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Cost of controlled economic recovery: Japan's coal mining industry after World War II*

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Abstract

After the World War II, the Japanese government employed the system of planning and control for economic recovery until early 1949, when Japan transited to a market economy. This paper explores the efficiency implications of economic controls and the subsequent market transition using the micro data from the coal mining industry. While the market transition had positive impact on the growth of labor productivity and production, it was just for high productivity mines and high calorie mines, which implies that economic controls indeed distorted firm incentives, and that the incentive distortion concentrated on those high productivity and high calorie mines.

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 the major countries has been well documented in the literature. Economic controls and market transition, as well as aids from the United States (the Marshall Plan for European countries) were two of the key drivers of economic recovery common to those war damaged countries (Dow 1964; Kuisel 1981; Abelshauser 1983; Milward 1984; Cairncross 1985; Kosai and Teranishi eds. 1993; Woodward 2004; Crafts and Toniolo ed. 1996; Higgs 1999, for instance).

Concerning the aids, several recent studies quantitatively elucidated the mechanisms through which the aid contributed to the economic recovery. They demonstrated that the U.S. aid contributed to the economic recovery and subsequent growth through technology transfer (Giorcelli 2019; Marinez 2025), infrastructure investment (Bianch and Giorcelli 2023). On the other hand, quantitative impact of economic controls and the market transition, especially the micro-aspect of the impact has been unexplored.

This paper quantitatively studies the implications of postwar economic controls and the market transition in the context of Japan. Like in belligerent European countries, the Japanese government managed the war economy using the system of economic planning and controls (Harrison ed. 1998; Eloranta et al. eds 2014; Okazaki 2023; Broadberry and Harrison eds. 2025; Eloranta et al. eds, 2025), and after the war it continued planning and controls for economic recovery, under the supervision of the U.S. occupation authorities.

As we will see later, just after the war, Japan experienced a serious economic crisis with sharp production decline and high inflation (Nakamura ed. 1989; Kosai and Teranishi eds. 1993). The Japanese government gave priority to production recovery to deal with the crisis, restructuring the system of planning and controls taken over from the wartime. Then, from the end of 1948, given the production recovery to some extent the U.S. government and the occupation authorities came to shift priority to stabilizing inflation, and instructed the Japanese government to implement a policy package for this, i.e. the Dodge Plan, which made the Japan transit to a market economy (Ministry of International Trade and Industry 1954; Economic Planning Agency 1964; Bank of Japan 1985).

This paper quantitatively explores the implications of the economic controls and

the market transition. In doing so, we focus on the coal mining industry. The coal mining industry is appropriate for the purpose, because coal mining was the industry given the highest priority under the regime of planning and control. In addition, it is notable that the coal mining industry 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. This feature enables us to see the impact of the market transition clearly. By newly constructing coal mine-level panel data, we evaluate the productivity implications of the economic controls and the market transition.

To preview the main findings, the system of economic controls prioritizing production increase, particularly, the price control, distorted incentives of coal mining firms for labor productivity increase. Specifically, the firms whose labor productivity was higher in the initial year lacked incentives to increase productivity. Consequently, labor productivity of those firms stagnated under the economic controls, while that of the firms with lower initial productivity increased. Also, within the regime of economic controls, by modifying the control scheme, the government tried to stimulate improve productivity and production of high quality coal, but this control scheme change was not effective. 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 labor productivity only for those firms whose initial labor productivity was higher and incentives were particularly distorted under the controlled economy. Also, the transition stimulated production of only those mines which produced higher quality coal.

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 reminder of the paper is organized as follows. Section 2 overviews the economic recovery and policy regime change in late 1940s Japan. Section 3 describes details of the changing policy regimes for the coal mining industry. In section explains the data, and present the results of quantitative analyses. Section 5 concludes.

2. Economic recovery under controls and a market transition

War damage and recovery

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 (Economic Planning Agency 1961). 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

The 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).

Planning and control for economic recovery

Facing the situation, the Japanese government made efforts for economic recovery, under the supervision of the occupation authorities, i.e. the General Head Quarters, the Supreme Commander for the Allied of the Allied Powers (GHQ). Just after the war the Japanese government intended to remove economic controls implemented during the war, expecting antagonistic attitude of GHQ to Japan's wartime economic system. However, contrary to the expectation, GHQ instructed the Japanese government to

enforce economic controls for overcoming the critical economic situation[1].

Given the directive and the policy of GHQ, the Japanese government reconstructed a system of economic controls, including price control, distribution control, and financial control. As the National Mobilization Law (*Kokka Sodoin Ho*) and the Temporary Measures Law Concerning Imports and Exports (*Yushutsunyu-hin to Rinji Sochi Ho*), which had been the legal basis of the wartime economic controls, were abolished, the Price Control Ordinance (*Bukka Tosei-rei*, May 1946) and the Temporary Law for the Adjustment of Supply and Demand of Commodities (*Rinji Busshi Jukyu Chosei-Ho*, October 1946) were legislated for price control and distribution control, respectively (Ministry of International Trade and Industry ed. 1991, pp. 217-221, pp.279-291; Ministry of International Trade and Industry ed. 1992, pp.131-142)

Based on the Price Control Ordinance, the government set a system of official prices in March 1946, and revised it in July 1947, and then in June 1948. Repeated revisions of the official price system reflected the situation that the price control failed to suppress inflation, which in turn was due to large government deficit financed by the Bank of Japan. Meanwhile, based on the Temporary Law for the Adjustment of Supply and Demand of Commodities, distribution controls were implemented for basic materials including coal, steel and chemical fertilizer, and daily necessities including rice, cereal grains, salt and clothing. At first, industrial associations, most of which were successors of wartime control associations (*tosei-kai*) and control companies (*tosei-gaisha*), handled the practical operations of distribution controls, but according to the opposition of GHQ from the view point of the anti-trust, newly established public corporations (*kodan*) took over the operations (Ministry of International Trade and Industry ed. 1992, pp.159-161)

Concerning the financial control, the wartime law, the Temporary Fund Adjustment Law survived. Based on this law, the government regulated flow of fund for concentrating fund to the sectors essential for economic recovery, such as coal, steel and chemical fertilizer. In addition, a new public financial institution, the Reconversion Finance Bank (RFB, *Fukko Kin'yu Kinko*) was established in October 1946 to supply fund which was necessary for economic recovery but could not be supplied by private financial institutions, according to the government policy. The RFB raised fund mostly by issuing RFB bonds, underwritten by the Bank of Japan, which in turn became one of

[1] In Directive No.3 (SCAPIN-47) to the Japanese government, the GHQ instructed:
a. You are responsible for initiating and maintaining a firm control over wages and prices of essential commodities
b. You are responsible for initiating and maintaining a strict rationing program for essential commodities in short supply, to insure that such commodities are equitably distributed

the primary causes of the high inflation (Ministry of Finance ed. 1976, pp.183-200, pp.623-683; Ministry of International Trade and Industry ed. 1992, pp.161-165; Okazaki and Ueda 1995).

To manage those wide-ranging economic controls, a new government institution, the Economic Stabilization Board (ESB) was established in August 1946. The ESB was designed to be the headquarters of economic controls and policies. That is, ESB's President, concurrently served by the Prime Minister, could direct the minister of each ministry, and the policies of each ministry should be in accordance with the economic plans drawn up by the ESB. In particular, the ESB drew up the Material Supply and Demand Plan (*Busshi Jukyu Keikaku*), the Fund Supply and Demand Plan (*Shikin Jukyu Keikaku*), and the Reconversion Finance Bank Fund Allocation Plan (*Fukko Kin'yu Kinko Shikin Keikaku*), for each quarter every year (Ministry of International Trade and Industry ed. 1991, pp.271-278; Ministry of International Trade and Industry ed. 1992 p.146, pp.152-159).

The Material Supply and Demand Plan is the plan to allocate each commodity to individual sectors and industries. For example, the plan for the second quarter of 1947 FY covered 101 commodities across 15 categories. While the classification of the recipients varied by commodity, in the case of ordinary steel, it was allocated to 44 sectors and industries, including the Allied Forces, export, land transportation, marine transportation, coal mining, iron and steel, machinery, ceramic industry etc.[2] Also, the Price Agency (*Bukka Cho*), an external bureau of the ESB, drew up the systems of official prices stated above. Thus, the economic planning and controls that started during the war, basically continued, except for labor controls.

Economic stabilization and market transition

Under the system of economic planning and control, industrial production 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

[2] Economic Stabilization Board, "Showa 22 nendo daini shihanki busshi jukyu keikaku" (Allocation table of materials for 2nd quarter 1947) in "Keizai tosei 1945-1947(6)," held at the National Archives of Japan (https://www.digital.archives.go.jp/file/2850362).

determined ex post for each international transaction, and hence they are multiple, which isolated the Japanese economy from international competition (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. In December 1948, the U.S. government gave "Nine-Part Interim Directive on Stabilization" to GHQ. It directed nine measures including balancing the government budget for swift unification of the foreign exchange rate. To enforce it, the U.S. government dispatched Joseph M. Dodge to Japan as the Financial Advisor of GHQ in February 1949 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.169-181). In other words, 1949 was an epoch when the Japanese economy transited from a controlled economy to a market economy[3].

3. The coal mining industry under economic controls and the market transition: Changes in the firm incentives

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 the coal production in Japan was 55.2 million tons in 1944, it became 31.5 million tons in 1945, and 22.7 million tons in 1946 (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

[3] 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 colonies and foreign countries[4], and most of those workers exited from coal mines just after the war[5]. 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; Nezu 1958, pp.52-53). The company history of Hokkaido Colliery and Steamship Co., 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 Colliery and Steamship Co., 1958, p.233, the author's translation)[6]. The deterioration of mines and equipment caused substantial decline in labor productivity. Indeed, coal production per worker was 146.3 tons in 1944, it declined tons 69.4 tons in 1946 [7] (Figure 3).

The sharp decline in coal production was critical to the Japanese economy, because before and during the war Japan's energy supply heavily depended on coal. In 1944 coal and lignite accounted for 60.5% of the total energy supply in Japan, and the share rose to 64.1% when we include thermal power generation[8]. As recovery of coal production was essential to recovery of the Japanese economy, the government launched so called "the priority production policy," giving highest priority to the coal mining industry. In implementing the policy, the system of planning and control described above was fully employed. That is, materials for coal mining, such as steel, mine timber and cement,

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[4] 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).

[5] 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).

[6] 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).

[7] Calculated by the data from Toyo Keizai Shinposha (1991) (p.449). 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 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).

[8] Water power generation accounted for 24.4% in 1944.

were concentrated to the coal mining industry in the Demand and Supply Plan, while loans from the RFB and private financial institutions were preferentially allocated to it (Figure 4). Meanwhile, workers were recruited using preferential allotment of foods, clothing and special dwellings close to coal mines (*tanju*).

Figure 4

It is notable that "state management of coal mines" was implemented in addition. In the general election in April 1947, the Japan Socialist Party emerged as the largest party, and the Chairman, Tetsu Katayama became the Prime Minister. Katayama and the Japan Socialist Party aimed at state management of coal mines as a step to nationalization of major industries. Most political actor, including conservative political parties, and coal mining firms were negative to rigid state management. GHQ was also negative, but permitted the idea of state management only insofar as it would contribute to coal production increase.

As it was determined through tough political negotiation and compromise, the legislation was delayed, and the Coal Mines State Management Act (*Tanko Kokka Kanri Ho*) was enacted in April 1948. In addition, the state management was watered down. The government (the Ministry of Commerce and Industry) designated major coal mines for state management, and the manager of each designated mine should file its operation plan to be approved by the Coal Bureau in each region. In case the Coal Bureau deemed necessary to achieve the operation plan of a mine, the Coal Bureau could give instructions to the firm that owned the mine (Kojima 1948). That is, the state management preserved the extant corporate organization, and in this sense this scheme was not so different from other government controls in this period. According to the Act, 42 coal mines and 14 coal mines were designated in June 1948 and in October 1948, respectively[9]. In a book titled *One Year of Coal Mines State Management*, 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) .

In the context of this paper, incentives of coal mining firms under the government control are essential. Under the government control, practical works of price and distribution controls of coal were taken in charge by the Japan Coal Corporation until

[9] The Official Gazzete 6427, 6528.

June 1947, then by the Coal Distribution Corporation. 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 producer prices and consumer prices were covered by the subsidy from the government (Nezu 1958, pp.842-846).

As stated in the previous section, the government set a new system of official prices in July 1947. The average official producer price of coal was raised from 346 yen/ton to 956 yen/ ton. Just after that the Price Agency announced that "This time, the conventional method of determining coal producer prices, which combined the individual cost principle with the principle of loss compensation, is not adopted". Instead, the Price Agency adopted the following new principles for determining coal producer prices (Nezu 1958, p.849).

(1) Prices were determined at the average cost of 14 regional groups of coal mines
(2) Prices were determined in advance
(3) Quality of coal was reflected in the price for each mine

Under the previous principle, as a coal mine could sell coal at the price that covered its production cost, it had no incentive to improve efficiency to reduce cost, which is a typical moral hazard under the controlled economy. The new principles gave coal mines to enhance efficiency by determining producer prices in advance. This implies that the government intended to improve firm incentives for productivity increase, within the system of economic control. Especially, the coal mines whose cost is higher than the regional group average would have strong incentives to efficiency increase because the producer price does not cover their production costs. It is noted that the Price Agency prepared a remedy for those mines to allow some additional price, but the additional price would cover just 30% of the deficit (Price Agency 1947, pp.47-48). Also, principle (3) is for incentives to increase production of coal with higher quality.

As stated above, the system of official prices was revised in June 1948. The average official producer price of coal was raised from 956 yen/ton to 2,388 yen/ton. This time, the above three principles for determining coal producer prices were maintained, except for that the number of regional groups was reduced to 10. In determining regional prices, the Price Agency adopted the idea of marginal cost. That is, based on the costs of individual mines in each region, the Price Agency set the regional standard price so that it was the same as the marginal cost at the production level equals to 75% of the coal

production target[10]. The remaining 25% was expected to cost reduction and the remedy for high cost mines, similar to that for July 1947 revision. Namely, a part of the gap between the regional standard price and individual costs was compensated by additional prices (Hatano 1949, p.280).

An important implication of the coal price control from 1947 to 1948 is that it provided incentives for enhancing productivity to lower productivity mines, because the official producer prices did not cover their costs, and were expected not to cover the costs even after the future revision of official producer price. On the other hand, the incentives for higher productivity mines were relatively small. Although the Price Agency announced that the official producer prices were determined in advance, in reality, the producer prices were revised as the inflation proceeded, which was happened in June 1948. In this situation, higher productivity mines expected that their cost reduction would be reflected in the producer price revision in near future.

The source of firm incentive distortion was not only in the system of price control, but also in the system of material allocation. 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 of each coal mine (Cho 1994, pp.91-94, Japan Coal Mining Federation 1949, p.39).

Like the case of the price control, the government recognized the incentive distortion by this system, and revised the scheme of material allocation. 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 mine-level allocation of materials was revised from 7-9 quarter in 1948. That is, the government evaluated 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).

From the end of 1948, in the general trend of market transition of the Japanese

[10] This method was called "bulk line method".

economy, controls on the coal mining industry were eliminated. 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. Concerning the wage negotiation between coal mining firms and the labor union, Hepler prohibited a wage increase based on government subsidy, deficit covering loan by RFB or raising official prices, which was called "The Three Principles on Wage" (Asahi Shinbun-sha 1949, p.79). 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 (Ministry of Finance 1981, pp.81-82). After that, coal mining firms, which had depended upon government compensation and RFB's 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 Japan[11] 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 mining 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, by the macro-stabilization policy instructed by Joseph Dodge, coal demand declined to increase stock of coal. This implies that price and distribution controls were not necessary any more. 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).

The impact of the market transition on the coal mining industry is reflected in the aggregate data (Figure 4). Labor productivity started to increase in 1948, and the increase accelerated in 1949. In the next section, we will examine the mechanism of this aggregate productivity increase using mine-level micro data.

[11] Fukuoka Prefecture was the center of coal mining besides Hokkaido Prefecture.

4. Productivity implications of the policy regime changes

In this section 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 balanced panel data using the mine name as the 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. The 179×6=1,074 mine-year observations are our basic samples. In the previous section, we found that the price control system in 1947 and 1948 provided different incentives of cost reduction or productivity increase to low cost mines and high cost mines within regions, and the low cost mines had smaller incentives.

To see the implication of this incentive structure, Figure 5 shows the labor productivity indices, dividing the 179 coal mines into those with labor productivity higher than the median value in the same region in the initial year, 1946, and the other mines. Here, we identify 4 regions, i.e., Hokkaido, eastern part of Honshu, western part of Honshu, and Kyushu. It is clear that whereas labor productivity increased for low productivity mines from 1946 to 1948, labor, that of high productivity mines were stagnant in this period. In contrast, from 1949, after the market transition, labor productivity of high productivity mines started to increase, and the labor productivity growth of the two groups of mines became almost the same. These observations suggest that the system of price control indeed distorted firm incentives for productivity improvement.

Figure 5

The price control system in 1947 and 1948 also intended to increase production of coal with higher quality. To see the implication of the price control and market transition on coal production by quality, we divide the mine samples by the average calorie of coal they produced. Because appropriate coal calorie data for the postwar period are not available, we use the data for 1943 fiscal year (Ministry of Transportation 1947, pp.106-110). We assume that the mines that produced high calorie coal in 1943 were those had

potential to produce high calorie coal in the period just after the war. Because the 1943 calorie data are available for 110 mines out of the total 179 sample mines, we show the production indices of 55 mines that produced coal with calorie above median in 1943, and the other 55 mines. While production of both groups increased from 1947, production of the low calorie group grew faster until 1948. In contrast, from 1949, the production of the high calorie group grew faster. This observation suggests that despite the intention of the Price Agency to stimulate production of high quality coal by revising the official price system, the price control continued to distort firm incentives to produce high quality coal.

Figure 6

We now examine the implications of economic controls and market transition on firm incentives by regression analyses, using the mine-level panel data. The equations to be estimated are:

$$\text{LaborProductivityGrowth}_{it} = \beta_0 + \beta_1 \text{HighProductivity1946}_i + \beta_2 \text{HighProductivity1946}_i * \gamma_t + \gamma_t + \delta_i + e_{it} \quad (1)$$

$$\text{ProductionGrowth}_{it} = \beta_0 + \beta_1 \text{HighClorie1943}_i + \beta_2 \text{HighCalorie1943}_i * \gamma_t + \gamma_t + \delta_i + e_{it} \quad (2)$$

$\text{LaborProductivityGrowth}_{it}$ is the growth rate of labor productivity of mine i from year t-1 to year t. HighProductivity1946 is a dummy variable which equals to 1, if labor productivity of mine i in 1946 was higher than the median of the region where it was located, and 0, otherwise. ProductionGrowthit is the growth rate of coal production of mine I from year t-1 to year t. HighClorie1943i is a dummy variable which equals to 1, if average calorie of the coal that mine i produced was higher than the median, and 0, otherwise. γ_t is a year fixed effect, δ_i is a mine fixed effect, and e_{it} is the error term. In addition to equation (1) and (2), we also estimate the equations adding a variable Designation_{it}. This is a dummy variable which equals to 1, if a mine i was designated by the Coal Mines State Management Act in year t, and 0, otherwise. This variable takes value 1 in 1948 and 1949, for the mines that were designated in June 1948, while it takes value 1 in 1949, for the mines that were designated in October 1948.

Basic statistics is reported in Table 1, and estimation results are presented in Table 2. Column (1) indicates the estimation result of equation (1). The coefficients of

primary interest here are β_1 and β_2, which indicate the difference in the labor productivity growth rates between high productivity mines and low productivity mines in the initial year (1946), and its overtime change. β_1 is -0.346 and statistically significant, which means that the labor productivity growth rate of the high productivity mines were 36.4% points lower than low productivity mines in 1947. β_2 for 1948 is 0.143, but statistically insignificant. That is, the productivity growth rate gap between the two groups did not significantly decline in 1948. In contrast, β 2 for 1949 is 0.181 and statistically significant at 10% level. Then, in 1950 and 1951, β 2 increases to be 0.259 and 0.282, respectively, and statistical significance increases as well.

These results indicate that under the regime of economic controls, there was a substantial gap in labor productivity growth between high productivity mines and low productivity mines, and that this gap declined after the market transition. The coefficients on year fixed effects are also notable. They are all statistically significant, which means that the market transition affected only the productivity growth rate of the high productivity mines. These results are consistent with the feature of the price control system that distorted the incentives to increase productivity especially for high productivity mines. In addition, it is also noteworthy that either β_2 for 1948 or year fixed effect for 1948 is not significant. In 1948, the government revised the material allocation system as well as the price control system to stimulate productivity improvement, but this result indicates that this reform within the regime of controlled economy was not effective.

Column (2) of Table 2 presents the result in case we add Designation variable to control for the effect of the state management of designated mines. This specification reinforces the results in column (1). β_2 for 1949 not only becomes larger, but its significance level is 5%. Other coefficients common to column (1) are qualitatively the same. The coefficient on Designation is negative and statistically significant, which implies that the state management reduced the productivity growth rate.

Table 3 presents the estimation results of equation (2). Statistical significance is relatively weak, but we note that while β_2 for 1948 is negative, it is consistently positive for the years from 1949, and for 1950 it is also statistically significant at 10% level. These results indicate that economic controls distorted production incentives of mines that could potentially produce high quality coal, and the reform of the scheme within the controlled system was ineffective to improve the distortion. The coefficient on Designation in column (2) is negative and statistically not significant, which indicates that the state management did not have aby significant effect to increase coal production of designated mines.

5. Conclusion

Just after the World War II, under the occupation by the United States, the Japanese government endeavored to recover the economy from the war damage. Facing an economic crisis with sharp production decline and high inflation, the government continued economic planning and controls, restructuring the wartime system. Then, from the end of 1948, by the instruction of the U.S. occupation authorities, the Japanese government abolished most economic controls, while tightening macroeconomic policy to suppress inflation, which resulted in a market transition.

The process of economic controls and the subsequent market transition had substantial implications on efficiency. In this paper, we explored the implications using micro-data from the coal mining industry which was given the highest priority under the regime of economic controls. The scheme of the price control distorted the firm incentives to enhance labor productivity, especially for coal mines whose labor productivity was higher. Also, it distorted the firm incentives to increase production especially for coal mines which produced high calorie coal. Although the government recognized these distortions and intended to improve them by modifying the control scheme within the system of economic controls, those reforms were not effective. Also, the state management of the designated coal mines implanted from 1948 to 1950, was not effective to enhance productivity or increase production of coal mines which produced high calorie coal.

The market transition drastically resolved these problems. From 1949, the labor productivity growth of the high productivity mines accelerated, while production the high calorie coal mines also accelerated. These heterogeneous impacts of the market transition elucidate the magnitude of incentive distortion by the economic controls. It is true that the Japanese economy recovered from the war damage under the system of planning and controls, but this recovery was not without cost.

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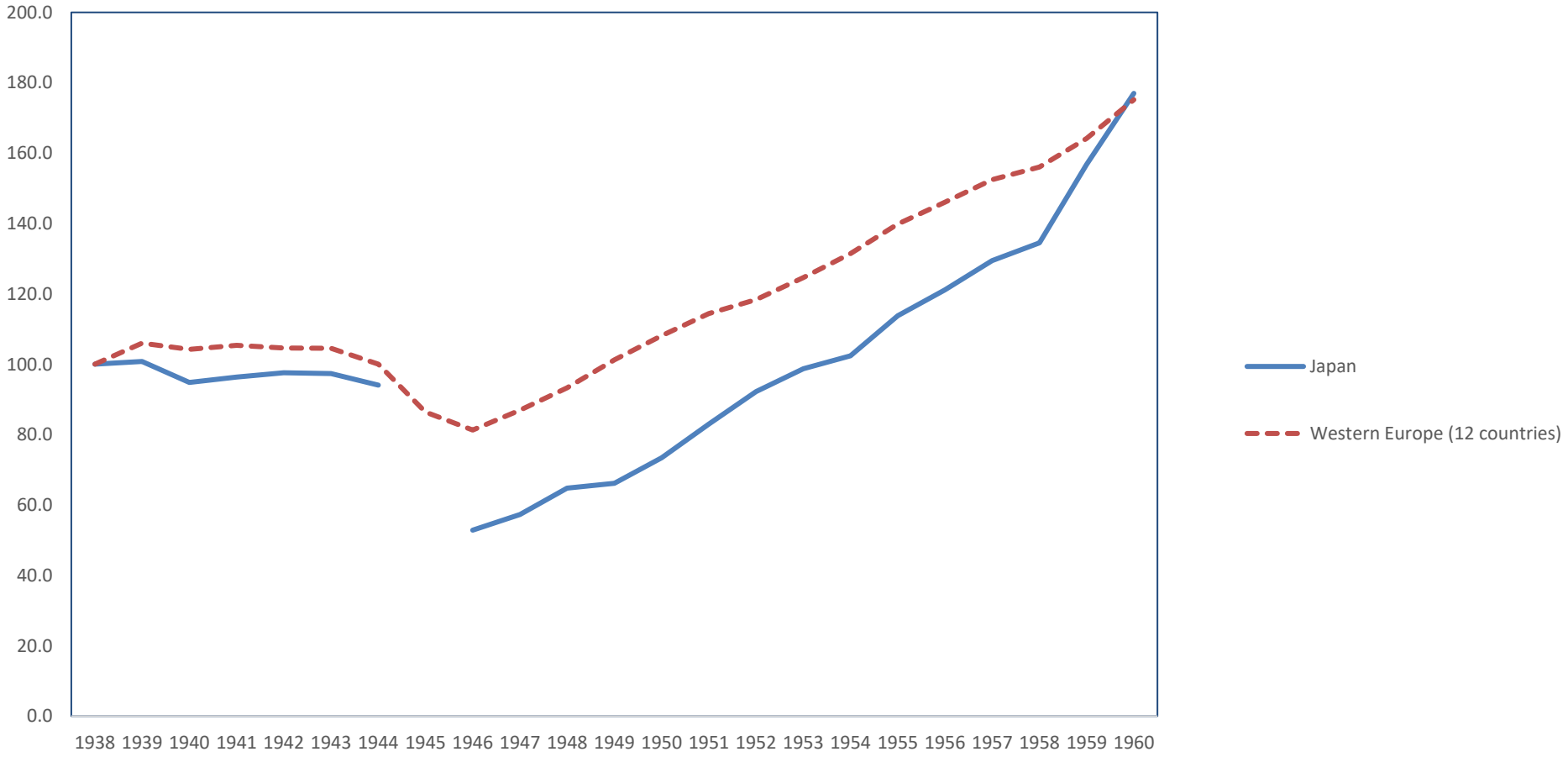
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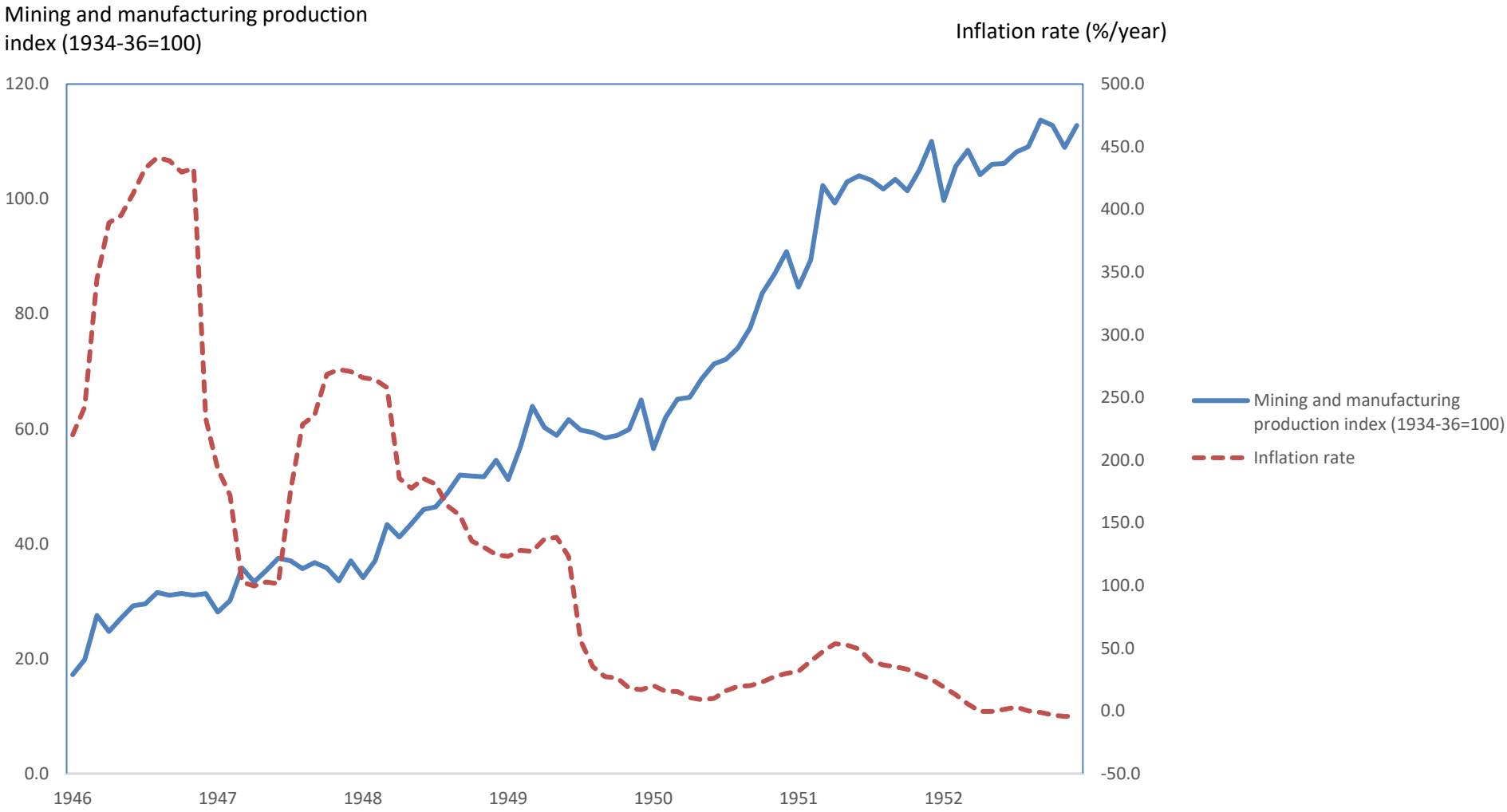
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Figure 1 War damage and economic recovery in Japan and Western Europe (real GDP, 1938=100)



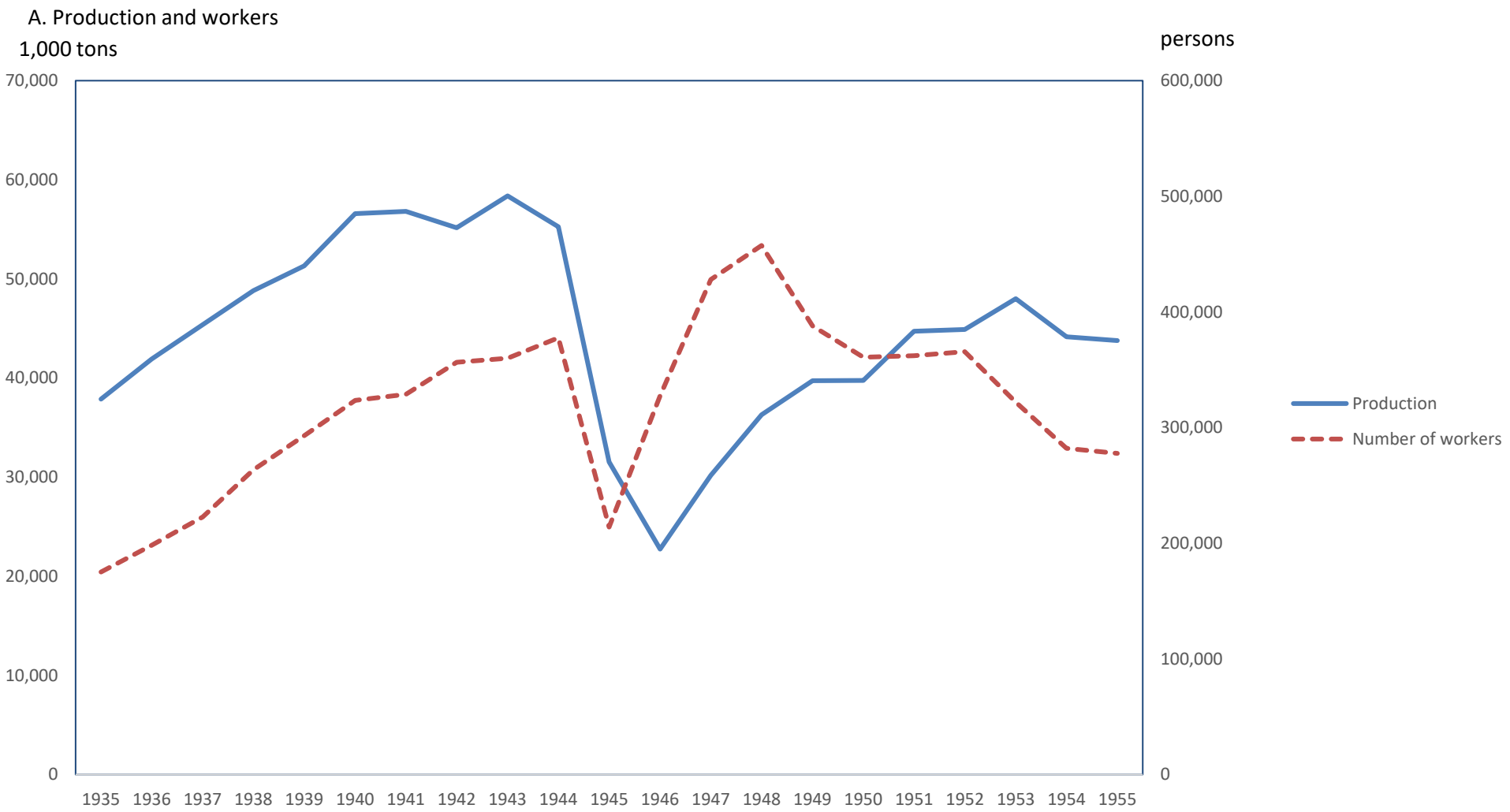
Source: Ministry of Finance (1978), p.28; Maddison Database 2010 https://www.rug.nl/ggdc/historicaldevelopment/maddison/releases/maddison-database-2010).

Figure 2 Postwar economic crisis and revovery



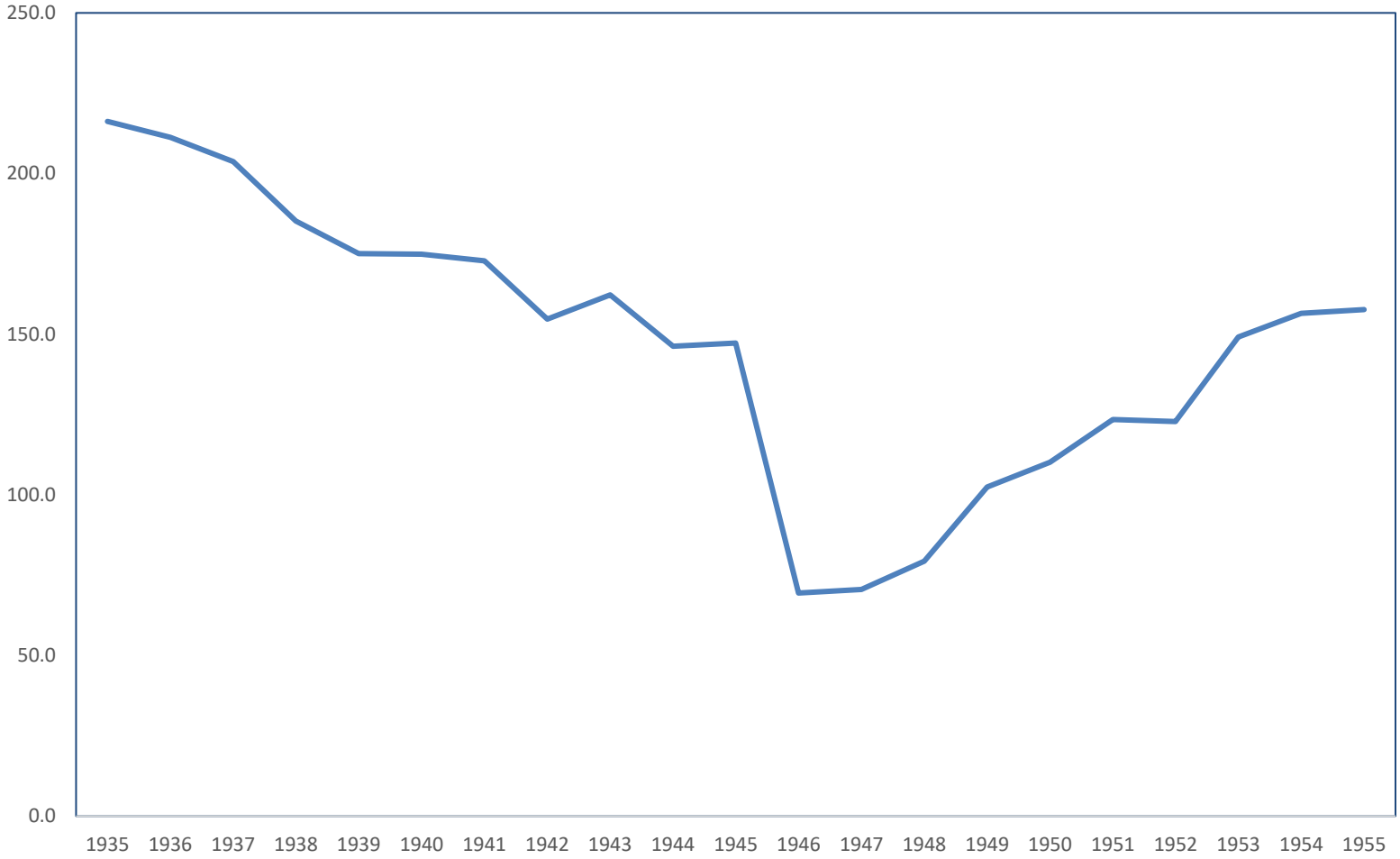
Source: Ministry of Finance (1978), p.62, pp.88-89.

Figure 3 War damage and recovery of the coal industry



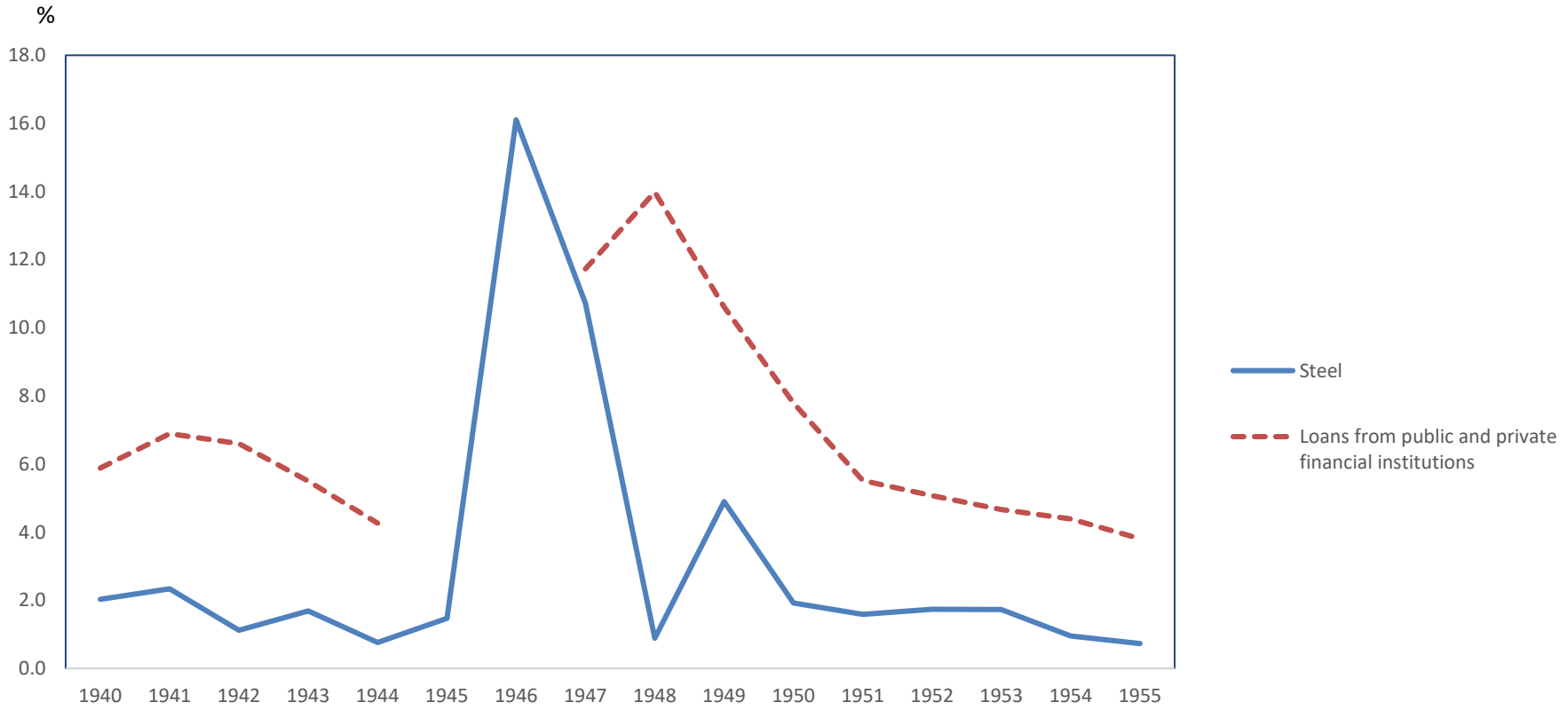
B. Labor productivity

tons/person



Source: Tōyō Keizai Shinpō-sha (1991), p.291, 303.

Figure 4 Concentration of resources to the coal industry:
Share of the mining industry in the total supply of steel and loans



Source: Japan Iron and Steel Federation 1960, pp.44-45; Ministry of Finance (1978), pp. 487-490, pp.567-570, p. 579.

Note: Steel supply for 1943-1948, and 1951 is for fiscal years (From April to March).
Loans for 1947 is as of the end of September 1947.
Loan data for 1945 and 1946 are not available.

Figure 5 Difference in labor productivity growth between high labor productivity mines and low productivity mines in each region in 1946

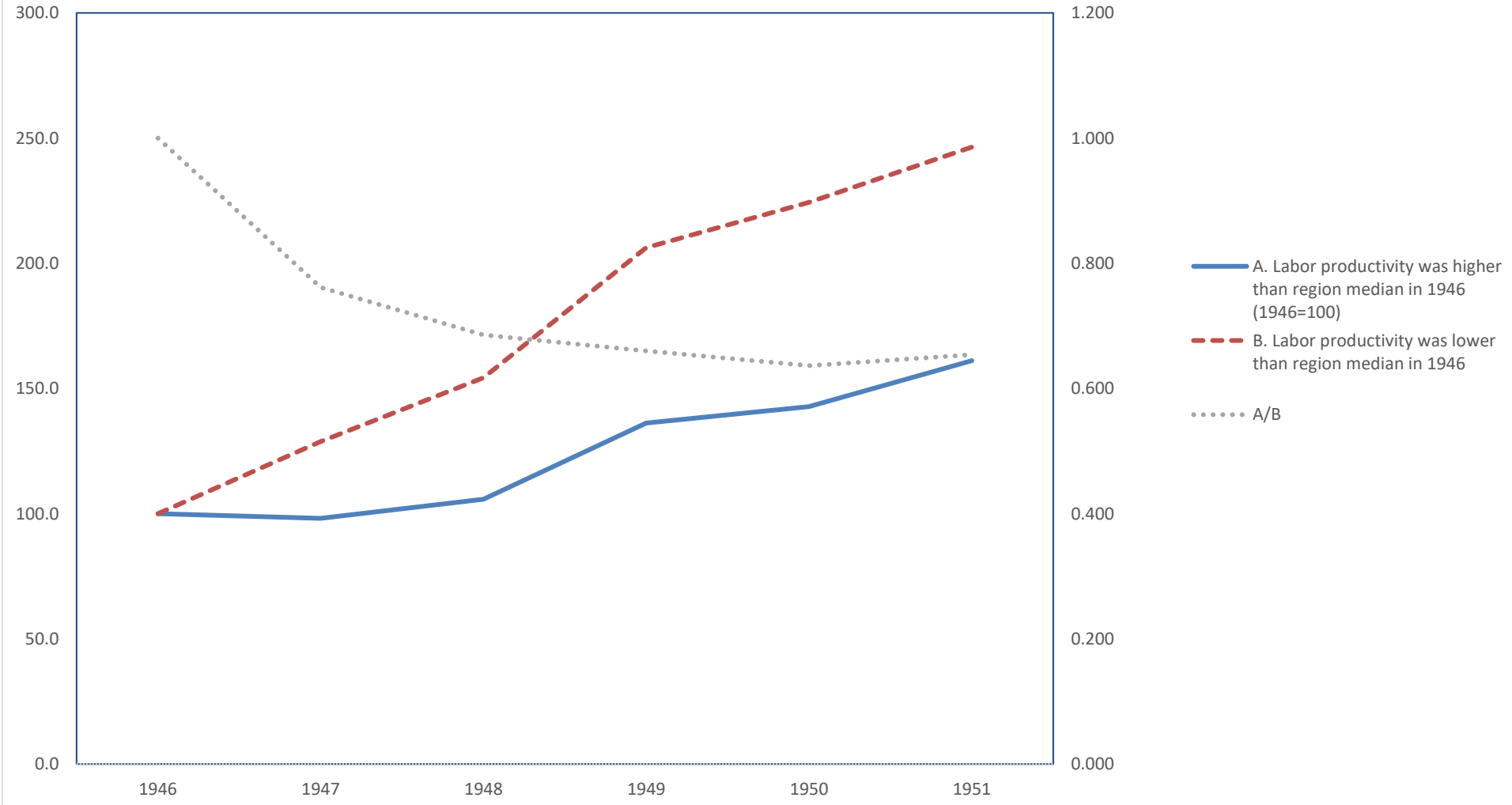


Figure 6 Difference in production growth between high calorie mines and low calorie mines in 1943

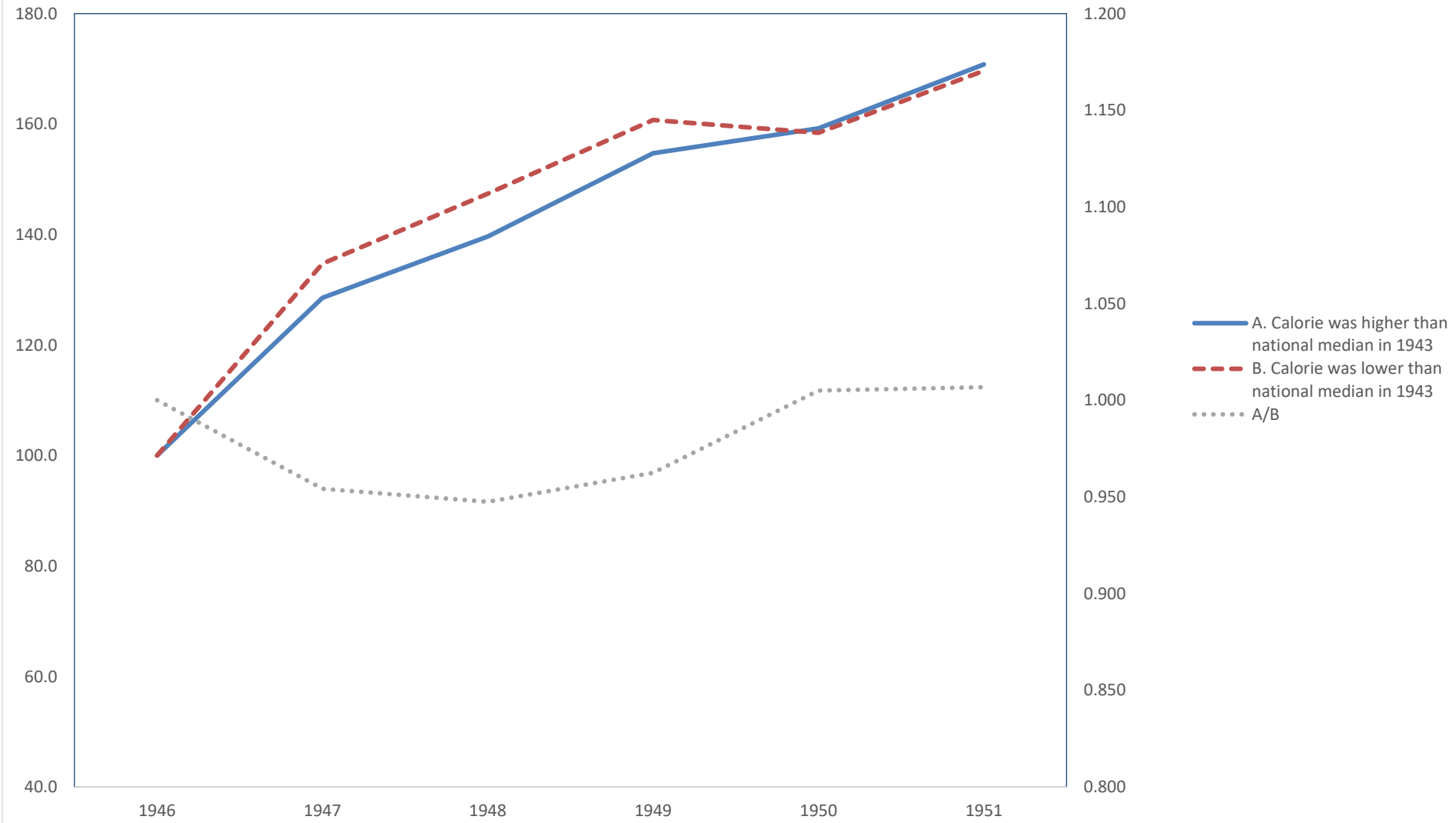


Table 1 Basic statistics

	Obs.	Mean	St.Dev	Min.	Max
Production	1,074	144,926	235,617	165	2,156,900
Worker	1,074	1,681	2,779	32	28,789
LaborProductivity	1,074	92.55	42.90	1.00	530.00
ProductionGrowth	895	0.11	0.44	−4.88	5.42
LaborProductivityGrowth	895	0.14	0.40	−4.03	4.26
HighProductivity1946	1,074	0.49	0.50	0.00	1.00
Highcalorie1943	660	0.50	0.50	0.00	1.00
Designation	1,074	0	0.26	0.00	1.00

Table 2 Estimation results on labor productivity growth

Dependent variable: LaborProductivityGrowtl	(1)		(2)		
HighProductivity1946	−0.346	(0.081) ***	−0.408	(0.081)	***
HighProductivity1946 *1948	0.143	(0.140)	0.155	(0.139)	
HighProductivity1946 *1949	0.181	(0.101) *	0.198	(0.099)	**
HighProductivity1946 *1950	0.259	(0.108) **	0.259	(0.108)	**
HighProductivity1946 *1951	0.282	(0.107) ***	0.282	(0.107)	***
Designation			−0.141	(0.055)	**
1948	−0.159	(0.121)	0.006	(0.124)	
1949	0.056	(0.086)	0.084	(0.090)	
1950	−0.146	(0.093)	−0.146	(0.093)	
1951	−0.151	(0.093)	−0.151	(0.093)	
Const.	0.313	(0.071) ***	0.360	(0.069)	***
Mine FE	Yes		Yes		
Number of obs.	895		895		
R^2	0.097		0.103		

Note: *** statistically significant at 1% level.
** statistically significant at 5% level.
* statistically significant at 1% level.
Robust and clustered standard errors are in parentheses.

Table 3 Estimation results on production growth

Dependent variable: ProduvctionGrowth	(1)		(2)	
HighCalorie1943	0.042	(0.064)	0.039	(0.063)
HighCalorie1943 *1948	−0.035	(0.108)	−0.029	(0.106)
HighCalorie1943 *1949	0.057	(0.071)	0.064	(0.070)
HighCalorie1943 *1950	0.138	(0.079) *	0.138	(0.079) *
HighCalorie1943 *1951	0.029	(0.112)	0.029	(0.112)
Designation			−0.030	(0.043)
1948	−0.117	(0.099)	−0.111	(0.102)
1949	−0.217	(0.062) ***	−0.208	(0.066) ***
1950	−0.367	(0.071) ***	−0.367	(0.071) ***
1951	−0.191	(0.106) *	−0.191	(0.107) *
Const.	0.322	('0.058) ***	0.331	(0.058) ***
Mine FE	Yes		Yes	
Number of obs.	550		550	
R^2	0.221		0.290	

Note: *** statistically significant at 1% level.
** statistically significant at 5% level.
* statistically significant at 1% level.
Robust and clustered standard errors are in parentheses.