Unintended consequences of industrial policy: Aircraft, petrochemicals, and computers

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Abstract
This paper examines the aircraft, petrochemical, and mainframe-computer industries to delineate the reasons why some of Japan’s industrial policies during the rapid-growth period succeeded and some failed. The Japanese government implemented policies to advance each of the three industries, but the measures had significantly different effects. While the government favored approaches that involved limiting the number of companies in the given industry and providing support for large-scale production to maximize efficiency, the companies in the industry tended to reinterpret the policies to the extent possible under the official constraints in ways that would minimize the resulting disadvantages to company operations. Out of that context, with the government’s policies on one side and the firms’ strategic responses on the other, emerged a wide variety of unintended consequences. The cases of the aircraft and petrochemicals illustrate how the government’s attempts to cultivate “national champion” companies by supporting the “visible hand” of management ended up stopping or twisting the “invisible hand,” thereby bringing the government’s policies to unforeseen failure. Meanwhile, the mainframe-computer industry sheds light on how the government can allow the visible hand and the invisible hand to coexist and function effectively.

Keywords: Industrial Policy, MITI, Aircraft, Petrochemicals, Computers

I. Introduction
Numerous empirical studies have examined the impact of industrial policies on industrial development in Japan, but authors have not necessarily converged on a consistent conclusion. Since the 1980s, several European and American scholars have looked at Japan’s industrial policies and made conflicting assessments of the degree to which the impressive performance of Japanese companies explains the policies’ effectiveness in practice (Johnson 1982; Samuels 1987, Samuels 1994; Friedman 1988). Even the impact of Ministry of International Trade and Industry (MITI, now the Ministry of Economy, Trade and Industry) policies on industries where the Japanese corporate sphere’s performance has earned widespread recognition, such as the electronics industry, has produced its share of both positive and negative arguments (Anchordoguy 1989; Okimoto 1989; Fransman 1990, Fransman 1999; Callon 1995). Questions remain up for debate: were the industrial policies effective, and, if they were, what were the conditions underlying their success?
From far-reaching technological innovation policies in the United States to government involvement in guiding industry in China, recent years have seen states working to play an active role in enhancing their industrial structures and spurring technological innovation through policy measures. A look at the Japanese experience, however, shows that government intervention in industries is far from guaranteed to succeed as intended and also runs the significant risk of wreaking massive social losses in the name of a public purpose. Those perils stem from the fact that policies are not one-way streets; members of the commercial sector have the ability to make their own, independent decisions—just like the government—and thus have room to take strategic action in response to industrial policies.

One key element in understanding the Japanese experience is the types of industries the Japanese government focused on during the country’s postwar period of rapid economic growth. MITI’s primary targets were new core industries that posed technical challenges for Japan but also had the potential for positive ripple effects in surrounding industries. Aiming to facilitate that process by giving domestic industry a sharper competitive edge, the Japanese government pushed policies to drive industrial reorganization and capital-investment adjustments on the belief that having a strong base of larger companies would be crucial to the effort. Ōjimi Yoshihisa, who served as MITI deputy vice-minister from 1969 to 1971, named the industries that the government saw to be particularly important for Japan.

The MITI (Ministry of International Trade and Industry) decided to establish in Japan industries which require intensive employment of capital and technology, industries that in consideration of comparative cost of production should be the most inappropriate for Japan, industry such as steel, oil-refining, petrochemicals, automobiles, aircraft, industrial machinery of all sorts, and electronics, including electronic computers. From a shortrun, static viewpoint, encouragement of such industries would seem to conflict with economic rationalism. But, from a longrange viewpoint, these are precisely the industries where income elasticity of demand is high, technological progress is rapid, and labor productivity rises fast.1

Ōjimi noted seven major industries to focus on for the future: steel, oil refining, petrochemicals, automobiles, aircraft, industrial machinery, and electronics. This paper deals with aircraft, petrochemicals, and electronics (mainframe computers, specifically) to look specifically at focus industries that had not yet taken root in Japan prior to the 1950s. Hoping to foster growth in these three industries, the government offered support to help companies accelerate their technological development and strove to sustain the flow of technologies coming into Japan from developed Western nations. For some observers in Japan during the postwar economic boom, establishing domestic aircraft, petrochemical, and electronics industries would be the key to solidifying Japan’s presence as an industrial power—and the Japanese government launched policies promoting industrial growth at roughly the same time and for essentially the same overarching purpose. What those policies produced, however, was vastly different from the objectives that went into them.

To get straight to the conclusion of this paper, the immense gaps between the government’s initial objectives and the corresponding outcomes were not the results of inconsistencies or arbitrariness in Japan’s industrial policies. MITI, operating from a rational standpoint, indeed worked to support large-

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1 Alexis Jaquemin, *The New Industrial Organization: Market Force and Strategic Behavior* (Cambridge MA: The MIT Press, 1987), 171.
scale production and limit the recipients of policy funding to a small group of companies in order to maximize efficiency. For example, proposals for state-sponsored companies served to limit the scope of funding recipients to a single company; grouping frameworks were likewise a means of keeping beneficiaries to just a handful of firms. By limiting the number of companies, MITI was aiming to consolidate policy budget for development and capital investments, along with individual corporations’ management resources, as effectively as possible. In addition to pooling resources together, the ministry’s commitment to directing funding to small groups would also help streamline companies’ progress toward achieving economies of scale.

From the corporate perspective, however, proposals for state-sponsored companies and grouping framework would run in contrast to the contemporary conditions in corporate management or infringe on management autonomy. Companies thus resolved to preserve their management freedom, doing whatever they could within legal bounds to prevent their business activities from fall under national government control. Firms subject to the government’s policies also reinterpreted the frameworks to the extent possible under the official constraints in ways that would minimize the resulting disadvantages to company operations. The corporate sphere’s strategic responses to the policies would ultimately trigger an array of unintended consequences.

The first case I examine is the aircraft industry, where the government led the way in setting up a national policy company. The policy ultimately failed, however, as the company was unable to commercialize an economically viable civilian aircraft. The participating companies all took steps to safeguard against the risks of failure before the project even got off the ground, thereby limiting their liability. The second case is the petrochemical industry. In attempting to propel the industry forward, the government gave preferential treatment to major companies as a way of facilitating the construction of large-scale ethylene centers. In time, however, new players began finding ways to circumvent the policy and stream into the industry, which soon buckled under the weight of rampant overproduction and drooped into a prolonged structural recession. The third case is an examination of the mainframe-computer industry, where the government’s proposal for a national policy company and groups fell apart in the face of stringent opposition from the private sector. In response, MITI decided to cater to corporate demands by having companies cooperate on development and sales only but allowed for free, open competition on the production front. Surprisingly, the functional division proved successful and helped establish a domestic computer industry.

Behind these policy developments was the government’s conviction that supporting the “visible hand” of management could jump-start Japan toward making up ground on its international counterparts by achieving economies of scale and nurturing big, powerful business in the form of “national champion” corporations. Despite its intentions, the government sometimes ended up reaching into areas where policy directed the visible hand of management to restrain the “invisible hand” of god. As the following cases illustrate, that dynamic allowed national policy companies to get away with reckless management, caused efforts to turn away newcomers via market-entry barriers to backfire, and led to a variety of other unanticipated policy failures.2 The lone success story was the mainframe-computer industry.

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2 For more on the concept of the “visible hand,” see Alfred D. Chandler Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, MA: Harvard University Press, 1977). The book includes a case study of Rockefeller’s Standard Oil. Based on Chandler’s terminology, the establishment of a trust by the US oil industry
computer industry, which offers valuable insights into how government policy can support the visible hand of management but still let the invisible hand of god function. The following sections explore the unintended consequences of the industrial policies in the three industries.

II. Aircraft: A lack of incentive for a national policy company

The Japanese aircraft industry’s share of the international market remains small to this day. The production value of the US aerospace industry in 2018 was 26.768 trillion yen, over 10 times Japan’s meager total of 2.192 trillion yen—just 1.36 trillion of which came from civilian aircraft.\(^3\) The Mitsubishi Regional Jet, which has long fueled hopes for a small passenger plane with a made-in-Japan pedigree, remains short of its planning goals and sales estimates as of 2021. Efforts to create a domestically produced civilian aircraft have thus lingered in a virtual development freeze for roughly half a century, stretching all the way back to the YS-11, the first civilian aircraft developed in Japan after World War II. Why was it that the aircraft industry scuffled along so slowly while other industries made impressive strides forward? As this section will show, the key hindrance was that the plan for creating a national policy company to develop, produce, and market aircraft failed to offer adequate incentive to the individual companies.

Japan’s defeat in World War II devastated the domestic aircraft industry in more ways than one. While the war destroyed Japan’s means of domestic aircraft production, the postwar Occupation forces also saw the continued existence of the industry itself as a possible contributor to future war and imposed a seven-year ban on aircraft production. When Japan regained the ability to manufacture aircraft with the signing of the Treaty of San Francisco (the Treaty of Peace with Japan) in April 1952, MITI established an Aircraft Division as part of the Heavy Industry Bureau to serve as the foundation for aircraft industry policy. Members of the corporate sphere, too, immediately began reorganizing to manufacture aircraft immediately after the lifting of the production ban. In February 1953, several manufacturers joined forces to create an industry association: the “Japan Aircraft Industrialists Society,” which later became the Society of Japanese Aerospace Companies.\(^4\) The first years of the 1950s thus saw a flurry of activity after the ban on aircraft production ended, with players in both the public and private sectors quickly laying a foundation for reviving the aircraft industry—but the bulk of the business that took place was repairing US military aircraft.\(^5\) MITI, aiming to get the aircraft industry off

\(^3\) Society of Japanese Aerospace Companies, “Kōkū uchū sangyō dētabēsu, Reiwa 2 nen 7 gatsu” [Aerospace industry database, July 2020], https://www.sjac.or.jp/common/pdf/toukei/7_database_2020.07.pdf.

\(^4\) Editorial Committee for the 25-Year History of the Nagoya Aircraft Works, Mitsubishi Jūkō Nagoya Kōkōki Seisakujo nijūgonen-shi [The 25-year history of the Nagoya Aircraft Works] (Nagoya: Mitsubishi Heavy Industries Nagoya Aircraft Works, 1983), 7, 17; Editorial Committee for the History of Fuji Heavy Industries, Fuji Jūkō Kōgyō sanjūnen-shi [The 30-year history of Fuji Heavy Industries] (Tokyo: Fuji Heavy Industries, 1984) 84; Kawasaki Heavy Industries Ltd., Kawasaki Jūkōgō Kabushiki Kaisha shashi (honshii) [The history of Kawasaki Heavy Industries Ltd. (full)] (Kobe: Kawasaki Heavy Industries Ltd., 1959), 875.

\(^5\) Kōkū Kenkyūkai, Kōkū genssei [The current state of aviation] (Tokyo: Toyooki Insatsu, 1959), 164.
the ground and independent, reached out to the Ministry of Finance (MOF), Bank of Japan, and Development Bank of Japan for funding and used its sway in the private-sector banking segment to encourage lending to the industry.

In March 1956, MITI met with the leaders of Shin-Mitsubishi Heavy Industries, Kawasaki Aircraft, and Fuji Heavy Industries. MITI proposed starting up the civilian aircraft industry by building on prewar aircraft technologies without confining itself to the licensed production of US military aircraft. The attendees all came out in favor of the idea. With the support of the manufacturers, MITI drafted a Five-Year Plan for the Domestic Production of a Medium-Sized Transport Aircraft.

At the time, however, even some MITI officials were skeptical about whether it would be realistically possible to develop civilian aircraft. The Ministry of Transport and Ministry of Defense both voiced their opposition to plans for a transport aircraft that would serve commercial and military purposes. Views on developing civilian aircraft were mixed on the manufacturer side as well. Companies had their sights set on securing defense demand, which then represented an overwhelming share of aircraft demand; the levels of enthusiasm for developing civilian aircraft from square one, without any prior experience to build on, varied from firm to firm.

The first step in the Five-Year Plan for the Domestic Production of a Medium-Sized Transport Aircraft was to create an organization for design and research work, which came together as the Transport Aircraft Design Research Association in April 1957. The organization comprised six aircraft manufacturers: Shin-Mitsubishi Heavy Industries, Kawasaki Aircraft, Fuji Heavy Industries, Shin Maywa Industries, Japan Aircraft Manufacturing, and Showa Aircraft Industry.

However, the plan hit a roadblock when MOF balked at granting MITI budget requests to cover the costs of developing a test model. For securing the requisite prototyping funding, MITI decided the best plan of action was to create a national policy company that would be responsible for bringing the medium-size transport aircraft plan to marketable fruition. MITI saw setting up national policy companies as an effective means of protecting and nurturing infant industries, as the approach made it possible to offer shared, consolidated access to the resources and technologies in the industry and enabled economies of scale in production. On the other hand, aircraft manufacturers were dependent on steady defense demand at the time and saw civilian aircraft production as little more than a secondary piece in the larger picture. Companies thus adopted a wait-and-see stance on the MITI plan.

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6 Kondō Kan’ichi and Osanai Hiroshi, eds., Sengo sangyō-shi e no shōgen, san: Enerugi kakumei, bōei seisaku no kiseki [Testifying to postwar industrial history, part 3: The story of the energy revolution and defense production] (Tokyo: Mainichi Newspapers, 1978), 315.
7 Kondō and Osanai, eds., Sengo sangyō-shi e no shōgen, san, 315.
8 Maema Takanori, YS-11: Kokusan ryokyakuki o tsukutta otokotachi [YS-11: The men who built a made-in-Japan passenger plane] (Tokyo: Kodansha, 1994), 27.
9 Kōkū Kenkyūkai, Kōkū gensei, 195.
10 Komiya Ryūtarō, Okuno Masahiro, and Suzumura Kōtarō, eds., Nihon no sangyō seisaku [Japan’s industrial policy] (Tokyo: University of Tokyo Press, 1984), 57.
11 In 1959, the Defense Agency and US military accounted for 16.68 billion yen, or 88.6%, of the total value of aviation industry production (18.83 billion yen) (Japanese Aeronautic Association, Kōkū uchū nenkan 1966 [The 1966 aerospace almanac] (Tokyo: Ikarosu Shuppan, 1966), 90). That same year, aircraft represented less than 10% of total sales at Shin-Mitsubishi and Fuji Heavy Industries (Editorial Committee for the History of Fuji Heavy
The Diet passed the MITI Aircraft Industry Promotion Act in April 1958, and the aircraft that the effort was to produce got its name—the YS-11—that same spring. “YS” is a combination of the first letters of two words from the Japanese version of the Transport Aircraft Design Research Association: “Y” from “Yusōki” (transport aircraft) and the S from “Sekkei” (design). The “11” was a set of two ones: a “1” for the engine in the aircraft, which was the “first” proposal considered, and a “1” for the airframe, also the first proposal. The logistical framework for the production of the YS-11 continued to flesh out in June 1959 with the founding of the Nihon Aircraft Manufacturing Corporation (NAMC), a quasi-governmental corporation with both public and private financing. By FY1967, the government covered 4.2 billion of the company’s 7.8 billion yen in capital (53.8% of the total).

NAMC was a part-private, part-government “quasi-governmental” corporation with 300 million yen in government capital and investments totaling 200 million yen from private companies, banks, and other private-sector entities. Roughly 20% of the company’s total shares were allocated to Japan’s six aircraft manufacturers, with Mitsubishi Heavy Industries owning 51% of that allotment, Kawasaki Heavy Industries 26%, and Fuji Heavy Industries 13%. That portion of the capital was to go toward prototyping, while the funding for mass production was to come entirely from loans. The long-awaited YS-11 test model reached completion in July 1962 and successfully made its first flight the following month.

NAMC’s roles spanned the whole aircraft-production process, including development, manufacturing, and sales. The quasi-governmental firm directed everything, issuing instructions to the individual manufacturers responsible for the actual production tasks. Essentially, the manufacturers were subcontractors for NAMC.

With over half of its capital coming from government sources, NAMC served as a central hub that consolidated everything from design drawings to manufacturing and distribution rights into a single organization. The NAMC framework defined the relationships with the individual manufacturers as follows. First, NAMC held authority over all development work and drew up all the schematics for airframe designs. The manufacturers used those designs to create the corresponding production drawings, which then then headed back to NAMC for review and approval. Second, in its role overseeing overall production (prototyping and mass production), NAMC bought the necessary engines, propellers, other major components, and manufacturing materials in bulk and provided the purchases to the six aircraft manufacturers at no charge. The six companies then set to work on making the parts for the YS-11 in a clear division of labor: Shin-Mitsubishi worked on the fuselage, Kawasaki on the wings.
and nacelles, Fuji Heavy Industries on the tail, Japan Aircraft Manufacturing on the ailerons and flaps, Shin Maywa on the rear fuselage, and Showa Aircraft Industry on the honeycomb. When the parts were ready, Shin-Mitsubishi assembled them into a complete whole and outfitted the plane. 18 The third basic element of the setup had to do with sales. The plan stipulated that NAMC would be responsible for the marketing front but did not spell out any specifics beyond that, simply noting that discussions on establishing sales and servicing departments would take place at a later date.19

The NAMC System featured extensive, almost gratuitously detailed planning for everything that went into development, production, and sales, a vision that exuded an optimistic outlook on how the system would function. The structure of the plan to consolidate development, production, and sales into a government-financed national policy company allowed aircraft manufacturers to impose risks and costs on NAMC across every phrase of the process.

On the development side, the NAMC development process was such that the manufacturers made their drawings in line with basic designs and specific drafting instructions from NAMC. Manufacturers thus lost the incentive to inform NAMC, which held full authority over the design, about user needs during the development phase. The basic setup of the whole process contributed to the issue; there were no direct rivalries between manufacturers because they were sharing designs for each part, nor did the manufacturers feel any need to incorporate user needs to outmaneuver competitors in the development phase. In addition, any damage arising from potential delays in sales of the NAMC YS-11 due to future marketing problems would be dispersed across six companies. On top of that, the fact that state was ultimately the largest investor in NAMC was yet another factor dampening the incentive for the manufacturers.

The production element was also low on incentive. When aircraft manufacturers received orders from NAMC, they demanded payment of the costs to produce the parts plus a profit surcharge. This method was the same as the one applied when aircraft manufacturers delivered military aircraft to the Defense Agency, and the hourly rate per man-hour was also the same as the rate for the Defense Agency. 20 If NAMC not only offered a guarantee against the risks that came with a manufacturer’s parts production but also went as far as footing both the production bills and profit surcharges for the products, the manufacturer would naturally have no real incentive to reduce costs.

The sales framework got a late start, as the sales department formed in February 1963 with two divisions and ten employees. The delay in the launch was just one of the factors that affected sales, however; the YS-11 planning delays stemming from the system for development and production above, along with the project’s divergence from actual user needs, also had a major impact on sales. Under the arrangements, NAMC was able to develop and manufacture the aircraft on the national budget without having to consider whether it would be profitable until it actually tried to sell it. As long as the YS-11 had poor cost performance, domestic airlines tried to avoid any risk that could imperil their competitiveness, regardless of the fact that the product was key to national policy for the government. If one were to present a private-sector company in the industry with a foreign-made plane that performs better at a lower cost, the company would obviously want to buy it. Conditions surrounding exports of

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18 Editorial Committee for the 25-Year History of the Nagoya Aircraft Works, *Mitsubishi Jūkō Nagoya Kōkūki Seisakujo*, 119.
19 Yamamura, *YS11 no higeki*, 91.
20 Maema, *YS-11*, 500.
the YS-11 were even more dire: the Japanese government had no influence abroad, so the YS-11 naturally faced dumping and rebates without any regard of profits. NAMC also lacked practical know-how in selling civilian aircraft, and bungling sales certainly did nothing to stop the business from deteriorating further.21

By FY1969, NAMC had already posted a cumulative deficit of 8.571 billion yen in excess of its capital—and at closing in FY1970, the project reported an addition deficit of 14.54 billion yen for that year alone.22 Considering the interest rates on the hefty loans that helped enable mass production, the deficit was bound to balloon if business went on as usual.

The aircraft manufacturers objected to taking the blame for NAMC’s deficit because they saw themselves as no more than NAMC subcontractors that were simply following instructions. While they did manage to secure new demand in the form of YS-11 production through the NAMC project, the manufacturers were ultimately just going along with the NAMC plan because it was national policy. Therefore, the manufacturers argued that the government should have to cover both the deficit of the YS-11 project and the expenses for civilian projects in the pipeline.23

The Japanese aircraft industry proceeded to abandon the independent, domestic development of civilian aircraft and shift its focus to international joint development. In 1975, a proposal from Boeing led to the signing of a contract under which Japanese aircraft manufacturers would manufacture parts for Boeing planes as subcontractors.24 From that point on, Japanese aircraft manufacturers have been working to incorporate technologies and sales expertise via alliances with foreign companies—and no purely domestic civilian aircraft has rolled off the production line since the YS-11.

III. Petrochemicals: A counterproductive 300,000-ton standard

The Japanese petrochemical industry developed rapidly during the 1960s, but excess production capacity ended up bringing about a structural recession in the 1970s. The tide changed again in the 1980s, when industry players started diversifying and branching out into leading-edge technologies in areas like electronics, biotechnologies, and new materials. From the 2000s onward, firms that had begun to shift from commodity (bulk) chemicals and toward fine chemicals rose to the forefront and established a more sizable presence for the petrochemical industry as an ample source of functional chemicals ranging from semiconductor materials to materials for LCD displays. Despite those advances, Japanese petrochemical companies still have smaller-scale operations and lower revenues than their counterparts abroad, and many are working to downsize or optimize their commodity-chemical divisions. Why, then, did the Japanese petrochemical industry develop into such a low-revenue arena teeming with a multitude of companies?

The structure was an unintended consequence of MITI’s industrial policy. The ministry’s initial aim was to keep companies from flooding the industry, which it hoped to do by making large-scale

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21 Yamamura, *YS11 no higeki*, 140.
22 Yamamura, 154.
23 Maema, *YS-11*, 514.
24 Richard J. Samuels, “Rich Nation, Strong Army”: *National Security and the Technological Transformation of Japan* (Ithaca, NY: Cornell University Press, 1994), 202–3.
production capacity a prerequisite for market entry. What ended up happening, however, was the opposite effect: the production prerequisite actually encouraged more and more companies to join the fray. MITI erected a formidable barrier to entry in hopes of turning away newcomers and permitted entry to any company that satisfied the production-capacity requirement. The decision to open the field to anyone with the requisite production capabilities, coupled with the optimistic demand forecasts of the second half of the 1960s, ultimately led to overinvestment that—even despite the ministry’s best attempts at fine-tuning—would not have occurred if companies had been making their own, independent management decisions.25

The Japanese petrochemical industry began to shift into high gear in July 1955, when MITI finalized its “Measures for Fostering the Petrochemical Industry” and adopted a policy to repurpose the former military fuel plants in Yokkaichi, Iwakuni, and Tokuyama for petrochemical use.26 Coming out of its defeat in World War II, Japan found itself trailing its international competitors considerably in terms of technological development in the petrochemical sector. To make up some ground on developed Western nations, the Japanese government focused on accelerating the process by building mammoth petrochemical complexes at home.27

In petrochemicals, naphtha (a broad term covering several crude gasoline fractions) is pyrolyzed to produce ethylene, which is then used as a raw material to make a wide variety of products. Commercializing ethylene production was a risky initiative rife with uncertainty. The massive initial investments for enabling expansive production also posed significant fundraising challenges for new market

25 For more on how MITI and the industry made optimistic demand forecasts during this period, see Hirano Sō, “Sekiyukagaku sangyō ni okeru setsubi tōshi chōsei: Echiren nensan 30-man ton kijun to un’yō” [Capital-investment adjustments in the petrochemical industry: The establishment and operation of the 300,000-ton standard for annual ethylene production], Keieishi-gaku [Japan business history review] 43, no. 1 (2008). Hashimoto Noriyuki’s “Kōdo seichōki Nihon no sangyō seisaku to setsubi tōshi chōsei: Echiren 30-man ton kijun saikō” [Japan’s industrial policy and capital-investment adjustments during the rapid-growth period: Reconsidering the 300,000-ton standard for ethylene production], Rekishi to keizai [The journal of political economy and economic history] 206 (2010) takes a closer look at MITI’s flexible approach to adjusting the production standard. Hirano Sō also discusses how MITI put newcomers into three groups and what kinds of interactions took place between the groups in his “Seifu, kigyo-kan kankei no ruikei to sangyō hatten no dainamizumu: Sekiyukagaku kōgyō no jirei ni motozuite” [The patterns of government-corporate relationships and the dynamics of industrial development: A case study of the petrochemical industry], Soshiki kagaku [Organizational science] 46, no. 3 (2013). Meanwhile, Nagai Keitarō examined capital-investment adjustments for not only ethylene but also derivative products, arguing that MITI actually gave preferential treatment to derivative-product newcomers as a means of putting ethylene production to good use, in his “Kōdo seichōki kōhan no sekiyukagaku sangyō ni okeru yūdōhin no setsubi tōshi chōsei: Chūteiatsu-hō poriechiren, suchirenmonomā, echirenokisaido o jirei ni” [The adjustment process in plant-building for derivative products in the petrochemical industry in Japan’s late high-growth era: The case of middle/low-pressure polyethylene, styrene, and ethylene oxide], Waseda seijii keizai-gaku zasshi [The Waseda journal of political science and economics] 396 (2020). Aiming to elucidate the situation from a variety of perspectives, these painstaking studies use detailed data to show how MITI and companies in the industry interpreted and acted within the contemporary climate.

26 Hirai Gakuya, Sengo-gata kigyo shūdan no keiei-shi, 190–96; Tsuruta Toshimasa, Sengo Nihon no sangyō seisaku [Industrial policy in postwar Japan] (Tokyo: Nihon Keizai Shimbun, Inc., 1982), 175.

27 Kudō Akira, “Sekiyukagaku” [Petrochemicals], in Sengo Nihon keiei-shi, dai II kan [The management history of postwar Japan], eds. Yonekawa Shin’ichi, Shimokawa Kōichi, and Yamazaki Hiroaki (Tokyo: Toyo Keizai, 1990), 280–81.
entrants. For MITI, the goal of its basic policy for the petrochemical industry was to develop companies with large-scale production facilities. In the petrochemical industry (a process industry), economies of scale were vital to production. MITI thus saw big-time production capacity as vital to bringing Japanese petrochemical companies up to a level where they could contend with their foreign counterparts.

MITI initially considered using a proposal for state-sponsored companies or an effort to establish a single-company arrangement for intensive, consolidated production to help cultivate Japan’s petrochemical industry, but the ministry ultimately decided to let the private sector handle production.28 Aiming to facilitate the process, the ministry took steps to help a core group of zaibatsu-type firms and other companies with promising technologies, funding, and sales capabilities to build a stout infrastructure. At the same time, it also worked to keep new, small-scale players without the requisite production capacity out of the market. MITI’s basic policy, therefore, was to minimize the influx of new entrants and give companies the room and ability to expand their production operations.

Four companies—Mitsui Petrochemical, Sumitomo Chemical, Mitsubishi Petrochemical, and Nippon Petrochemicals—were part of the ethylene initiative under MITI’s phase-one plan. All four were formidable players in the Japanese chemical and oil industries, with histories dating back to before World War II.

MITI took numerous steps to minimize the risk of market entry for the first big four. On the production side, MITI offered financial support for capital investments and provided tax breaks to facilitate the expansion on which economies of scale depended. That involved securing low-interest funding from government-affiliated financial institutions, such as the Development Bank of Japan, and utilizing a special depreciation system under the Act on Special Measures Concerning Taxation. The ministry also made numerous petrochemical-related products eligible for tax exemptions for important products.29

Another element of MITI’s support efforts was helping companies procure raw materials on more favorable terms. MITI offered incentives to oil manufacturers, which provided the raw materials for petrochemical products, to make sure that the petrochemical industry would receive ample allocations of oil for manufacturing naphtha. At the time, the allocation of foreign-currency funds needed to settle import payments had to be approved by the minister of MITI. The ministry allocated more foreign currency to oil manufacturers that supplied more crude oil toward naphtha production for petrochemicals.30

By the close of the 1950s, four petrochemical centers had launched operations in Japan, with zaibatsu-type companies accounting for the bulk of the activity. MITI’s goal of establishing an oligopolistic system around a small group of companies had largely come to fruition. The resulting framework proved successful and generated a positive cycle, as mass production precipitated price drops that thereby enabled further mass production. In those conditions, the petrochemical industry grew at a blistering pace. By the mid-1960s, it had completed its transformation from an import industry to an

28 Hirai Gakuya, Sengo-gata kigyō shūdan no keiei-shi: Sekiyukagaku, sekiyu kara mita Mitsubishi no sengo [Exploring the business history of postwar-type corporate groups: What the petrochemical and oil industries reveal about Mitsubishi’s postwar development] (Tokyo: Toyo Keizai, 2013), 192.
29 Tsuruta Toshimasa, Sengo Nihon no sangyō seisaku, 182.
30 Tsuruta, 185.
export industry—and, in doing so, made a winner of the government’s effort to achieve a much-needed import substitution.

However, the four petrochemical heavyweights were not the only companies looking to make their way into the industry. Plenty of latecomers began showing interest, driven by both the industry’s growth potential and their own hopes of making their chemical-manufacturing operations more efficient. MITI’s phase-two plan (1962–1964) included five newcomers—Tonen Sekiyu Kagaku, Daikyowa Petrochemicals, Maruzen Petrochemical, Kasei Mizushima (a subsidiary of Mitsubishi Kasei), and Idemitsu Petrochemicals—and approved the creation of a new petrochemical center for each. From the phase-two plan onward, the rush of new companies into the industry intensified intercompany competition and thus dissipated the concentration of ethylene production. The conditions set the industry up for what MITI had feared: systemic erosion that would lead to a severely weakened state.

MITI responded by expanding the production requirements for the ethylene plants. Starting out at minimum levels of 40,000 tons in 1960 and 60,000 tons in 1961, production requirements would rise substantially after the end of the phase-two plan, climbing to 100,000 tons in 1965 and 300,000 tons in 1967. The escalating minimums effectively made it impossible for companies without that level of expansion capability to enter the market. Under the phase-two plan, MITI had found itself with no choice but to approve new construction projects in the industry, which enabled five newcomers to make their way into the market. Aiming to avoid making the same misstep twice, the ministry moved to hoist the authorization standards to a level that it hoped would effectively prevent any more companies from finding a way in.

The zaibatsu-type petrochemical firms and the rest of the forerunners in the industry loathed the idea of latecomers getting their feet in the door. From that standpoint, MITI’s new minimum-standard policy was a welcome development. To help thwart new entry within the legal bounds, the existing big players took active part in MITI’s policymaking and supported the idea of increasing the plant production criterion for market entry. Looking back on the time, former Mitsui Petrochemical Industries President Iwanaga Iwao recalled feeling “an odd sense of anticipation that setting the bar at 300,000 tons would make the construction expenses, the space requirements, and other benchmarks so daunting that newcomers would just back away.” Higher plant standards would force newcomers to pour even more resources into capital investments, a setup that the established cadre of companies saw as an effective means of shaking off firms incapable of significant expansion.

The plan for the Japanese petrochemical industry thus entered the era of the “300,000-ton standard” in 1967. MITI and industry players established the policy as a way to ward off newcomers—but things did not transpire that way. Companies went right on building more and more new facilities. In the first

31 Tsuruta, 181.
32 Shimizu Hiroshi, “Sangyō seisaku to kigiyō kōdō no shakaiteki gōsei: Sekiyukagaku kōgyō no ‘rieki naki han’ei’” [The social synthesis of industrial policy and corporate activity: “Profitless prosperity” in the petrochemical industry], in Gendai keieigaku kōza 2: Kigyō no hatten [Survey of modern management 2: The development of the corporate sector], ed. Yonekura Seiichirō (Tokyo: Yachiyo Publishing, 2002), 161.
33 Hirano Sō, Nihon no sekiyukagaku sangyō [The Japanese petrochemical industry] (Nagoya: University of Nagoya Press, 2016), 113. The MITI official who came up with the 300,000-ton standard was Amaya Naohiro, then director of Chemical Section I in the Chemical Industry Bureau.
years under the new requirement, Osaka Petrochemical Industries, the Šōwa Denkō–Yawata Chemical Group, and Asahi Kasei–Nihon Kōgyō Group all secured authorization. A host of other companies, including Sumitomo Chemical, Mitsui Petrochemical, Mitsubishi Petrochemical, Tonen Sekiyu Kagaku, and Nippon Petrochemicals, received approval for their second centers. MITI was obviously not happy about the emergence of these numerous newcomers, which stood in the way of its intentions to form a tight, small group of companies to drive progress. Why was it, then, that MITI wound up letting such a sizable group of new companies into the mix despite establishing such a rigorous policy to keep newcomers out?

Part of the reason was the fact that the government’s initial plan gradually fell apart as companies seeking entry into the industry found ways around the regulations in place. Companies that had been planning to apply for entry under the phase-three plan had received no prior notice of the imminent 300,000-ton minimum capacity requirement. When they submitted their plans, which naturally stipulated smaller-scale production than what the new regulations called for, MITI denied their applications. For latecomers, that meant losing any real chance for entry into the petrochemical industry—but not all of them went down without a fight. Clever schemes helped many circumvent the roadblocks. Tonen Sekiyu Kagaku, for instance, worked up an ingenuous plan to meet the requirements. The firm built small-scale facilities for the front-end processes, which were the processes subject to the regulations, and went all out on the back-end processes. They then asked MITI to revise their plans after the fact to account for the imbalance. Once they had clearance to make changes, they proceeded to add new facilities on the front end. Through these types of maneuvers, the latecomers managed to foil the system and expand production within the boundaries of MITI’s regulatory framework.

While newcomers were taking inventive approaches to securing industry entry, recent research has shown that other factors also spurred an excessive amount of new facility construction: both MITI and the big industry stalwarts overestimated demand growth based on the Petrochemical Cooperation Roundtable Conference’s demand forecasts from 1968 onward, and those inflated projections prompted an increase in the number of open slots for incoming companies. Having grounded its outlook in overly optimistic business projections, MITI eventually found itself with no reason not to approve overly ambitious, large-scale business plans by industry hopefuls. MITI and the industry took a bullish stance on future demand, an outlook that formed the basis for the ministry’s approval decisions. The wily strategizing by private firms aiming to secure entry into the industry, along with MITI’s optimistic projections at the time, combined to prompt capital-investment adjustments and, in turn, major capital investments that would not have automatically occurred if the government had let market mechanisms dictate the industry. The conditions set the stage for the excessive production capacity of the 1970s and ensuing decades.

In the 1970s, as demand dropped amid a recession and the oil crisis, the overcapacity issue materialized into full view. The petrochemical industry found itself mired in a classic mode of structural

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34 Hirano Šō, “Seifu, kigyō-kan kankei no ruikei to sangyō hatten no dainamizumu: Sekiyukagaku kōgyō no jirei ni motozuite” [The patterns of government–corporate relationships and the dynamics of industrial development: A case study of the petrochemical industry], Soshiki kagaku [Organizational science] 46, no. 3 (2013): 54.
35 See the discussions of the seventh, eighth, ninth, and tenth meetings of the Petrochemical Cooperation Roundtable Conference in Hirano Šō, Nihon no sekiyukagaku sangyō, 118–38.
recession. MITI’s efforts to spur production expansion and suppress market entry had actually increased the number of companies joining the industry—exactly what it had been trying to prevent—and the industry’s overall production volume overshot the real market conditions without any grounding in real demand.

The decade also saw naphtha prices skyrocket as a result of the recession and the first oil crisis, while falling demand precipitated a drop in profit margins throughout the industry. As ethylene production plateaued, companies began forming depression cartels and scrapping facilities in coordination in order to reduce their production-capacity levels. With that, the petrochemical sank into a rut of stagnation that would take years to climb out of.

IV. Mainframe computers: Competition and planning coordination

The Japanese electronics industry has carved out a sizable share of the global market since the 1980s onward thanks to robust performance in mainframe computers, semiconductors, personal computers, and other segments. In 2020, Fugaku, a supercomputer developed by Fujitsu and other manufacturers, became the fastest supercomputer in the world—evidence that Japanese companies maintain top-flight levels of technical prowess in the industry to this day. How did Japan manage to domesticate mainframe computers so successfully? This section delves into that question, eventually concluding that the triumph came from a surprisingly effective change of course by MITI. Initially, the ministry yet again championed a proposal for a state-sponsored company to lead the way for the industry. When private companies pushed back hard against the idea, MITI had to take what it saw as the next best approach: grouping companies for the development side of the industry, letting companies compete freely on the production side, and establishing a national policy company to handle sales. Incredibly, that seemingly disjointed strategy mitigated risks on the development and sales fronts while still sustaining competition among the industry players.

Japanese companies first started to develop mainframe computers in the early 1950s. MITI decided to help nurture the industry through state-level policies, with private firms doing their part by pouring their energies into development. MITI grew alarmed at the overwhelming technical gap with

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36 Nihon Keizai Shimbun, June 23, 2020.
37 For a comprehensive look at Japan’s industrial policies on mainframe computers, see Miyazaki Kunio, “Nihon ni okeru denshi keisanki sangyō seisaku de no seisaku kettei purosesu” [The policymaking decision process behind Japan’s computer-industry policies], Kokusai kankei – Hikaku bunka kenkyū [Journal of international relations and comparative culture] 6, no. 2 (2008). For details on the negotiations with IBM, refer to “Nihon no konpyūta sangyō hatten to IBM kihon tokkyo: Naze Nihon kigyō wa teiketsu dekita no ka” [The implication of IBM pioneer patents for the development of the Japanese computer industry: Why could Japanese companies conclude the agreement?] by Takahashi Kiyomi, in Keieigaku kenkyū ronshū [Research in management studies] 25 (2006): 115–33. See also Aoki Hiroshi, “Nihon no shoki konpyūta sangyō to gaishi teikei: IBM to no kōshō katei” [Japan’s early computer industry and its partnership with foreign capital: Focusing on the negotiating process with IBM], Kenkyū nenpō keizaigaku [Annual report of the Economic Society] 75, nos. 3–4 (2017), published by the Tohoku University Economic Society. For a comparison of conditions in Japan and France, see Takahashi Kiyomi, “Nichi-Futsu hikaku ni yoru sangyō no seiritu to hatten ni kan suru shiteki kenkyū: Conpyūta sangyō no jirei kara” [Historical study of industrial establishment and development by comparison of Japan with France: A case of computer industry], Keieigaku kenkyū ronshū [Research in management studies] 25 (2017), published by Meiji University.
the United States as Japan started to import IBM, UNIVAC, and other computers produced in the United States during the 1950s.

MITI sat down at the negotiating table with IBM in April 1960 and strongly urged the company to disclose the basic computer patents in its possession to Japanese manufacturers. IBM, meanwhile, had previously requested that MITI grant IBM Japan status as a licensed corporation under the Act on Foreign Capital so that IBM Japan could repatriate its profits. In 1960, IBM owned 5,000 computer-related patents in Japan and abroad; its “important” patents alone numbered in the dozens. To avoid prolonged negotiations that might have prevented Japanese manufacturers from starting production, MITI ultimately yielded to IBM’s demands and brought the talks to a favorable end for both sides.

NEC, Hitachi, Fujitsu, Oki Electric, Toshiba, Mitsubishi Electric, Matsushita Communication Industrial, and other Japanese corporations thereby obtained the basic IBM patents under identical conditions beginning December 1960. IBM agreed to postpone the launch of domestic computer production by IBM Japan by two years rather than impose limits on the number of computers produced in Japan, and the company also agreed to subsequent consultations with MITI. Domestic production of the popular IBM1401 was thus pushed back until 1963, giving domestic manufacturers a grace period to develop competing models.

With IBM Japan subject to these restrictions for the period that MITI and IBM had agreed on, many Japanese manufacturers worked out technology-introduction plans with IBM competitors in the United States between 1961 and 1964. Japanese firms may have obtained the basic patents, but there was still an obvious gap separating the domestic and foreign machines—and the future of domestic computers was still murky.

MITI then turned its focus to laying a firmer foundation for computer production by Japanese manufacturers. To further compound the delay in the domestic production of the IBM1401, the ministry began taking whatever steps possible to prevent imports of the machine into Japan. Meanwhile, domestically produced computers were delivered to government agencies, national universities, and other public institutions on a priority basis.

In August 1960, MITI released its “Measures to Facilitate Domestic Computer Production” and pledged to lend the industry a helping hand through efficient use of funding, focused engineer assignments, distribution of production models, code standardization, and other elements of planned production, along with implementing a rental system, developing large computers, and training human resources for positions like programmers and planners. MITI laid out its plan for bringing that vision

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38 IBM Japan, Ltd., *Nihon IBM 50 nen-shi* [The 50-year history of IBM Japan] (Tokyo: IBM Japan, 1988), 158.
39 Nakamura Kiyoshi, “Konpyūta sangyō” [The computer industry], in *Nihon sangyō hatten no dainamizumu* [The dynamism of Japan’s industrial development], ed. Takeda Haruhito (Tokyo: University of Tokyo Press, 1995), 246.
40 According to statistics for 1961, foreign computers accounted for 78.9% of the total value of computer deliveries in Japan; just 21.1% of the total were Japanese-made computers (JECC Corporation, *JECC jūnen-shi* [The ten-year history of JECC] (Tokyo: JECC, 1973), 82).
41 Tateishi Yasunori, *Hasha no gosan* [The miscalculations of the champions], vol. 1 (Tokyo: Nihon Keizai Shimbun, Inc., 1993), 162.
42 Data from August 1963 indicates that seven foreign-made and thirteen Japanese-made computers were installed at government agencies, while one foreign-made and twenty domestic units were in operation at national universities (JECC Corporation, *Gonen no ayumi* [Our first five years] (Tokyo: JECC Corporation, 1968), 39).
43 JECC Corporation, *Gonen no ayumi*, 22.
to fruition in a document called “About JECC State-sponsored Enterprises” that October. In addition to covering the above measures, the document also proposed a plan for producing computers via a state-sponsored company: consolidating the computer manufacturers into a single company that would execute planned production with state sponsorship.

One important factor that played into the plan was MITI’s careful concerns about how MOF would respond to a budget request for industrial advancement. In the first place, MOF was showing reluctance about providing massive budget funding to the computer industry; the ministry had, after all, clearly expressed its opposition to allotting substantial funding to multiple individual companies.44 Noting MOF’s apparent unwillingness to dish out budget resources far and wide, MITI needed to provide the MOF with a clear pretext for the investment by consolidating the industry and making it at least appear to be a state-sponsored enterprise.45

However, domestic manufacturers opposed the idea and appealed to MITI to guarantee free initiatives for corporate management with regard to manufacturing and sales, in particular.46 MITI found itself stuck between pressure from MOF to limit its budget requests and stiff opposition from the private sector. With manufacturer opposition mounting, budget acquisition appearing less and less likely, and a consensus among the relevant agencies on legislative preparations failing to take shape, the proposal for a state-sponsored company crashed. The dilemma prompted MITI to change course and come up with a new plan.

The ministry decided to adopt a policy of supporting the manufacturers’ autonomous management and split up the failed proposal for a state-sponsored enterprise along functional lines. The resulting plan distinguished between domains where MITI would have control and domains the private sector would have free rein.47 In more specific terms, MITI sought to compartmentalize development, production, and sales—the three important elements in the original plan—and leave production to private-sector initiatives, establish a state-sponsored rental company with joint private sector financing to handle sales, and provide subsidies and technical assistance for the joint development of large computers.

The state-sponsored rental company, which MITI envisioned as shoudering the responsibility for computer sales, was JECC (Japan Electronic Computer Company). Established under the guidance of MITI in August 1961, JECC was funded by NEC, Toshiba, Hitachi, Fujitsu, Oki Electric, Mitsubishi, and Matsushita. At the time, IBM supplied computers to global users based on a rental system, using its access to enormous amounts of funding. In order to compete with IBM, Japanese manufacturers needed to bolster their sales structures.

MITI and the big industry players thus set up JECC, which purchased computers from manufacturers in bulk and leased them to users.

JECC protected Japanese manufacturers, which were on a poor financial footing, from challenges and burdens on the sales front so that they could better contend with IBM. However, the framework did not save manufacturers from the risks of sales competition. Under the original proposal for a state-

44 Marie Anchordoguy, “The Public Corporation: A Potent Japanese Policy Weapon,” Political Science Quarterly, vol. 103, no. 4 (1988): 708.
45 “JECC Monogatari” [The JECC story], issue 23, JECC Corporation, JECC nyūsu [JECC news], August 16, 1981.
46 “JECC Monogatari,” issues 7 (April 1, 1981), 23, and 24 (October 1, 1981).
47 “JECC Monogatari,” issue 23.
sponsored enterprise, the assumption was that computers would be purchased in bulk—but the idea of leasing computers to users was not part of the picture.\footnote{48} The problem was that, under the JECC system, manufacturers had to take back the rental computers after the rental contracts expired—and, when doing so, pay the remaining book value to JECC. Even if they sold computers to JECC at a high price to JECC, then, they would still need to buy the computers back after the rental. The purpose of JECC was essentially to create a time lag to recover funds at the inception of the rental system. JECC itself never had to deal with any sales risks.

The responsibility for development, another element of the proposal for a state-sponsored enterprise, went to the FONTAC Project. In September 1962, MITI established the Computer Technology Research Association based on the Act on Research and Development Partnerships concerning Mining and Manufacturing Technology (enacted in 1961). The aim was to develop larger, more advanced computers than the machines that companies could develop on their own (or in partnership with US manufacturers). The participants in the FONTAC Project were NEC, Fujitsu, and Oki Electric. With the support of MITI and the Agency of Industrial Science and Technology, the project’s member companies received up to 350 million yen in subsidies for joint research on mainframe computers with an aim to create something to rival the IBM7040/7044 models. Named using the initials of its three members (Fujitsu-Oki-Nippondenki-Triple-Allied Computer), FONTAC completed its work in 1964. Although the resulting computer itself never went to market, the companies acquired technologies along the way that later played roles in their respective products. Participating in the project also helped the companies garner experience in sharing technologies, so subsequent development competition among the FONTAC firms operated on a degree of mutual understanding—NEC, Fujitsu, and Oki Electric knew what one another was working with. It all came together to give the firms stronger incentive to develop technologies capable of outperforming those of other companies, an outcome that further encouraged competition on the development front.

The government’s policy of providing assistance by splitting up the proposal for a state-sponsored enterprise, leaving production initiatives to the private sector, establishing JECC as a joint rental company to conduct sales, and establishing the FONTAC Project for advanced joint research and development limited the scope of government planning. In addition, MITI implemented the policy in a way that did not interfere with domestic manufacturers’ incentive to compete on production and development.

On the domestic market, Japanese computers have outperformed foreign-made computers in terms of both total sales value and the number of installed machines since 1968. MITI, too, has acknowledged that its industrial-development policy was successful to a certain degree in advancing hardware capabilities.\footnote{49}

In 1970, MITI began seeking budget funding for the development of a model to compete with IBM’s new System 370. Departing somewhat from its past tendencies, MOF agreed to budget the computer industry in broad terms—but again, the ministry was reluctant to dole out funds to several

\footnote{48} “JECC Monogatari,” issue 24.

\footnote{49} Hiramatsu Morihiko, “Watashi no rirekisho” [My resume], Nihon Keizai Shimbun, June 17, 1992. As of 1970, IBM Japan had carved out the highest market share in terms of the value of the installed computer base in Japan at 31.9%, but the domestic manufacturers had secured steady positions with Fujitsu at 16%, Hitachi at 16%, and NEC at 11.9% (Sakamoto Kazuichi, Konpyūtā sangyō [The computer industry] (Tokyo: Yuhikaku, 1992), 97).
corporations and demanded justification for the investments.\textsuperscript{50} MITI eventually floated a compromise to MOF, one that would organize the six companies in the industry into three groups through partnerships. In April 1971, MITI officially notified the manufacturers of the grouping request.

After Fujitsu and Hitachi forged their collaboration that September, the groups were complete by November. Leaders decided to spend 34.1 billion yen from general accounts, instead of special accounts, for a period of three years starting from FY1972.\textsuperscript{51} The arrangement actually continued through 1976, with each group receiving about 57 billion yen in investments toward the development of new models over that time. With that ample funding, each group completed the development of a new series on schedule: Fujitsu/Hitachi successfully developed the M Series, NEC/Toshiba the ACOS series, and Mitsubishi/Oki Electric the COSMO series in 1974 and the years after.\textsuperscript{52}

On April 1, 1976, the computer industry reached full liberalization in terms of both trade and capital. By that time, the companies had finished developing their computers to compete with IBM. Some observers had worried that liberalization might fuel a large-scale increase in the presence of foreign computers, but those fears turned out to be unwarranted. The policies for Japan’s computer industry had apparently delivered solid results.

V. Conclusion: Use the “visible hand,” but don’t stop the “invisible hand”

Looking back over the three cases in this paper, one can see a common strain running through MITI’s patterns of action in all three industries: the consistent belief that entrusting new, fledgling industries to a massive company or companies was an effective approach to industrial development. The ministry designed methods for doing so through proposals that aimed either to create a national policy company, give preferential treatment to a select number of big, existing firms, or group multiple companies together into a single, combined recipient of budgetary funding.

In many cases, MITI’s first proposal for an initiative to foster industrial advancement centered on creating a single national policy company and tasking the new company with the full range of activities—development, production, and sales. All three of the case studies in this paper started out with a proposal for a state-sponsored company, in fact. While private firms generally object strongly to that type of approach, the Japanese aircraft industry was a different story; private companies did not come out against the idea but rather decided to wait and see how the national government went about taking responsibility for the project. The manufacturers were wary of the sizable risks they saw in the idea of developing, producing, and marketing civilian aircraft all on their own. However, the proposal for a state-sponsored company, which should have been the most systematic, efficient means of achieving the government’s aims, ultimately failed to produce a profitable business that met market needs, and MITI’s plan ended up grounded.

When the initial proposal for a state-sponsored company either failed to materialize or seemed irrelevant to the situation, MITI’s second line of action involved selecting a handful of zaibatsu-type companies or other big, established firms to receive special support from the government. That was the approach MITI took in the petrochemical industry, where a small group of zaibatsu-type manufacturers

\textsuperscript{50} Tateishi Yasunori, \textit{Hasha no gosan}, vol. 2, 148.
\textsuperscript{51} Hiramatsu Morihiko, “Watashi no rirekisho,” June 19, 1992.
\textsuperscript{52} Sakamoto Kazuichi, \textit{Konpyūtā sangyō} [The computer industry] (Tokyo: Yuhikaku, 1992), 310.
spearheaded the construction of ethylene centers to propel the industry forward. In that case, however, a surge of companies seeking entry into the industry prompted the government to enact a 300,000-ton production minimum. The standard was supposed to quench the influx of newcomers, but it instead encouraged widespread expansion and actually wound up leading to overcapacity issues. Not only did MITI’s entry restrictions fail to keep new entrants out, but the presence of the entry-suppression policy also triggered massive capital investments by numerous companies without any basis in actual demand.53

If the second approach of giving preferential treatment to a small group of companies proved unfeasible, MITI went with a third-line strategy: grouping large companies together with mergers or other maneuvers to both promote expansions of scale and reduce the number of players in the field. As the history of the auto industry shows, however, the grouping strategy prompted harsh backlash from the private sector, which saw the move as an infringement on management autonomy.

After the first, second, and third strategies came a fourth option, where MITI would create a national policy company or group firms together to cover a functionally limited scope, such as development or sales, and preserve the independence of private-sector corporate management. That was the case in the mainframe-computer industry, the third case study in this paper. After its plans for a comprehensive national policy company fell through, MITI decided to form state-sponsored firms and do limited grouping for specific functions like development and sales. Tough pushback from private computer manufacturers thwarted MITI’s plans for a state-sponsored enterprise, so MITI switched gears and adopted what it saw as its next best alternative: functional division that would limit the risks for industry players but still keep competition alive. What the case of industrial policy in the computer industry suggests is that rather than systematically planning everything out from the start on the basis of a national policy company, the most effective approach to driving progress is a more flexible arrangement where functional divisions enable both in-market cooperation and competition. One crucial element in implementing that type of strategy is leaving enough room for competition among the companies so as not to deprive them of incentive.

As the cases of the Japanese aircraft, petrochemical, and mainframe-computer industries have all shown, government policies involving the creation of a state-sponsored company or measures to suppress market entry run a much higher risk of failure when they let private companies lay full responsibility at the feet of the government or when the government uses the policy to shut out newcomers. What imperils these policies is their interference with the natural order—they impel companies to behave in ways they would not if the market mechanisms were functioning normally. Ironically, industrial development has sometimes flourished best when MITI’s plans missed the mark and private companies were able to make their own strategic decisions on matters of competition and investment.54

53 Hirai Gakuya, *Sengo-gata kigyō shūdan no keiei-shi*, 317–18.

54 This falls in line with Kikkawa’s argument (1993) that government industrial policies “are often effective in enhancing companies’ international competitiveness through investments in rationalization and expansion but ultimately fail as they lead companies to aggregate, thereby suppressing competition.” Kikkawa Takeo, “Sangyō seisaku no seikō to shippai: Sekiyuka ga kōgyō to sangyō seisaku” [Successes and failures in industrial policy: The petrochemical industry and industrial policy], in *Nihon-teki keiei no seisei to hatten* (Kēsubukku, Nihon kigyō no...
Forming plans around target intentions often leads to failure, while the absence of a fully laid-out plan often leads to success. Part of the reason for that dynamic is that it is extremely difficult for any government to functionally replace the workings of the market. While policies are effective as aids to the visible hand of management, such as efforts to make rational expansions in production scale, policies that go too far and either stop or twist the invisible hand of god by reaching over the workings of the free economy or actively suppressing market entry run the risk of dealing considerable damage to the industries they aim to benefit. The history of Japanese industrial policy offers valuable lessons into the immense challenges that companies face in developing financially viable businesses when the need to comply with policy intentions forces them to operate with a blind eye to actual market conditions.

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