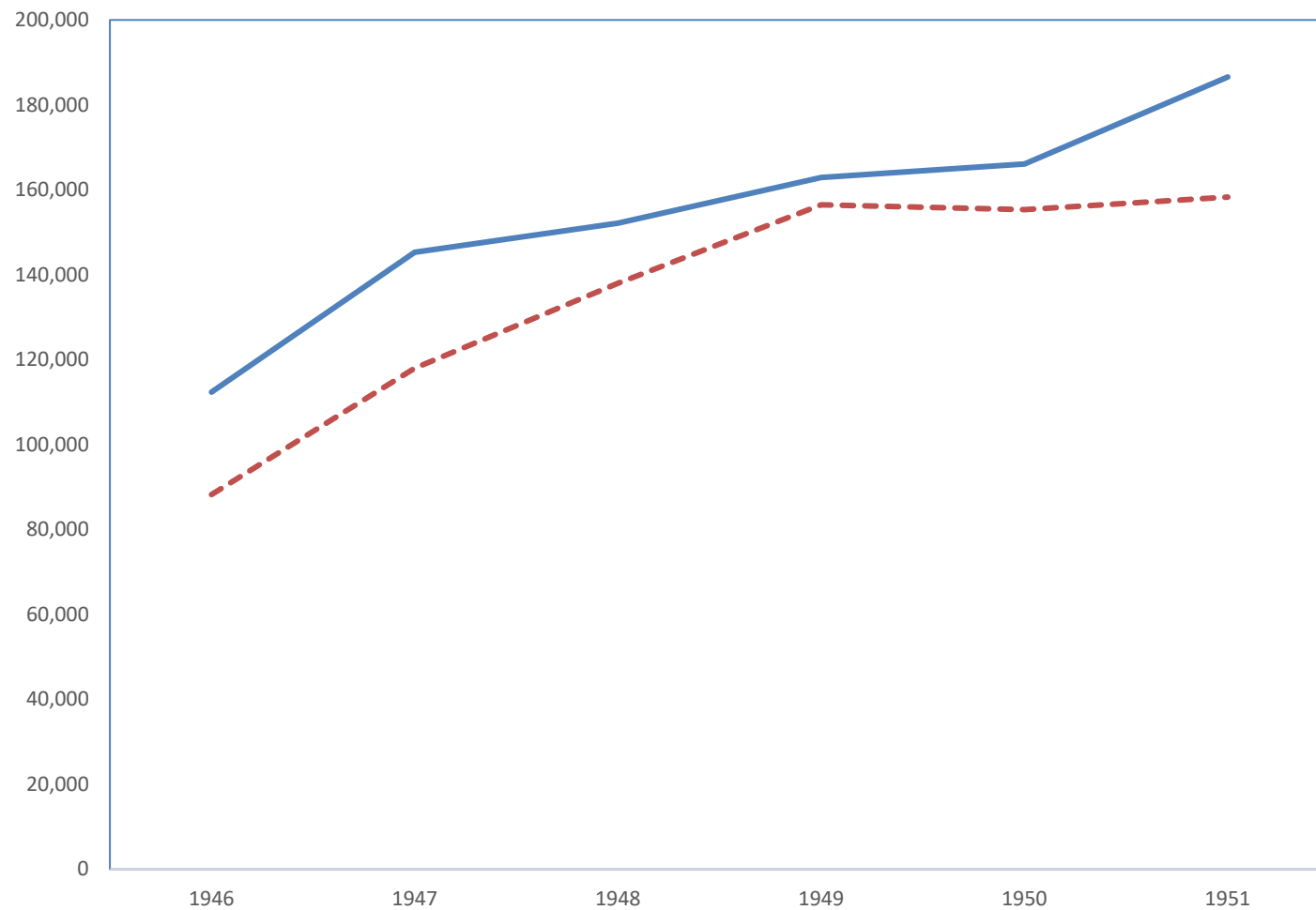


Figure 8 Comparison of means between the firms with labor productivity higher than median and the firms with labor productivity lower than median

A. Production

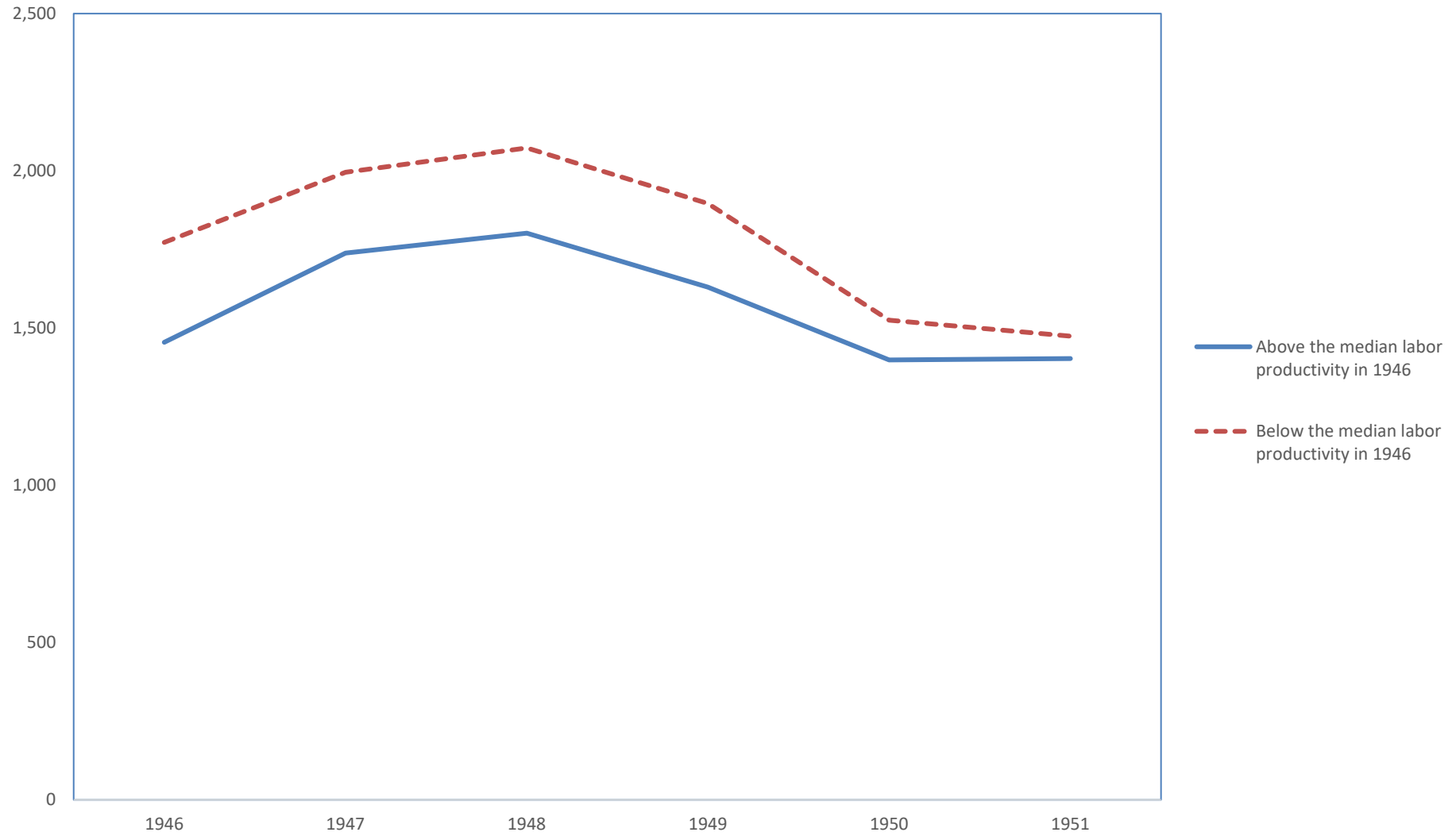
tons



— Above the median labor productivity in 1946
- - - Below the median labor productivity in 1946

B. Number of workers

persons



C. Labor productivity

tons/person

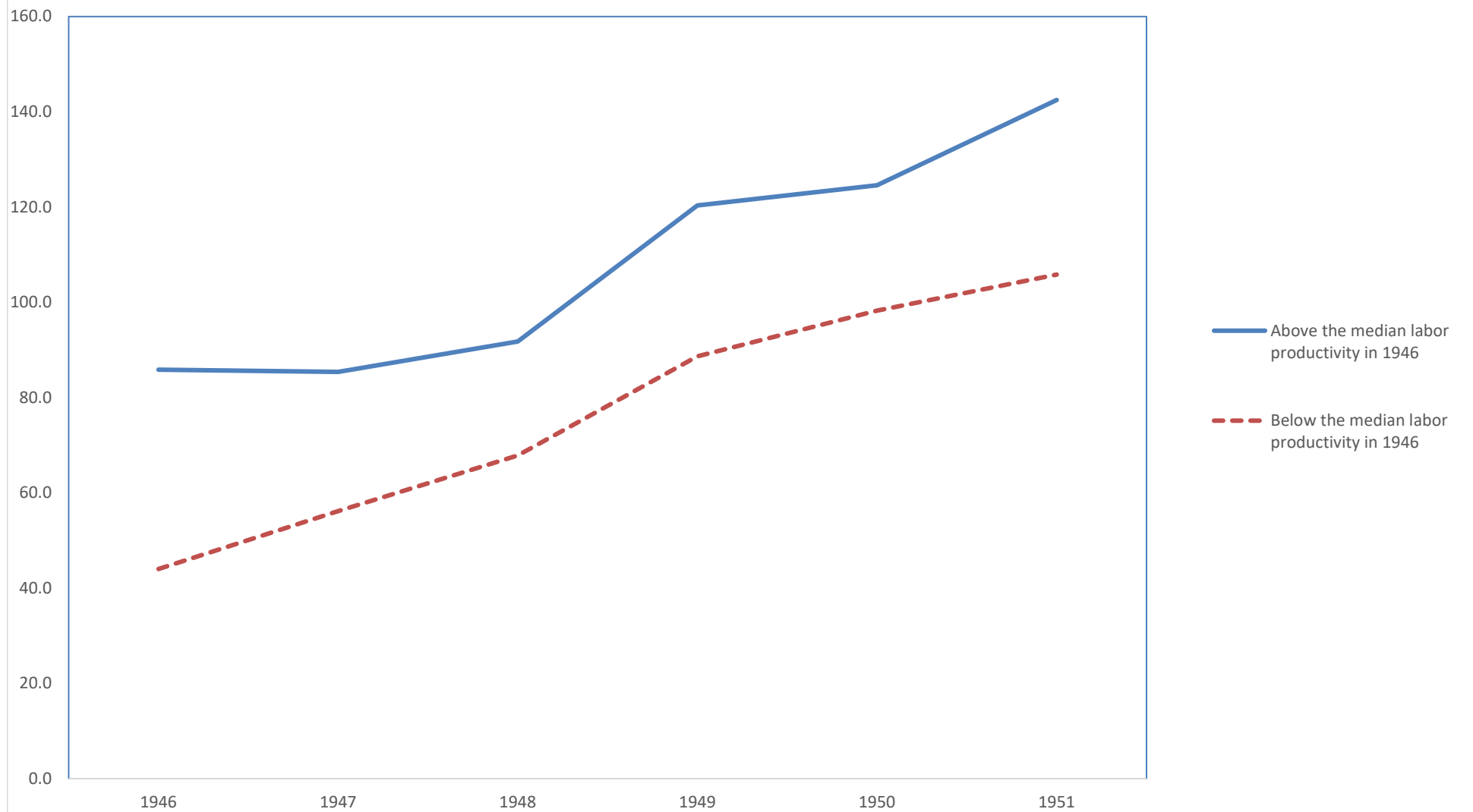


Table 1 Basic statistics

	Obs.	Mean	St.Dev	Min.	Max
Production	1,074	144,925.90	235,617.00	165.00	2,156,900.00
Worker	1,074	1,680.90	2,779.20	32.00	28,789.00
LaborProductivity	1,074	92.51	42.89	0.80	530.00
LaborProductivityGrowth	895	0.14	0.40	-4.25	4.49

Table 2 Estimation results

Dependent variable: LaborProductivityGrowthl	(1)	(2)	(3)	(4)				
AnobeMedian1946	-0.253	0.001 ***						
AboveMedian1946*1948	0.108	0.131						
AboveMedian1946*1949	0.213	0.091 **						
AboveMedian1946*1950	0.197	0.100 **						
AboveMedian1946*1951	0.296	0.097 ***						
AbobeMean1946			-0.259	0.078 ***				
AboveMean1946*1948			0.123	0.126				
AboveMean1946*1949			0.222	0.088 **				
AboveMean1946*1950			0.197	0.097 **				
AboveMean1946*1951			0.309	0.094 ***				
AboveRegionMedian1946				-0.258	0.079 ***			
AboveRegionMedian1946*1948				0.141	0.129			
AboveRegionMedian1946*1949				0.179	0.091 *			
AboveRegionMedian1946*1950				0.252	0.098 **			
AboveRegionMedian1946*1951				0.279	0.097 ***			
AbobeRegionMean1946					-0.254	0.076 ***		
AboveRegionMean1946*1948					0.120	0.125		
AboveRegionMean1946*1949					0.218	0.087 **		
AboveRegionMean1946*1950					0.202	0.095 **		
AboveRegionMean1946*1951					0.302	0.093 ***		
1948	0.004	0.114	0.001	0.106	-0.011	0.112	0.005	0.102
1949	0.041	0.080	0.045	0.074	0.060	0.077	0.052	0.072
1950	-0.116	0.087	-0.108	0.081	-0.141	0.084 *	-0.106	0.078
1951	-0.158	0.085 *	-0.153	0.080 *	-0.147	0.084 *	-0.146	0.077 *
East	-0.008	0.179	-0.001	0.018	-0.004	0.018	-0.007	0.180
West	0.007	0.029	0.009	0.029	0.005	0.029	0.011	0.029
Kyushu	-0.046	0.015 ***	-0.041	0.014 **	-0.019	0.014	-0.031	0.015 **
Const.	0.253	0.072 ***	0.242	0.066 ***	0.237	0.070 ***	0.229	0.064 ***
Number of obs.	895		895		895		895	
R ²	0.396		0.396		0.396		0.396	

Note: *** statistically significant at 1% level.

** statistically significant at 5% level.

* statistically significant at 10% level.

Robust and clustered standard errors are in parentheses.