

MEIJI ECONOMIC DEVELOPMENT IN PERSPECTIVE:  
REVISIONIST COMMENTS UPON THE  
INDUSTRIAL REVOLUTION  
IN JAPAN

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I

“An watershed marks the end of an uphill grade, but is not the end of the road.”

[Stephen Toulmin and June Goodfield, *The Fabric of the Heavens*]

**A** MIDST general confusion and reassessment, there would appear to be two quite distinct perspectives on the industrial revolution in Japan during the later nineteenth century. If one considers even briefly the more recent work of several of the expert economic and social historians of Japan, the overall message is one of gradualism and historical prerequisites of the Rostovian variety,<sup>1</sup> in explicit and intended contradistinction to the earlier historical consensus. On the other hand, those development economists who refer to the Japanese case tend to emphasize the discontinuity represented by Meiji, the unbalanced nature of the development process, and the highly strategic character of the socioeconomic relationships and institutions established during the period of industrialization. The *tiro* might be excused in considering this difference a partial result of the economists being behindhand in their reading of the relevant historical literature. However, this is not indeed the case.

Undoubtedly the difference is one of perspective as such. No defender of a rampant neo-classical approach to history, I would nevertheless like to suggest that the economists, to all real *historical* purposes, have adopted the most useful

<sup>1</sup> This and subsequent reference is to W. W. Rostow [52], yet the most famous of all the products of economic history. To simplify crudely, the Rostovian approach may be epitomized as a stress on “prerequisites” which are at once a causal nexus and a period in time, a reliance upon the “stage” development of a national economy in relative isolation (at least, during the crucial “take-off” stage), an identity between development and industrialization which fails to treat of the dynamic process of underdevelopment [52, p. 166], and an emphasis upon the convergence of industrial economic systems. The most useful part of the book, the “leading sector” notion in fact required no history, and was formulated earlier in [51]. Rostow allows the term “growth” to embrace basic structural changes in both economy and society, the latter of which, with rare exceptions, e.g., “science” in the precondition/take-off era, appear to follow the former in a manner reminiscent of the most vulgar of Marxisms. Strangely, the work is subtitled, “A Non-Communist Manifesto.”

and interesting approach in their consideration of late nineteenth century Japan. More specifically, their more developmental and internationalist perspective on the Japanese economy is of greater relevance to an understanding of its history than is much of the recent material produced by the professional, expert economic historians of the country, whether they be Japanese or North American. The historians (of all people?) appear to have lost sight of the Platonic method, the comparative approach, one that should be most dear to their hearts and most central to their question asking and problem solving *procedures*.

The development economist visualizes the Japanese case as a sparkling and relevant example of relatively discontinuous and successful development in the face of severe factor and other restraints. Thus Benjamin Higgins in his well-known advanced text begins his section on "Success Stories" with the claim that,

In contemporary economic history, Japan provides the most spectacular success story. One hundred years ago [1868] Japan was clearly an underdeveloped country . . . .The beginnings of Japanese industrial growth are usually traced to the Meiji Restoration of 1868. . . .[and in terms of development economics] . . .the relatively high rate of growth has to be explained in terms of a comparatively low incremental capital-output ratio rather than in terms of a high investment ratio. [19, pp. 617-19]

Similarly, S. K. Singh, although intending to revise several judgments on the Japanese example, emphasizes that,

One after another, many countries have *gone over* to a significantly increased growth rate of 8% a year. By now, the instances are far too many to be brushed aside. First *of course* was Japan, which *absentmindedly* reached this figure and has continued at that rate despite repeated predictions of all economists—Japanese and non-Japanese—of a fall in the growth rate to a much lower level in the near future. (my emphasis) [55, p. 240]

Indeed, J. C. H. Fei and G. Ranis focus on the Japanese case as the very basis for the specification of their version of the labor-surplus theory of initial industrial development: "Japan's escape from the Malthusian trap is all the more impressive since the agricultural labour force not only decreased relatively but began to decline absolutely after 1897" [7, p. 131]. Perhaps the clearest exposition of both the discontinuous and exemplifying character of the Japanese industrial revolution was the early (1956) article by Nelson which was, significantly enough, published in the *American Economic Review* [41, pp. 894-908]. None of the above work evidences ignorance of the contemporary *historical* research, and the later examples utilize the most recent figures of Ohkawa, Rosovsky, Nakamura, and Shinohara.

In contrast, the task of much new work by economic historians appears to have been to reduce the importance of the Meiji Restoration as a distinct, historical, strategic development period in the history of Japan. This undermining of the industrial revolution has occurred as a pincer movement on two flanks: A reassessment of the Tokugawa period has bolstered a redefinition of the growth process within the years of Meiji.

Amongst several alternatives, there are three major ways in which a period's historical distinctiveness may be so "undermined." The analyst (e.g., Nakayama) might stress the continuity of trends in causal factors, such as demographic change or the role of social values, between the period and prior or subsequent eras. Secondly, the analyst (e.g., Hanley, Yamamura, Rosovsky, Nakamura, etc.) may seek to either reduce the level of achievement (especially Nakamura) or question the newness or uniqueness of the major characteristics of the period. Finally, the Rostovian analyst (e.g., Hauser, Yamamura, Rostow, etc.) would elect to emphasize the "prerequisites" or "preconditions" era immediately prior to the period, especially stressing change in those elements of the era which *become* either the overriding characteristics of the period in question or those which may be seen as directly causal to the achievement of such characteristics. In all three tactics a key problem, often insufficiently acknowledged, lies in the selection of those *characteristics* which might properly (?) *be* said to represent the essential nature of the period. For instance, to emphasize a continuity in demographic trends before, during and after a "period" might only be said to contribute to its "undermining" if demographic factors are clearly shown to determine other major social and economic characteristics. When Ashworth argues that the Rostovian prerequisites and notion of "take-off" [1, p. 164] have rejuvenated the idea of discontinuity, he neglects to allow for the tendency for "continuity" to appear again at the back door via the Rostovian emphasis upon the logical, almost cumulative consequences of the developments prior to take-off.<sup>2</sup>

By 1968, John Whitney Hall was writing of the "New Look" of Tokugawa history. As opposed to those historians who depicted Tokugawa Japan as feudal, isolated and reactionary,<sup>3</sup> Hall argued that we could look back with pride, rather than in anger at developments prior to 1850. However, although contradicting the relevance of terms such as feudalism and stagnation, emphasizing the dynamics of both political and institutional structures, and acknowledging the work of Smith on agriculture and Dore on education, as providing material on the "sources of Japan's modern condition," Hall was also clear in his assignment of boundaries and limitations to the historical significance of such work. Particularly, he acknowledged that "when it comes to making generalisations or comparisons with Europe, the Japanese historian is still apt to describe the Tokugawa period as being feudal and retarded," and that the work of *Western* scholars "should not imply that there has been any *conscious attempt to rewrite* Japanese history or to form a *new school of interpretation*" (my emphasis) [15, pp. 59, 61]. In addition, Hall highlighted the plurality of approaches or perspectives on the period and the growing skepticism with regard to "simplistic or deterministic solutions to historical problems." Thus, whilst change on a wide front and some

<sup>2</sup> See [1, pp. 163-69]. Also, it should be noted that "preconditions" in Rostow, despite somewhat haphazard attempts to locate them temporarily, are more a nexus of causal relationships than actual historical periods.

<sup>3</sup> A view which may be derived from a somewhat partial reading of Edwin O. Reischauer [47] and E. Herbert Norman [42], both of which Hall cites.

recognition of an "uphill grade" (see above) were elements to be stressed, the notions of "preconditioning" or of simplistic modeling of the *overall* development processes were not part of Hall's summary approach. Indeed, "there is no denying, of course, that the influence of the West upon Japan after 1853 was critical." The question then concerns the treatment by the historian of such a term as "critical." Absorption and adaptation are by no means necessary reflections of a process of preconditioning in the Rostovian sense.

Surveying much of the essential research of the 1960s, Hanley and Yamamura took the argument a good deal further in their treatment of a "quiet transformation" in Tokugawa history (1971). The "ideological straightjacket" of Marxism<sup>4</sup> was to be replaced by a vision of "dynamism, of pervasive changes... growth and development, rather than stagnation and eventual demise" [16, p. 377]. Here the treatment is analogous to Rostow's program for the preconditions phase—fundamental changes in agriculture, economic institutions and population are emphasized as the dynamical nexus representative of the Tokugawa period. Indeed, this last item is of some real importance in a reinterpretation; both Rostow's and Kuznets's approaches to growth appear to require a per capita increase in income sustained over a *contemporaneous* and trend growth in population. Now, whilst it may be true that some of the earlier Japanese findings on Tokugawa population trends were inaccurate,<sup>5</sup> recent work has by no means proved a demographic revolution during the period of institutional change. As the very fine recent paper by Thomas C. Smith clearly states,

From the early eighteenth century until the middle of the nineteenth, approximately the last half of the Tokugawa period, the output of the country grew more or less steadily, though of course very slowly, while the population remained nearly unchanged.<sup>6</sup>

So, despite the "revisionist" connotations (and, at times, claims) of much of the new work, and quite apart from the distinct possibility that the perspective is somewhat forced,<sup>7</sup> the functional significance of Tokugawa institutional and other changes in terms of the nature, timing and process-momentum of the industrial revolution of the post-1868 years remains elusive. If summary perspectives may be derived from detailed research, then recent monographs may be structured around definite commitments. Yamamura's recent work on *samurai*

<sup>4</sup> For their dismissive approach to the Marxist perspective see [16, pp. 373, 75, 79, 380].

<sup>5</sup> See Naotarō Sekiyama [54]. Implications of the early work are reviewed in Irene B. Taeuber [61, pp. 392–97].

<sup>6</sup> He also emphasizes and explains problems in Japanese historical demography which derive from Tokugawa population registers [57, pp. 130–34].

<sup>7</sup> "Forced" because, whatever the preconditioning, the Meiji Restoration was not a "take-off" in the Rostovian sense, since it witnessed *concomitant* (not prior) agricultural change, the importing and diffusing of new technology through relative backwardness rather than the Rostovian "application of science to industrial technology" (see Section II below), and was associated with an essential tension and purposiveness itself resulting from a profound internationalism. It follows that the Rostovian focus of several Tokugawa and Meiji historians is forced and, perhaps, misdirected.

incomes is based on quantitative research and serves to bolster the preconditioning perspective by reducing the level of *samurai* indebtedness as a cause of and *motif* for entrepreneurial activity, and by upgrading the continuity and progress of merchant achievement. As with other "rigorous" approaches the trend figures are in fact estimated from very small and highly selected numbers (e.g., his source group *hatamoto* represented only 6 per cent of all *samurai*) and his *explicit* conclusions are somewhat ambiguous in terms of their wider significance, especially as the author allows that rising wants outweighed any welfare effect of constant incomes [64]. With the monograph of Dr. Hauser on the Osaka cotton trade, "preconditions," "Modern Economic Growth" (M.E.G.), and revisionist interpretation are placed squarely as the focus of analysis. In this case the data base is more than reasonable; Osaka provides good sources, became the major market center of Western Japan, and cotton by-employment was a major industry, whilst in the Kinai region as such (three provinces) cotton was a principal commercial crop and a prime input into the national textile industries. As early as the 1600s, Osaka appeared as a relatively pampered, prosperous and pervasive merchant center, epitomizing the emerging relationships between merchants, *han*, and Tokugawa. However, in contrast to Yamamura, Hauser relies on *samurai* frustration, income loss and retrenchment in explaining the major trends in commercial Japan in the period 1720–1868. And again, despite its precise and intelligent formulations at the research level, Hauser's volume concludes in the essentially qualitative and ambiguous terms of much traditional history:

The process of economic and social change discussed above *contributed* to the Japanese *potential* for modern economic growth. When combined with education and literacy skills, it *incorporated* many of the elements which *coalesced* as the *foundation* for industrial development and the establishment of *modern* forms of social organization. To describe the modern experience of Japan as "miraculous"—a description which is still current in popular accounts—is to overlook the *realities* of the Japanese case. (my emphasis) [17, p. 190]

The most "rigorous"<sup>8</sup> attempt in terms of model building, statistical estimation, simulation and consequent theory construction belongs to the richer sources of the Meiji era itself. Kelley and Williamson, in contradistinction to Hall's formulation of 1968, consciously intend a rewriting of Meiji economic history [22] [23] [24] [25]. In their major work the authors attempt to "explain Japan's economic development during a critical phase in her history," i.e., the 1880s

<sup>8</sup> Rigor is elusive. A frequent mistake in social science is to consider or imply that assembling a system of *analytical* concepts is tantamount to possessing a theory in the *explanatory* meaning of that word. In fact, a concept such as "social class" or "capital" is only of use in generating *historical* explanations when it is both analytically sound and empirically verifiable. At the same time, a "theory" is a misnomer unless some degree of explanation is present. We come to explanatory theory by stages. With this argument a dictum of C. Wright Mills comes to mind: "The basic cause of grand theory is the initial choice of a level of thinking so general that its practitioners cannot logically get down to observation" [32, pp. 33–34].

to 1914. The basis of analysis is the L.T.E.S. figures of Ohkawa, Nakamura, Shinohara, Umemura, and others at Hitotsubashi University,<sup>9</sup> utilized in terms of a general equilibrium model tested against explicitly formulated counter-factuals. In summary:

We assign to the model initial conditions and parameters which are representative of the Meiji economy and then compare the "predicted" model performance with "actual" economic history. [24, p. 12]

Carefully distinguishing their approach from that of Fei and Ranis,<sup>10</sup> a veritable host of conclusions follow, two of which might be mentioned as representative. A prime claim is that it was "not so much labour-surplus conditions as the nature of technical change<sup>11</sup> in the Meiji period" which kept laborer's wages low, that determined the movement of factors and allowed the more capital-intensive developments of the 1920s and 1930s. A second and related conclusion is that agriculture performed positively within the period in spite of such constraints as a limited supply of land, a lag in fixed capital stock and a decline in the labor force because of *intermediate* inputs (explained through variable production functions in *both* sectors of the economy) of capital and technology which served to harness the literacy, health, improved traditional technology and social overhead capital formation of the Tokugawa heritage.

In terms of the Meiji Restoration as a period in Japan's economic history, the Kelley and Williamson approach contains several drawbacks. Although the authors admit that "growth theorists in their analysis of neo-classical models appear to be encountering diminishing returns, and only a confrontation with historical evidence can alleviate the situation," their "confrontation" is a severely managed affair. The simulation of the economy which they believe has reference to the "facts" is based on parameter values which are derived from a neo-classical model. At the same time, their factor productivity approach demands the assumption of constant returns to scale. Surely the term "confrontation" is a misnomer? Of more significance are the historical inadequacies of the approach. Kelley and Williamson start their analysis and thus derive their trend figures from the year 1887, which serves to deflate their growth rates in comparison to series which cover the years from 1868. Thus the Meiji becomes an "impressive" rather than an "unusual" case of development. The authors argue that they are

<sup>9</sup> See [44]. See also, for earlier usage [36] [37, pp. 358-61] [27] [43].

<sup>10</sup> See especially [24, pp. 32-34] [25, pp. 8-12]. The model is designed to incorporate variations in the intensity of use of factors, the nature of the specific technology employed as reflected in production parameters, and the rate and bias of technological change.

<sup>11</sup> Technology here being defined in neo-classical terms rather than in the way adopted in Section II below. Technological change occurs when the same amount of output can be produced using less of at least one of the incorporated (in the production function) factor inputs. If technical change is "neutral," both capital and labor are saved equally. This process is to be distinguished from economies of scale (even though these, indeed, may only be attained at some times through the utilization of new machinery or management techniques, i.e., the more common understanding of "technology"), where a doubling of all inputs more than doubles output. For a good brief account see J. A. Kregel [28, Chap. 3].

using the Kuznets case of M.E.G., that is, a period of sustained and rapid increase in per capita income alongside significant population growth, this associated with sectoral change, especially in industry, and an expansion of "international contacts." Yet the fact that at least three of the four elements were present in the years 1868–87 suggests that the authors are in fact choosing a base year on grounds of data availability. In addition, as this data availability is seen in the light of a neo-classical model, then the choice of a base year reflects selectivity on theoretical rather than historical grounds. So on Rosovsky's labelling of these years as "transitional" the period 1868–87 is dismissed from the analysis of development under Meiji, and the authors have found a fourth means whereby an historical period might be "undermined"; through systematic (?) sub-division. A second major historical problem lies in the use of the urban-rural dichotomy as the spatial basis of economic dualism. Time and time again this distinction is made<sup>12</sup> as part of a "multidimensional" definition of the dual economy: "...we shall specify a rural-agricultural and an urban-industrial sector" which they claim has unquestioned "empirical" justification. The fact that this distinction is employed at the level of both the production function and patterns of demand ensures that the dynamic, developmental and demographic role of by-employments is neglected. Though it may be true that a dualistic model based on a labor-land vis-à-vis a labor-capital distinction of the Fei and Ranis type takes no account of the variation of intensity in the use of factors or the rate of technical change, the Kelley-Williamson approach, chosen in favor of a capital goods-consumption goods dichotomy, ignores the developmental significance of one of the most dynamic structural tendencies of the later Tokugawa and earlier Meiji years. To dismiss by-employments as part of the "blurred areas" in the face of the work of Thomas C. Smith is careless to say the least. By-employments were at once rural or semi-rural industries, labor intensive but with variable capital inputs, associated with zero or near-zero population growth and depopulation of large urban areas, and directly linked to both a major industry and the emergent Kuznets-type "international contacts."<sup>13</sup>

Despite such omissions, the authors are forthright in their revisions. Thus on one of the most sensitive issues in Japanese economic history—the performance and developmental role of the "agricultural" sector—the authors conclude that a favorable performance (with growth rates of 2.0 to 2.2 per cent) was a direct result of increases in labor productivity, approximately half of which is to be explained in terms of the accumulation of purchased inputs from the industrial sector, i.e., *intermediate* goods. In addition, "the rate of total factor productivity growth in agriculture was unusually high and this impressive rate may be related to the underutilised technical potential bequeathed as a Tokugawa legacy." They go on to add that,

This rapid rate of T.F.P.G. in Meiji Japan agriculture clearly was influenced by

<sup>12</sup> See for example, [25, pp. 8, 11] [24, pp. 11, 24, 31].

<sup>13</sup> See particularly Smith [57] [56, pp. 687–715], neither of which are listed in the bibliography of Kelley and Williamson [24].

the "prerequisite" irrigation system inherited from the Tokugawa period... It appears that much of what is unique about Meiji agricultural development is the initial conditions over which the Meiji government had little control. To cite Meiji Japan as a "lesson of history" may be hazardous without appropriate qualifications regarding the unusually advantageous conditions confronting Japanese agriculture in the 1870s and 1880s. [24, pp. 193-96]

So despite the use of quite respectable growth figures from 1887, Kelley and Williamson join in agreement with the major argument of Nakamura that the original figures for agriculture used by Ohkawa et al., were artificially high, and the *role* of Japanese agriculture during Meiji was a reflection of its development during Tokugawa [35] [36]. Yet Nakamura's historical problem, of constructing an alternative series based on "real" yields calculated for tax purposes, and relating these tax figures to real *production*, still stands, despite the more recent L.T.E.S. estimates. On top of this, as Rosovsky has precisely argued, there are difficulties of analysis. Even given the adequacy of the L.T.E.S. series (which give growth rates a good deal higher than population growth) the Nakamura argument would require late Tokugawa Japan to be achieving rice yields per unit of planted area a large degree higher than *present* Malayan, Korean, and Taiwan yields, (i.e., 3.22 tons per hectare of paddy to 2.24, 2.75, and 2.93 respectively). In addition, Nakamura is asking the social historian to believe that, as Japanese income per head rose between the 1870s and 1880s not only did consumers retain their overall tastes in terms of types of food, handicraft and other commodities, but that, in particular, they retained a *constant propensity* to consume rice.<sup>14</sup>

## II

Although the air tingles with revisionism, what might be called in brief the Rostovian perspective has, if dominant, yet to claim its victory. What we are in fact left with is the finding that Japan did not have the demographic change and sustained rises in per capita income associated with the pre-industrial phase of growth in several (by *no means* all) Western nations, usually represented by the British case. A significant growth in by-employment, a frustrated social status and personal identity amongst active groups, a relaxation of government activity and institutional restraints and an underlying value system which was traditional rather than traditionalist in nature, were elements of buoyancy but were hardly representative of *sufficient* Rostovian preconditioning. Indeed, certain elements of dynamic "anti-conditioning" (?) may have been associated with such trends—by-employment development might well have been amongst the causes of population stagnancy and a positive reduction in the flow of migrants to towns, in turn associated with a process of de-urbanization and decline in the position of the urban classes, a reverse of the simple Western model. Smith will not admit to more than that, "despite everything, the economy is slowly expanding by virtue of a host of mouse-trap innovations, a positive investment rate and pro-

<sup>14</sup> See for example Y. Hayami and S. Yamada [18] and Henry Rosovsky [50, pp. 347-60].

gressive relaxation of government control over the economy" [57, p. 149]. There would, therefore, still appear to be room for believing in a discontinuity in the economic history of Japan associated with the Meiji Restoration.

In early 1825 the English provincial newspaper press delighted its readers by producing detailed accounts of the export of eighty h.p. steam engines to Moscow for use in powder manufacturing and mining. At that time, the English engineer Munro was conferring with the Russian authorities on the possibility of steam engine manufacturing in Russia using iron from Sweden [29, p. 262]. In 1863, five Japanese noblemen, one of whom was the Marquis Ito, journeyed to England to join Alexander Williamson's famous industrial chemistry laboratory: "They took back with them the seeds of Western scientific culture..." [21, pp. 2808-28]. Such items, although random, are far from irrelevant. From her intensive and justly famous work on medieval technology, Lynn T. White Jnr., has concluded that,

Discontinuity occurs when an item or set of items is borrowed from outside a culture and when that borrowing alters the whole style of the relevant activity in the recipient culture. [63]

At one point even Kelley and Williamson admit that the import of technology in Meiji could serve to "realize" the Tokugawa heritage and, later, that a definite "productivity gap" existed and was of historical significance. Thus they, somewhat qualitatively, join with the more traditional view. Perhaps its most important exposition is in the brilliant interpretative text by William Lockwood:

With the opening of the Meiji era there set in a feverish process of modernisation. Japan was now exposed to a rising tide of Western influence... Young Japanese by the score went abroad to study Western science and technology, political institutions and economic organisation... an eager, discerning acceptance of the West by the young *samurai* reformers... [30, pp. 12-13]

Thus we may be fairly confident that an examination of technology in Meiji provides some insight into the nature of discontinuity. When the "style" of production suffers mutation, the effect may not be immediately or totally evident in production statistics or growth curves. Following White, Meiji technology induced discontinuity in so far as (a) it affected industrial production during Meiji and (b) is only conceivable in terms of exogenous influences. Secondly, we may show that the overriding technical characteristics of Meiji are incomprehensible in terms of Tokugawa *science*. At the same time, it is quite possible that the diffusion of technical innovations,<sup>15</sup> *within* Japan was some function of the receptivity and buoyancy of the late-Tokugawa early-Meiji period. Discontinuity may thereby be finally visualized as a product of underlying social

<sup>15</sup> Innovations *per se* might embrace, as for instance in Schumpeter, progressive change in management techniques or the utilization of factors on the frontier of normal activity, e.g., new lands. In this section of the paper *technology* refers to innovations in the use of machinery and new sources of power and methods of processing, and incorporates such concepts as invention and innovation and diffusion.

characteristics, rather than as a necessary result of modernizing or preconditioning forces.

The diffusion of technology has been seen as analogous to that of the spread of an infection. Here, the *transmission* process is concerned chiefly with the methods of spread (of disease, between infected and non-infected: of technology, between creative center and receiver), whilst the *contagion* process concerns the rate of spread (of disease, within the body or infected population: of technology, within the national society). It might be suggested that the process of *transmission* is to some extent related to conditions obtaining and operating outside Japan (e.g., the international economy), and is therefore left for consideration in Section III of this paper. Contagion, to be centered on below, depends not only upon forces (a) receptive to (b) promotive of change, but also upon those forces (c) resistant to it, which themselves may be (1) dynamic, (2) existent barriers.<sup>16</sup> This latter consideration leads us back to the problem of preconditioning: Political barriers ([c] above) might have become weakened as an integral part of a preconditioning process, but this tells the historian far too little about the total nexus of contagion (which includes [a] and [b] above), i.e., in this case, the internal diffusion of new technology in Japan.

Yuasa is quite adamant in his emphasis on the foreign contribution: "The traditional society (feudalism) before the Meiji Restoration, namely the age of Edo or Tokugawa Shogunate, was based on pre-Newtonian science and technology, and on pre-Newtonian attitudes towards the physical world."<sup>17</sup> For Yuasa it was Perry who stimulated the technical innovations in shipping derived from the removal of the Shogunal ban on large ships (type [c] [1] above). By 1855, Western machinery and factory organization had been introduced at Nagasaki for the maintenance of warships, and a spurt of building began in 1860 under Dutch leadership. It was Englishmen who in 1867 constructed the first steam *powered* spinning plant, the Kagoshima Spinning Factory. Such models for diffusion—undeniable and prestigious—were soon multiplied. By 1882 the Osaka Spinning Company operated 16 mules, 10,500 spindles and was partially powered by steam.<sup>18</sup> From demonstrative effects it is easy to document the spread *within* industrial sectors of the foreign influence. In 1863 the Tokugawa government invited a group of Dutch technicians to Japan, headed by the famed engineer Karl Lehman. After consultation with the Japanese, the French government sent Francois L. Verny and many technicians who were responsible for the establishment of the Yokosuka Iron Foundry and a machine factory at Yokohama. Between 1866 and 1872 the Yokosuka yard had built over 10 steamships and repaired some 260 ships. From 1870 to 1873, 245 railway engineers arrived in Japan from Europe. In particular, the English engineer Edmund Morell constructed major lines between Tokyo and Yokohama, and

<sup>16</sup> This is a formulation somewhat different from that found in the relevant literature. See [31, pp. 741–66] [14, pp. 275–80] [13, pp. 409–415] [48, pp. 189–210].

<sup>17</sup> See [68, pp. 155–58], also [65] [46].

<sup>18</sup> T. Nakamura [38, pp. 294–319] gives an excellent summary of the activity in industry of the foreign element.

Osaka and Kobe: *Japanese* rail production began only in 1901. Telegraphic communication was also established by the British from 1871. In this area the spread of foreign influence was very rapid due to individual training programs; both George M. Gilbert and William E. Ayrton, distinguished electricians, undertook the direct training of Japanese. Similarly in mining: By 1884 twenty-four mining engineers and forty-five construction workers and mechanics had been engaged from abroad by government, and these were serviced in turn by foreign doctors, clerks, and marine experts. In the early years civil engineering was overwhelmingly foreign dominated, and Dutch and English engineers planned (i.e., surveyed and constructed) the bulk of Japanese canals, river embankments, harbors (e.g., Osaka), lighthouses, and irrigation systems. Many historians would see of most significance the role of the foreigner in the development of Japan's staple industry and export product, silk manufacturing and spinning. The first machine manufacture of silk was introduced by a Swedish engineer on Italian methods. Under the guidance of Paul Brunet and ten other French engineers, the model silk manufacturing at Tomioka became the most famous of all. More clearly tied to foreign science was the chemical industry, at the same time the one most "simple and home-based" in the pre-Meiji period. Porcelain, earthenware, glass, brewing (sake, soy sauce, and later, beer), sugar, gunpowder, and cement manufacture were dominated by foreign knowledge and machinery.

Such a descriptive list could be extended almost indefinitely. But the impact of such notably "discontinuous" achievement was felt at least in part through what might be termed the "servicing" elements embodied in the more immediate foreign impact. These were of several types and operated at different levels, perhaps the most diffusive being the work of foreign *teachers* of new technologies. For example, the School of Engineering, founded in 1871 as an offshoot of the Ministry of Works, was *completely* serviced by foreigners, thirty-two in number. With the exception of industrial art, all were British.<sup>19</sup> Similarly, the Tokyo Agricultural School, (later the College of Agriculture in the Imperial University) was foreign dominated, this time by Germany. A second level of foreign servicing of new technology was represented by the continuity and long-period employment of foreigners as *technicians* and applied scientists or general advisors. Verny could only have an impact at the Yokosuka yard through the long-period employment of over forty-five French technicians. As early as 1871 at least 378 foreigners were employed in similar capacities. One Japanese publication cites 1392 as the number of foreigners employed by Japanese industry and government between 1860 and 1912, at least 900 of whom were invited. Of interest in terms of the location of discontinuity is the fact that the largest number of technicians arrived in the early years 1868-89 with the peak occurring in 1871-82. According to one calculation, the average stay of distinguished experts

<sup>19</sup> Amongst them were Henry Dyer (1848-1918, dean and professor of mechanics), W.E. Ayrton (1847-1908, professor of physics), Edward Divers (1837-1912, professor of chemistry), John Milne (1850-1913, professor of geology and mining), Josiah Condor (1852-1920, professor of building construction).

was just over four years. Another level of servicing—surely the most infamous—was that of the “European journey” made by many young Japanese officials and businessmen during the early Meiji years. In addition scientific and technical works in Western languages were published in Japan at a highly increasing rate from the 1880s onwards. Lastly, through personnel or ideas (normally both), foreigners dominated the major scientific-cum-technical associations formed for the diffusion of knowledge, from the Tokyo Academy itself, through to the Engineering Society of 1879 to the Electrical Society of 1888.<sup>20</sup> Such associational influence and diffusion was accelerated by the contemporary unification of technical terminology in dictionaries and texts.

A systematic approach towards the assessment of such influences has recently been attempted by Ryōshin Minami, a member of the L.T.E.S. research team [33] [34, pp. 935–58]. Starting with a total factor productivity approach, it is possible to make a limited calculation as to the role of technological progress in Japanese industry. Minami suggests that “the rapid growth of Japanese manufacturing, compared with that of other countries, was largely dependent on rapid technological progress... as a latecomer Japan had the advantage of exploiting modern technologies developed in advanced countries” [34, p. 358]. With total horse-power as H, and gross value in manufacturing and mining as O and K representing capital stock, a rise in the rate of H/O was significant in the years 1905–11 and this may be estimated to result from a rise in H/K as K/O declined. Power capacity was most successfully increased in heavy industries (metals, machinery, and chemicals), precisely those where the foreign technical influence was so obvious. Thus the annual rate of growth in total horse-power for 1891–1937 was in the order of 13 per cent, whilst that of the three heavy industries rose as 21 per cent, 16 per cent, and 16 per cent respectively. Throughout industry steam engines and steam turbines (87 per cent) easily exceeded water power (13 per cent) by 1890, with an even speedier diffusion of electrical motors in the 1900–1919 period. As early as 1909 electric power provided 40 per cent of the total in machinery, 40 per cent in printing and building, 16 per cent in metals and 10 per cent in chemical industries. Minami emphasizes the relative speed of the contagion in Japan [34, p. 945]. This fits well with three generalizations derivable from diffusion theory. Firstly, acceptance of an innovation tends to be quickest for techniques requiring small outlays initially, an effect especially applicable to electrification in Japan’s prevalent small plants. Secondly, it would appear that the *results* of the application of a given innovation should reach a visible and minimum degree of success before the process of spread might be expected to accelerate or reach high levels. In the case of power technology such results of the use in *other nations* were perfectly perceptible. Finally conditions for diffusion within a nation are improved when the communicators (i.e., those pressing for the new technique) possess *prestige*. This was indisputably the case

<sup>20</sup> A list of such societies would include the Tokyo Academy (1879), mathematical (1877), medical (1877), chemical (1878), geological (1879), engineering (1879), seismological (1880), botanical (1882), physical (1884), anthropological (1884), mining (1885), veterinary (1885), architectural (1886), agricultural (1887), zoological (1888), and electrical (1888).

in those several instances of government involvement in the institution of modern-power operated industrial plants. Relationships of this sort assist in the explanation of the "discontinuity" effect of technology in Japan. At the same time, so too do elements existing within the pre-Meiji period. As Richard Hills has recently shown, animal power was an immensely important source of power in English spinning prior to the steam engine [20, p. 89]. In Japan the use of animals was quite exceptional in power generation.

However, such relationships do *not* adequately explain the process of *adaptation* associated with Japanese borrowing, which was also a function of "servicing" instruments and internal socioeconomic factors. As Rosenberg has pointed out, technical change is perhaps most frequently a stream of "innumerable minor adjustments, modifications and adaptations," rather than Schumpeterian leaps and bounds [48, pp. 166-67]. In the Japanese case one can visualize *significant initial modifications* at the point where, let us say, a technique passes from one economic "frame of reference" to the Japanese, this followed by a series of smaller improvements and adaptations to conditions in particular organizations, geographic areas and so on.<sup>21</sup> Such latter conditions may be both social and economic. It is at this point that such constraints as factor endowments become operative in understanding diffusion within a nation such as Japan and also in assessing the "type" of technology that will be appropriated in the initial phase. The ease with which the first large adaptation takes place will be then some function of the appropriateness of the original technology concerned. Therefore, less-than-best-practice-techniques were utilized in the Japanese silk industries, and their presence helps to explain, as Minami suggests, the rapid diffusion of "modern" technology into Japan. Thus co-existence, competition and dualism were all present in the Meiji technological mix.<sup>22</sup>

Yuasa has elsewhere acknowledged the social location of science as a determinant of its nature and development:

All scientific activity has an intimate and essential relationship to the view of nature by which man regards the physical world surrounding him, and also with the sense of values by which he evaluates certain human operations within the pattern of man's social activity. [66, p. 188]

This leads us to some brief consideration of the fundamentals of Japanese science prior to and during the Meiji period. Was pre-Meiji society and scientific culture

<sup>21</sup> An example of a "significant initial modification" might be, say, the substitution of human for steam power in the modern imported cylinder presses (during the years 1874-79) of such newspapers as the *Osaka Mainichi*. See [59] [34, p. 951]. Other examples might be the substitution of wood for iron in reeling machinery, and water power for steam power in silk reeling plants.

<sup>22</sup> Such considerations illustrate the inadequacy of too rigid an interpretation of the "infection" model. A germ or virus, the subject of transmission etc., is an *unchanged* unit with a *uniform* impact—in contrast, "a technology" might be transformed almost beyond recognition yet still be notionally (or legally, e.g., as documented in a patent description) *one* innovation, i.e., object/subject of transmission.

such that a technical floor of the sort laid down during Meiji could have been created from internal cultural resources?

Secondly, was the science of Meiji characteristically Japanese? Negative answers to questions such as these would serve to stress the discontinuity effected by the Restoration.

The German physician Erwin Baelz, addressing the members of faculty at Tokyo Imperial University in 1901 chose the occasion to criticize the Japanese for their tendency to seek the "latest acquisitions of science, instead of studying the spirit which made the acquisitions possible" [2, pp. 149-50]. The claim represents one instance in the continuing debate as to the so-called *epiphenomenality* of Japanese science. For our purposes, an epiphenomenal cultural form is one either unrelated to underlying social values or, approaching the problem from the other end, one determined by forces exogenous to the social system.<sup>23</sup> Despite the fact that those who argue this case for Japan are often drawn into the declamation that specific social values and institutions associated with the development of science in the West are necessary and sufficient conditions for its growth elsewhere (a generalization disprovable on at least two counts), there would appear to be a strong argument in favor of the peripheral nature of science in Japanese society prior to industrialization. It might be possible to fasten upon specific practices representative of value patterns which were antagonistic to the growth of science or acted as barriers to its diffusion. Thus the traditional natural philosophy of Chinese origin, namely the doctrines of *yin-yang* ("positive-negative") and *wu-hsing* ("five elements") were applied freely to interpret any natural phenomenon by Japanese intellectuals, and might be argued integral to their "value orientations."<sup>24</sup> The danger of the approach is that the analyst then begins to argue that Japanese value orientations (assuming that such Parsonian building blocks can indeed be located empirically) were generally and systematically other than those of the West. At the same time, the replacement or destruction of such values by alternatives dominant during industrialization and science-technical diffusion would be illustrative of both the non-scientific "style" of the pre-Meiji society, and of its ability to *respond* to new influences from outside. A principal problem of interpretation lies in the

<sup>23</sup> Social values define the main directions of social action without reference to specific goals, and are the fundamentals of the Parsonian action system: See Talcott Parsons [45, p. 171]. As with much functionalist theory, and a basic problem in this sort of historical work, values may not be identified *directly*, but "can only be inferred from attitudes, as only attitudes are fully detectable" [12, pp. 46-47]. But just as a general statement may not be entirely verifiable through proving one hypothesis, so too the proper identification of a value requires the construction of systematic attitude scales. Unfortunately, this procedure is rarely possible for the historian. Once science is seen to have a characteristic social profile then its development may be interpreted in terms of social forces. See Norman Storer [60].

<sup>24</sup> Against these negative elements, the Japanese appear to have had no deeply rooted belief in the impossibility of cognizance of the fundamental laws of nature, and this contrasts with the Chinese case. In addition, the Japanese value system seems to have been traditional rather than traditionalist (following Edward Shils and Marion J. Levy), i.e., to have been an historical construct rather than as in the Chinese instance a system of ideal values impossible to penetrate without wholesale social disorder.

lack of research on this area of Japanese history, a shortcoming often lamented by such commentators as Yuasa [66, p. 189].

For the period prior to 1868 it is possible to identify several trends. The lowering of institutional barriers (types [c] [1] and [c] [2] above) might be traced to 1720 when the eighth *shogun*, Yoshimune Tokugawa allowed the import of foreign books on science and technology more freely. The resultant *rangaku-sha* has been seen as a "hormone" (force [b] above) which stimulated a revolution in Japanese science [67, pp. 137-58]. If the Dutch scholars are regarded as "transitional," then on the basis of a sample of 1,740 scientists, Yuasa has documented the years 1841-45 as the transition point ("the age of transference"), from which time modern or "new Western type scientists" outnumbered, outmoded and dominated those of a traditional<sup>25</sup> or Dutch-period type. Without hesitation Yuasa goes on to clarify that this represents the "establishment of modern science in Japan" [67, pp. 143]. So, from the time of the Dutch influence to Meiji any advances (although we should except Asada's independent discovery of Kepler's third law and seismology as proving the rule) that were made in Japan's science were not unrelated to foreign influence or teaching. Chemistry, a science closely related to the newer technology of the later nineteenth century, was highly sensitized to foreign influence. In 1837, Yōan Udagawa published his seminal *Principles of Chemistry* which incorporated most Western findings through reference to more than thirty Dutch books on chemistry, including the Dutch edition of Lavoisier. From about that time forward, Japanese chemistry was Western chemistry. As Minoru Tanaka has put it: "The considerably successful and rapid transference of basic knowledges and conceptions of chemistry in Japan took place about thirty years before the downfall of the feudalist regime" [62, pp. 107-10]. On the other hand, as emphasized by Yuasa, "a hundred years ago, modern chemical industry was practically non-existent in Japan" [66, p. 187]. So, prior to 1868, however disruptive of traditional knowledge or values the foreign scientific influence may have been, the effect on industrial production was yet minimal. Moreover, science in Japan, with its *hiden* tradition, was of and for the very few, who as an intellectual elite possessed little in the way of associations or other mechanisms for the further diffusion of knowledge within the nation: transmission had taken place but contagion was lacking.

An examination of science within the Meiji years illustrates the institutionalization of the "contagion" phase of the diffusion of knowledge basic to a higher technology. Such prestigious scientific centers as Tokyo University were dominated by foreign scientists.<sup>26</sup> From an examination of major institutions Kinno-suke Ogura has concluded that the scientific history of early Meiji Japan is synonymous with the chronicle of the transplantation of English and American science. This outlook is furthered when the science associations are considered—even the Seismological Society of 1880 was dominated by an Englishman, J.

<sup>25</sup> Traditional here embracing such groups as the *wasan-ka* ("mathematics"), *honzō-ka* ("herbalists"), and *kampō-i* ("physicians").

<sup>26</sup> For example, Edward S. Morse (American biologist), Edmund Naumann (German geologist), Curt Netto (German metallurgist).

Milne, who was also professor of geology and mining in the College of Engineering from 1875 to 1895. Although the modern scientific seismograph was invented in Japan, its inventors were professors Ewing and Gray, leading activists in the early years of the Seismological Society. At the creative frontier, foreigners were the focus of activity. A recent paper by James Bartholomew has argued that even bacteriology (an area in which it has always been generally acknowledged that decisive work was accomplished by the Japanese) was subject to foreign leadership: The eminent bacteriologist Shibasaburō Kitazato (1853–1931), trained in Germany, whilst the first chair in the subject at Tokyo went to Masanori Ogata who had similarly studied at Pettenkofier's Hygiene Institute in Munich and at the Pathology Institute in Berlin. Furthermore Bartholomew stresses that the pre-Meiji developments in this area were almost negligible and that the science's emergence as an "organised social activity in Japan" was *dependent* upon government sponsorship and direction [3, pp. 109–55]. The career of such a leading figure as Kitazato could not be explained other than in terms of government financing and German training [5, pp. 138–40]. In this manner Meiji bacteriology, a most successful "Japanese" science provides historical evidence similar to that found in other fields by such writers as Craig [6, pp. 149–51] and Nakayama [40, pp. 226–31].

Japan would seem to exemplify one principal finding of diffusion studies; that the movement of technology across national borders was faster than its diffusion within national boundaries.<sup>27</sup> At the same time and of great importance, the notion of "first contact" leading to the first stage of diffusion suggests a homogeneity in technology which might be contradicted by the Japanese example. In the Japanese case the "first case" of diffusion was often associated with and inseparable from creative inventions which were not simply innovations from the creative center: That is, the receiver could not have developed the intruding technologies, but the diffusion of the latter was some function of the adaptability of the receiver and was equivalent to dynamic processes of technological *adaptation* and not *adoption* as in the simple transmission—contagion analogy. Much of such adaptation would be independent of modern scientific knowledge. Where modern science was the basis of first contact and industrial activity, e.g., the chemical industry, some metallurgy, and textile processing etc., science became a *service*, and in the Japanese case was fundamentally foreign in terms of both an existing bank of knowledge and also in terms of institutional (service-diffusion) arrangements. So, the responsiveness of social values to outside science,<sup>28</sup> together with the forces encouraging the adaptation of new technology were decisive in creating a discontinuity in Japanese economic and social history. Conditioning rather than preconditioning was of the essence.

The *transmission* of technology encompasses at least three processes. The

<sup>27</sup> See J. J. Murphy's paper in [58].

<sup>28</sup> That is, rather than (a) evidence of friction (existent barriers [c] [2]), or (b) dynamic forces antagonistic to intruding technology (barrier type [c] [1]), or (c) the substitution of new for underlying traditional values, the Japanese case might be one of absorption. For the general argument see [39].

first is the export of a technology from the "creative centers" and the forces behind this. The second concerns the mechanisms existing or forged which serve to "carry" the technology. Thirdly the import of the technology (i.e., initial contact; F. H. Trevithick's locomotives and the Kagoshima Spinning Plant) to the receiver involves forces both external and internal to that receiver. It follows that an examination of the transfer of industrial technology to Japan requires acknowledgement of the nation's location in the international economy and its position of relative economic backwardness.

### III

The historian who accepts that latecomers on the development scene, (those relatively backward economies such as Germany, Italy, Russia, and Japan) followed very different *paths* and sequences than did earlier developers, is at some point surely directed towards technology and technological diffusion as possible causes of the resultant pattern of differences. One long quotation from a brilliant essay by Rosenberg serves to drive the point home:

The most important reason why poor countries may *not* have to tread the same path as their industrial predecessors is precisely that industrial countries have already done so. One of the advantages of not taking the lead in economic development is that, once an objective has been reached and clearly demarcated, other and easier routes to attain that objective may become obvious. Or, to put the point a little differently, there is no reason to believe that the optimal path in the development of a new technology is the same as the optimal path for transferring and adapting that technology, once it has been developed. In fact, I want to insist on this point. Economic growth has never been a process of mere replication. (my emphasis) [48, p. 152]

When to this argument—that latecomers are able to adopt best-practice techniques which deflect their pattern of development away from that "normal" in earlier starters—we add one derived from diffusion studies—that is, that technology in this period moved over frontiers more quickly than within them—then it follows that Japan experienced a significant discontinuity *relative* to that of nations which attained industrial revolution at an earlier stage. The approach is strengthened if we also admit that technical advance (not necessarily *diffusion*) within creative centers was particularly obvious in this period contemporaneous with the growing "roundaboutness" of production structures in nations such as Great Britain. Not only was the industrialization of Meiji a discontinuity in terms of the characteristics of Tokugawa, it was also a discontinuity in terms of the industrial history of other nations.

For this and many other reasons it is appropriate to think of the Japanese experience as constituting a "special case." But the question then becomes, How special? Many of the earlier economic and social historians stressed the *uniqueness* of Japanese history—in terms of consumption patterns, savings propensities, dualism of economy and society, employment and work ethics, economic ideology (e.g., as incorporated in *shingaku*), the political structure and

so on. The development economist has seen Japan as a *type* of case, the typology deriving from models of development processes, e.g., labor surplus, staple led etc. The modern economic historians have tended to stress the generality of the lessons to be learnt from Japan. Thus Kelley and Williamson attempt the enhancement of their researches with the generalization that, "the history of currently advanced economies must...still constitute the *primary* means of understanding development problems" (my emphasis) [24, p. 3]. From which one might legitimately infer that Japan has demonstrated both a general and *realizable* style of development. Indeed, the two authors throughout their work see Japan as a relevant model for securing solutions to such universal problems of development in the contemporary world as the role of agriculture in industry, the significance of dualism and the place of economic institutions. We are now in a position to not only question all of these perspectives, but to replace them with an historically reasonable alternative: Japan is a "case study" *generalizable* to the extent of explaining a process of development in conditions of relative economic backwardness within an international economic system of the late-nineteenth century type. Japan is by no means unique, but nor is it representative of a universal development pattern. The location of Japanese history within a systematic "pattern of differences" may be determined through an extension of the approach to European industrialization associated with the work of Professor Alexander Gerschenkron. Gerschenkron has suffered repeated, almost consistent misinterpretation.<sup>29</sup> His essential insight is represented by an extension of the relationships outlined by Rosenberg in the quotation above. Centering upon *industrialization* rather than development (which, to his credit, he does not equate), Gerschenkron has argued that latecomers to industrialization experience tensions when *confronted* with the recognition of relative economic backwardness—few historians would deny the traumatic effect of Perry. The necessary but perhaps not sufficient link required to bring a nation into the Gerschenkronian schema would seem to be the "essential tension" thus generated which sets up a pattern of responses as those in position to manipulate the economy are aware of the contrast between their actual economic position and their potential economic power. Quite reasonably, the schema of resulting patterns has been deliberately limited to the industrialization of later nineteenth century Europe, (in particular to Germany, Russia, Italy, Austria, and Bulgaria).<sup>30</sup>

<sup>29</sup> For example, see a reply to E. H. Carr by Alexander Gerschenkron [9, Lecture 4], Elizabeth Beyerley [4, pp. 203, 222, 240–46, 272, 275], and the reply by Gerschenkron [11, pp. 108–23] (The defects of this study are irremediable!). For a fine example of critical debate and clarification see the end notes for Gerschenkron and Rostow confrontations in W. W. Rostow [53]. For a very rare book which uses the schema as the backbone of interpretation for empirical studies, see Tom Kemp [26]. As Rosenberg has shown that the rate of technological change "was completely inseparable from these capital goods firms" [48, p. 152], it is worth noting that Kemp emphasizes that "it can be said that in the experience of the latecomers the capital goods industries played a more important role in the industrialization process than they had done at a comparable stage in British experience" [26, p. 25].

<sup>30</sup> See essays 1, 2, 4, 6 and 8, together with the much-used "postscript" of Gerschenkron [8]. And see also his [10].

But given the hypothesis that—assuming contact, which in the Japanese case is sensible—the more relatively backward a country is, the more there is likely to exist “tension,” there would appear to be no a priori reason why the Japanese case should be excluded; Japan was no area of recent settlement, possessed a political structure whose very dynamic was a close reflection of a response to outside economic forces, and benefited from both Gerschenkronian and Rosenbergian “follower” characteristics, i.e., that a relatively backward nation’s pattern of industrialization, its rate and structure, might be expected to be systematically other than that of early starters through dynamic, institutionalized and *purposive* “substitutions” for the products of pre-industrial preconditioning. For Gerschenkron, the pre-industrial history of a relatively backward nation is far less rich and exciting than that so often cited for Great Britain. On the other hand, the period of industrialization of the relatively backward nation is replete with institutional responses as the nation responds to its now recognized position in the political economy of nations. Without forgetting that the “take-off” and the “industrial spurt” are quite distinct, it may be seen that Gerschenkron’s approach to initial industrialization is somewhat at odds with that of Rostow.

When Thomas C. Smith emphasizes the small scale of production unit and describes the role of government and banks as “modest and mostly indirect,” he too readily dismisses Meiji industrialization as uncharacteristic of development under conditions of relative backwardness [57, pp. 156–60]—“modest” has to be measured in some way, and if the historian’s measuring rod is France, England or even Germany, such judgement is questionable. Even Rostow admits that from 1880 the Japanese case “was built on railways, on shipbuilding, on cotton manufacture. . . on silk cultivation and manufacture, on coal and pig-iron, and then, in the 1890s, on a surge of military outlays, that helped to build up the engineering industries” [52, p. 64]. Certain fundamental elements of the industrial drive under relatively backward conditions are thus applicable—politico-social tension and reaction, the speed of growth of industry, the *relatively* large role for banks, the innovative significance of government (not necessarily reflected in investment only), and the disproportionate size of the capital goods industries and heavy industry generally.

It is true that the years from 1868 to the early 1880s were based on the spread of a silk-industries staple. This brings us to the consideration of themes first expressed in Section II above. Possibly *the* important role of an imported technology under backwardness in the Gerschenkron framework is to lift the technical base *towards* best-practice techniques in earlier starters; but there is no necessity to suppose *replication*. The nature of imported technologies would be determined by some nexus of (a) factor constraints, (b) availability and initial cost, and (c) the technological lag resulting from relative backwardness. The important point is that discontinuity should occur. It is not necessary that imported technology be in the first instance (contact point) capital-intensive and best practice in *early starter* terms. And from the 1880s the fuller Gerschenkron patterning *does* prove itself in Japan. In addition, Smith has argued that the prime reason for the non-Gerschenkronian nature of initial technologies was social, i.e., that contrary to the Gerschenkron position of a significant

absence of skilled and socially malleable labor, Japan indeed possessed a skilled and receptive labor force sufficient to mount—perhaps promote?—labor-intensive industrialization. Of course, this argument makes some sense, but does not consider, (a) the economic movements after 1880, (b) factor endowments as such, (c) *conditions* for adoption and adaptation. It should also be noted that if pre-industrial Tokugawa values (e.g., paternalism in Smith's treatment) were essential to the working of this labor-surplus industrialization, then this serves to further (see Section II) emphasize the role of basic traits carried over from Tokugawa, rather than dynamic processes of preconditioning during Tokugawa. We are then dealing with a Gerschenkronian type of *responsiveness* to relative backwardness, the vital element in the approach. Gerschenkron has at all times emphasized that the exact demonstration of the relatively backward pattern in a particular nation is dependent upon a range of existent *conditions* in the "influenced" nation: There has never been the theory that all such nations reacted in precisely the same manner to identical external influences.

The unresolved doubts of Henry Rosovsky, a former student of Gerschenkron, are of a similar kind to those of Smith and Tsuru.<sup>31</sup> In the well-known Chapter 4 of his *Capital Formation in Japan*, Rosovsky stresses particularly the inappropriateness of the relative backwardness approach to Japan in the area of technical borrowing. Although the great speed of the industrialization process is emphasized and the discontinuity with Tokugawa is often noted [49, p. 90], the equation of "most modern and efficient techniques" with capital intensity and the technology of iron and steel encourages a delimitation of the internationalist approach. Besides once more underplaying the tendencies of the 1880s onwards, the approach does not allow the essential point that imported technology was a discontinuity in so far as it was not a product of national resources. At the same time, the use of electrical power and the development of electrical industries, for instance, is by no means associated with initial heavy capital investment. Surely a relatively backward economy will adapt the most modern technology available as far as this accords with the economic and social conditions within which aspiring leaders are forced to operate? Given that tariff protection was not allowed the Japanese at this time the most reasonable industrial development was one which stimulated an absorption of higher technology and promoted maximum comparative advantage on international markets.

#### IV

"The past is a foreign country. They do things differently there."

[L.P. Hartley, *The Go Between*]

All too generally, the paper has suggested that a case may be made out for an industrial revolution in Japan as an historical discontinuity the extent of which was some function of the working of forces exogenous to the nation. The term "some function" is, of course, the essence of ambiguity. But it has also been

<sup>31</sup> See [49], and the chapter on Japan by Shigeto Tsuru in Rostow [53].

argued that the receptivity of the Meiji society and economy to external forces might have been of more significance in explaining the timing and patterning of the economic history of the post-1868 years than is the alternative "pre-conditioning" approach.

The imminent interests of the economic historian concerned with the Japanese past might not be those of neo-classical economic theory. If history "is a jade who periodically renews her vigour by marrying oncoming youths" (N.S.B. Gras) then, in Postan's terms, the jade somehow gave birth to the "mule" of economic history. But this early and somewhat dubious relationship was not that of history and theory, but rather that which had been established from the seventeenth century between history and economy-as-subject-matter. But by 1938 Chester Wright was willing to describe the task of economic history as the "fructification of economic theory." This change in aim and perspective is itself worth a full study, and there can be little doubt that historians concerned with the Japanese economy have been, over a long period, influenced by such alternations in the perspectives of the wider academic community within which they work. In our present context, the general point may not be pursued at length. What might be said is that it is precisely such wide perspectives which determine the methods of the economic historian, proscribe and prescribe his or her set of problems, and legitimize his or her data selection. A fundamental problem in assessing Meiji industrialization lies in the selection of a somehow significant data base.

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