RATIONALIZING INTRA-INDUSTRY WAGE DIFFERENTIALS: AN ANALYTICAL FRAMEWORK*

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This paper takes up the problem of intra-industry wage differentials by the size of the firm, and presents an analytical framework for investigating the issue. It has been correctly pointed out that there are three strategic factors in the study of employment mechanism:[1] (a) supply of labor, (b) capital accumulation, and (c) technological advance.[2] These factors, especially the first and the third, are inseparable from our framework. Moreover, it will be seen that, while Japanese labor markets are distinct in various ways from those in the United States, the identical framework is useful for both economies. A brief description of the basic nature of the problem is given first (Section I), followed by discussions on the changing patterns of the demand for skills (Section II), the elasticities of the supplies of labor (Section III), and the effect of industrial technology on the structure of the labor markets (Section IV).

I. *Economic Significance of Wage Differentials*

(*a*) *Wage Differentials and Market Forces*

It is postulated throughout the present discussion that individual buyers of labor services will attempt to minimize cost and that sellers to maximize satisfaction in their work life. Further, we shall contend as our basic assumption that competitive forces are operating in the labor markets. If a worker is free to move and his service is completely homogeneous to others', then it follows that wage differentials of any kind will be wiped out, after allowing for an appropriate time lag. Moreover, the differentials *tend to* disappear (if not completely) without the mobility of labor if (1) substitution of products takes place between high-wage

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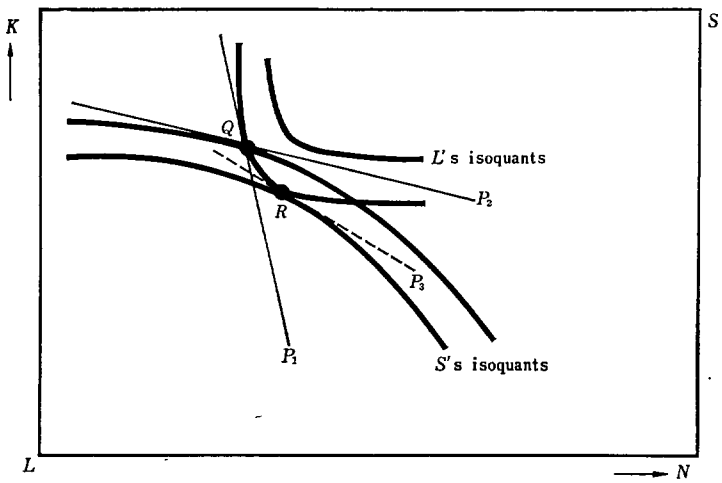
[1] By "employment mechanism" I mean both the behavioral and structural characteristics of the labor market.

[2] K. Ohkawa [33], p. 21.

and low-wage industries (firms, locations, etc.), and/or (2) capital is completely free to move from one place to another. Be that as it may, the working of competitive market forces with no institutional disturbance should in any event suffice to eliminate the raison d'être of differentials in remunerations for homogeneous labor services.

From this standpoint, one can assert that the existence of wage differentials (in whatever way measured) indicates a disequilibrium in the market. We may perhaps illustrate this point by referring to the following diagram which uses as an example the highly controversial intra-industry wage differentials between "large" (L) and "small" (S) firms.[3] The familiar Edgeworth-Bowley box diagram is displayed with two sets of isoquants, one for each L and S. For the sake of exposition, we are assuming that the manufacturing sector of the economy

FIG. 1



consists only of L and S, and that both inputs ——capital (K; measured vertically) and labor (N; measured horizontally)——are totally employed in so far as they are made available to the sector. The isoquants for L are drawn with greater curvature so as to indicate the relatively high complementarity between the inputs as well as the narrow margin of technological choices open to such firms. This corresponds presumably to the condition of a "follower" country in economic development which finds it beneficial and economical to adopt the large-scale production processes developed elsewhere.[4]

At point Q, the firms L and S face different relative factor-price ratios, as shown by the price lines p_1 and p_2. Now, by shifting the allocation of resources from Q to R, we have the uniform factor-price ratio p_3. The total product of the economy is obviously larger at point R than at Q. Hence, R is unequivocally "superior" to Q. Moreover, the former (R) is

[3] For a description of the intra-industry wage differentials in the Japanese economy, see, e. g., K. Ohkawa [32].

[4] This, incidentally, fits nicely with the model of which Eckaus [4] is thinking. See also Johansen [17], p. 158.

uniquely determined, given the isoquants (production functions) and the total quantities of inputs K and N. It is in this sense that we call wage differentials at Q, associated with homogeneous labor, a sign of "disequilibrium;" for Q is obviously not the "best" position one can attain.[5] Here again the notion of equilibrium is closely tied with that of maximizing behavior.[6]

Everyone will admit, however, that labor is far from homogeneous. In fact, the heterogeneity of labor service has never failed to be recognized since Adam Smith as the principal cause for occupational wage differentials.[7] This contention is probably one of the least disputable in the entire field of economics. From the theoretical point of view, heterogeneity in labor may be classified into two categories: (1) intrinsic differences due to natural ability or inclination and, (2) acquired skills through training. Wage differentials strictly ascribable to the former can be explained by the Ricardian doctrine of differential rent. In contrast, the differentials of the second category arise from investment in human development in the form of general education, apprenticeship, on-the-job training and the like. Obviously these two sources of occupational skill differentials may not be operationally separable, and we may be forced to ignore the distinction entirely. Of course if the labor market were functioning with perfect foresight and information concerning the unknown potential abilities of human resources, investment in human beings would be allocated in such a way that the gain (say in terms of the present value of net returns)[8] would be optimum. That is, the criterion of "the right man in the right place" would then be realized in the sense that the allocation of talents and skills would be the most efficient for the economy. Clearly, wage differentials in this context cannot be identified with disequilibria. On the contrary, they are the essential tool of the *invisible hand* by which the most efficient allocation of diversified labor service is achieved.

We take note here of the obvious implication of the elementary discussion outlined above: the observed wage differentials may safely be taken as the index of skill differentials (evaluated by the market mechanism), *only when the markets are in equilibrium* at which time the method of comparative statics is fully justified. In dealing with day-to-day observations we have, of course, no assurance that such is actually the case. The dual implications of wage differentials discussed so far create a serious difficulty in devising a test for checking whether markets are in equilibrium or not. The consideration itself is necessary, however, to emphasize the importance of making a distinction between long- and short-run analysis. In a longer span of time the competitive mechanism is likely to function more effectively, and any disturbing elements working against it will be influenced increasingly by random instead of systematic factors.[9]

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[5] We may note that the converse of this argument does not necessarily hold. That is, the absence of wage differentials does not necessarily guarantee the best allocation of resources and the highest level of output *unless perfect competition prevails everywhere.*

[6] P. A. Samuelson [45], p. 5.

[7] Adam Smith [48], Pt. I, Ch. 10.

[8] The elegant masterpieces by Gary Becker [1, 2] employ the internal rate of return as the criterion for investment in human capital. Admittedly, this approach simplifies algebraic manipulations and is convenient for expository purposes. However, the usefulness of the criterion may be questioned for it could lead to incorrect results. The criterion of present value seems, at least in theory, preferrable. See Radner [40], Ch. III.

[9] See Ulman [54] and Reder [41]. Reder's paper is superb in developing the "competitive hypothesis" in referece to the labor market.

(*b*) *Taxonomy of Wage Differentials*

Several kinds of wage differentials have appeared in the literature: (1) occupational, (2) sexual, (3) geographical, (4) industrial, and (5) inter-plant. Upon closer examination, only the first two and part of the third are theoretically meaningful. This is because, given competitive forces in operation for a sufficiently long period, the last two will be entirely ascribable to skill-mix and locational factors.[10] In other words, both (4) and (5) may be dissolved into the captions of (1), (2) and (3). Thus it is hollow to speak as if there were such things as "pure" industrial or "pure" inter-plant wage differentials. By contrast, economic theory indicates that (1) and (2) are the necessary consequences of the demand-supply conditions in the markets. Moreover, it is meaningful to discuss "pure" geographical differentials since economic information is scarce and the physical transfer of labor involves economic sacrifices.[11]

Empirically, however, the issue is far from conclusive. Concerning industrial wage differentials (4), the evidence is not sufficient either to accept or to reject the competitive hypothesis.[12] Part of the reason for this inconclusiveness lies in the inherent difficulty of applying the method of comparative statics to an economy which is in the midst of dynamic changes.[13] By the same token, inter-plant or intra-industry wage differentials have been thus far hotly disputed with relation to the Japanese economy without bringing much light to the subject. Statistical data indicate that substantial differentials remain unexplained even after making due allowances for the above forms of wage differentiation. The question of interest is why this should be the case.

In the following we shall discuss some aspects of economic development which, we believe, are pertinent to the phenomenon of intra-industry wage differentials. At the succeeding stages of the research, effort will be made to state our hypotheses in empirically testable forms. Our basic approach will be to try to bring down the intra-industry wage differentials to the theoretically meaningful level of skill differentials. The basic difficulty of analyzing wage differentials is that it is extremely hard to obtain an independent index of human skill levels.[14] We are soon faced with the tautology that the best indicators of the skill (or quality) differentials are wage differentials themselves. Even an interview survey will not improve the situation very much; employers themselves *do not know* of such an independent measure! Any fruitful empirical research on this topic will therefore depend on whether one is able at any point to cut this Gordian knot.

II. *Changing Pattern of the Demand for Skills*

(*a*) *A Classification of Workers*

So far in our discussion we have tacitly assumed that the labor markets as well as wage rates can be uniquely identified with no conceptual ambiguities. Unfortunately, this is not so. Perhaps it is safe to say that the labor market is one of the least developed of all

[10] This point is well made by Reder for the case of inter-industry differentials; *op. cit.*, pp. 276–77.

[11] Cf. G. J. Stigler [50].

[12] Reder [41], p. 278 ff.

[13] Johansen's paper [16] is one of the few attempts that introduce dynamic elements explicitly into the model.

[14] Umemura [56] has stated this difficulty succinctly (pp. 183–87).

the market places. Consequently, what we describe as *a* market often turns out to be a hodge-podge of various elements. A labor market should ideally be defined for *one* homogeneous labor service. That is in such a way that labor is roughly substitutable within the boundary of the market, but not outside of it. In order to bring our discussion somewhat closer to reality, it is appropriate here to attempt a crude classification of workers in manufacturing industries:

(A) Artisans (Traditional Manual Craftsmen)
  (1) Skilled (Master)
  (2) Semi-skilled (Apprentice)
  (3) Unskilled (Helper)
(B) Industrial-manual
  (1) Skilled
  (2) Semi-skilled
    (a) Upper-grade
    (b) Lower-grade
  (3) Unskilled
(C) Industrial-nonmanual
  (1) Technicians, Professional Workers
  (2) Office Workers
    (a) Upper-grade
    (b) Lower-grade

Skilled workers are distinguished from unskilled or semi-skilled workers by (1) knowledge and ability to make decision, (2) special training and mastery of technical skills, and (3) willingness and ability to assume responsibility.[15] On the other hand,

> Where no special skill or responsibility is involved, but the individual is doing a particular job habitually and usually in association with a certain industry or trade, [the work] is rated as semi-skilled. Unskilled work requires no special training and general in nature rather than associated with a particular industry.[16]

Admittedly, it is often hard to draw a clear distinction among the different classes of workers. In addition, each of the above categories may be further subdivided.

(*b*) *Technological Change and Skill Requirement of Workers*

The structure of labor markets, as defined above, shifts from time to time. Viewed from the demand side, we cannot ignore the significant impact of technological change on the nature of the required labor services. Consideration of the demand factor is of special importance for an economy which has experienced an exceptionally rapid process of economic development and it is necessary that we dwell on this point at some length.

In the pre-industrial days being a skilled workman was equivalent to having acquired long experience and manual dexterity. A relatively large proportion of aggregate investment was allocated to cultivating individual craftsmanship rather than to installing capital equipment, thus rendering the capital intensity (K/N) very low, if not negligible. This type

[15] S. H. Slichter, *et. al.* [47], pp. 59–60.
[16] D. V. Glass [9], p. 31.

of skill is usually characterized by (a) the difficulty of its mastery and (b) a considerable degree of heterogeneity among different grades of skilled workmanship. The significance of such a high standard of workmanship and of the quality of its product usually implies a long period of training. It seems that in the early days of modern industrialization, many types of craftsmanship called for (on the average) five or seven years of training and practice.[17] Such skills are typically transmitted by a trade school or a period of apprenticeship. Furthermore, each man's output is commonly identifiable as *his* product, its quality lending itself easily to community evaluation. Under such circumstances, it is not too difficult to establish an objective scale for measuring skill levels.

The unavoidable consequences of modern technological progress are that (a) a demand for new types of labor is generated replacing the traditional ones which have become obsolete, and that (b) an increasing number of "unskilled" or "semi-skilled" workers, as well as that of "service" or "white-collar" employees, is called for.[18] As a result of this transformation, the nature of "skill" undergoes a drastic change.

Put simply, old and new skills may be contrasted as follows: the old-type skills are highly marketable assets by themselves, irrespective of where they are performed, whereas the new ones cannot be useful without being directly attached to particular production processes. For brevity, we shall refer to these two types of skill as "artisan skill" and "industrial skill," respectively. In the former case, artisans generally take the initiative in production with the help of tools and equipment. By contrast, operations of the latter type are often run at a machine-set pace. To put the matter differently, the highly diversified and technical nature of modern industrial processes necessitates a higher capital intensity per worker (K/N) than the traditional methods.

As is well known, the pattern of economic development has gone through several technological epochs. From time to time innovations have provided spurts for new industries while the growth rate of older industries has slowly retarded. We can spot four such phases: (i) the age of handicraft industries, (ii) the age of cotton textile and other light industries, (iii) the age of steel, electric power, communication and transportation, and (iv) the age of chemical, automated, and atomic industries.[19] In these phases we would like to emphasize the changing pattern of skilled occupations concomitant with a rapid increase in the demand for unskilled labor. It does not seem too farfetched to claim that the skills of the artisans have gradually yielded their dominance to the "industrial" skills, and that the latter carried at least as much weight in the development of the epoch (iii).

The above four technological epochs are characterized by varying skill components. Roughly speaking, the second epoch (ii) may be clearly contrasted with the first (i) in that it

[17] G. Williams [58] cites (p. 1) the Statute of Artificers in England (1562) which imposed seven years' servitude on trainees. To give another example, Ishihara [14] reports (p. 25) that the carpentry training in the Meiji period (Japan) lasted approximately five years.

[18] In this connection, Scitovsky once argued: "In the days of the handicraft economy, every piece of clothing, every piece of furniture, was made to the specifications of the person who bought it; but from this position of 100 per cent consumer sovereignty we have retreated long ago. Consumers yielded their dominance first to merchants ..... and later to manufacturers, who now decide themselves what to produce." (T. Scitovsky [46], Ch. 15, p. 244.) This is certainly another consequence of the modern technological progress.

[19] Cf. S. Kuznets [20], pp. 29–35.

is dominated by unskilled or lower-grade semi-skilled workers (B-2 b) who attend to the repetition of simple production processes on the basis of the Smithian division of labor. The third epoch (iii) introduces the need for the control of various machinery and heavy equipment that demand a larger number of semi-skilled together with a nucleus of skilled workmen.[20] Finally, with the arrival of the fourth epoch (iv), it seems that the demand for industrial skills is gradually increasing. For example, the demand for such manual skilled labor as auto and airplane mechanics, tool and die makers, etc., has reportedly been growing in the United States after W. W. II.[21]

> The various kinds of skilled craftsmen must meet steadily stricter standards and growing responsibilities. They must work to closer tolerances, make more precise adjustments, install more intricate wiring and piping, make installations that meet stiffer standards of performance .... and they must know how to weld radically new alloys. They must assume responsibility for handling larger and more expensive pieces of apparatus and more costly materials.[22]

We must also note in this connection that more and more industrial, nonmanual workers (class C) are required as the economy develops.[23]

Along with this development, the demand for traditional artisans diminishes. Broadly speaking, there are three possible forms that the decline may take. The most obvious are that part of the traditional skills becomes completely obsolete, forming a source of industrial unskilled labor. Some artisans will be integrated into new industries as skilled workers. As an example of this, we may cite the fact that certain trades such as blacksmiths, metal workers, etc., constituted important classes of traditional skills on the basis of which Japan founded her initial government industries.[24] Finally, still others will continue for a long time to supply their products, despite their proportionately reduced weight in the total labor force. A conspicuous example of this may be found in the construction industry and related trades. Of course, there is no denying the fact that the nature of the labor service will be transformed in conformity to the shift in demand and the changes in technology. However, construction skills have preserved their mutual independence fairly well and still exercise control over entry into the labor market through apprenticeship programs.[25] In addition, one may note that the so-called "indigeneous" components in goods and services, which rely naturally on the artisan skills, will continue to be in demand for decades to come. In fact, relatively small size firms are often important suppliers of such components and also traditional manual

[20] Williams [58] observes: "In every industry and in every firm a nucleus of skilled workers is essential. Machines have to be set and maintained for the semi-skilled workers to operate and almost invariably there are one or two processes which, while an essential ingredient in the final product, do not justify investment in expensive machinery." (p. 47)

[21] S. Slichter, *et. al*, [47], pp. 62–63. A well-known episode in this connection is that the United Automobile Workers' Union (U. S.) finally yielded to the demand of skilled tradesmen and gave them a wide grant of autonomy since 1958. See L. Ulman [55], pp. 463–64.

[22] Slichter, *et. at*, [47], p. 65.

[23] This is particularly true when we look at the economy as a whole, since the demand for the service industries increases with the rise of per-capita incomes.

[24] For instance, cf. Sumiya [52], pp. 33–53.

[25] For the contemporary U. S. case, see Straus [51].

crafts.[26]

III. *Supply Elasticities of Labor*

(*a*) *Supply of Labor: Elastic or Inelastic?*

With the foregoing discussion as a necessary background, we will now proceed to the consideration of the mechanism through which industrial-manual labor is formed. Our main contention will be directed to two points: (1) the supply elasticities of skilled and unskilled labor, and (2) the distinction between the two concepts of labor costs: variable and fixed. We shall discuss the first point in this section, postponing the second until a later section.

In recent years, great credit has been given to the role of investment in human capital (i. e. expenditures on education and health) for acting as a basic stimulus for economic growth.[27] The relevance of this view cannot be disputed; nor can we deny the relative shortage of well-disciplined industrial labor at the beginning stage of modern economic development. However, one must be mindful of the fact that the primary problem facing a developing nation is not the need of human investment *per se*. It is instead that of *choosing* the most appropriate set of investment outlays in order to attain the optimum rate of growth given the fixed amount of economic resources. That is, we should conceive of the investment in human beings as standing in competition with other capital expenditures. In this sense, the nature of human investment in developing economies is somewhat distinct from that of more advanced nations.

In reference to the relative shortage of industrial labor, the Gerschenkron hypothesis comes immediately to our mind.[28] According to this thesis, the introduction of "borrowed" technology is doubly advantageous to an underdeveloped economy since it promises rapid growth potential and lessens the burden of the economy. Contrary to common supposition, well-disciplined, industrial labor is a scarce factor relative to capital. Furthermore, since the optimum level of unit operation in modern industries——particularly those characterizing epoch (iii)——is quite high, the average firm size grows necessarily larger under the "borrowed" technology.

Gerschenkron's hypothesis should perhaps be slightly modified in the following two respects: (1) which technological epoch is chosen in borrowing the backlog of technology and (2) the qualitative nature of industrial unskilled labor. If the technology corresponding to the second epoch (cotton-textile) is chosen, the shortage of industrial skill will not be prohibitive. This is because these industries need mostly unskilled (or lower-grade semi-skilled) female labor which is relatively easy to come by compared with industrial workers of higher grades. In particular, for a country where general educational attainment is relatively high *at the beginning* of industrialization and where few institutional barriers exist against social

[26] See Rosovsky-Ohkawa [44]. Williams [58] cites an inquiry made by the British Ministry of Labour in the midtwenties and observes that "as a general thing apprentices were concentrated in the small rather than the large firms." (p. 13)

[27] We mention, among other things, the following two sets of work: *Journal of Political Economy*, LXX, No. 5, Supplement (Oct. 1962) and Edward F. Denison [3].

[28] A. Gerschenkron [8]. See, especially, pp. 4-9.

mobility (e. g., Japan), there should be little difficulty in the recruitment of industrial unskilled labor, aside from short-run bottlenecks.[29] It is likely that firms of all sizes will seek entry into the market to exploit the cheap, high-quality labor.[30] Conversely, if the general quality of unskilled labor is low, the extra costs of training and education would be born initially by the companies and would tend to discourage the entry of smaller firms. As a result, the distribution of firms would cluster around two distinctive classes: very large and very small, the latter being characterized by traditional, craft-type production methods.[31] Whichever the case. it is conceivable that the intra-industry wage differentials associated with the choice of epoch (ii) are dominated by regional factors, for there would be relatively little room for skill differentials. In fact, observations on the Japanese experience seem to bear out this point.[32]

(*b*) *Labor Bottlenecks and the Choice of Technology*

Next, it seems instructive to ponder on the implication of the Gerschenkron thesis in reference to the Lewis-type setting of "unlimited supplies of labor," which is considered to be a basic nature of the Japanese labor market.[33] It is only quite recently, so runs the argument, that the symptoms indicative of the beginning of the "semi-limited" phase have appeared. These would include the absolute decline of employment in the primary sector of the econemy since about 1955 and the tightening of the market for new-entrants since about 1960.[34] If this is the case, it follows that the transactions of industial labor have been made in buyers' markets until the second half of the 1950's.[35] How can this claim be reconciled with the Gerschenkron hypothesis?

The crux of the matter rests on recognizing the diversified structure of labor markets. That is, the Lewis model is in no way contradictory with the short-run inelastic supplies of skilled industrial workers. The concurrent existence of abundance and shortage of labor in

[29] Such bottle-necks were actually felt from time to time in the Japanese experience; e. g., see Sumiya [52], pp. 166, 194–95.

[30] A contrast between the Gerschenkron hypothesis and the Japanese experience was noted first by Rosovsky. His discussion is pertinent to ours, and we are indebted to him for drawing our attention to the hypothesis. See H. Rosovsky [43], Ch. IV.

[31] Lewis called this "the cottage industry" ([23], p. 136 ff.). An example of this second case may be found in India. See Ishikawa [15].

[32] Cf. S. Nishikawa [29]; also, see Ishikawa [15], pp. 64–66.

[33] For a brilliant piece of contribution along a similar line of thought, see K. Tsujimura [53]. The idea of "unlimited supplies" may be found in Lewis [22].

[34] For instance, see K. Ohkawa [35]. Cf. also Ohkawa-Minami [34] and Minami [27]. Fujino has found that changes in money wages in the cotton-textile industry have become more sensitive to the secular fluctuations in demand during the post-W. W. II period than in the prewar days. This seems to accord with the appearance of the "semi-limitedness" in the labor supply. See Fujino [5], Ch. 26.

[35] It should be noted that our version of the model, as distinct from the original one, does *not* exclude the horizontal *shift* over time of the supply curve of labor. We are aware of the tenet which attempts to build a model of economic development in the strictly neo-classical tradition. According to this school of thought, empirical findings can be consistently explained without appealing to such "dubious" concepts as "unlimited supplies" or "disguised unemployment" (or, "overemployment," as Ohkawa puts it; see his [33], pp. 16–22, for further elucidation on overemployment). This controversy is rooted partly in the interpretation of facts and partly in the empirical testing of the model. We shall assume, in this paper, that the Lewis-type approach is basically sound and useful in understanding a facet of the Japanese development.

different areas of market stratum no doubt sets a perfect stage for the appearance of skill differentials in wages. However, it is difficult to determine to what extent the shortage of skilled labor alone actually induces the borrowing of capital-intensive methods of production.[36] Labor-using technology is not necessarily the optimum choice even for a labor-abundant economy. As one author puts it,

> In a portion of the national economy, we have a highly-modernized, industrial sector where the most efficient methods of production are employed. The advanced technology is overwhelmingly advantageous irrespective of the relative factor prices (wage vs. the interest rate), since it is necessary for manufacturing products with desired specifications and quality and/or for maintaining competitive position in the world market. Under such circumstances, factor proportions are set chiefly by technological requirements, and are hardly affected by the price of labor input. In other words, the level of employment is determined, through technological requirements, by the amount of accumulated capital.[37]

Given that the "follower" country has introduced the heavy, capital-intensive industries which characterize epochs (iii) and (iv), the advantages thereof are "not counteracted but reinforced"[38] by the skilled-labor-saving nature of the technology. An attempt to determine the nature of technological progress by Watanabe resulted in the discovery of an intensive utilization of labor-saving technology in Japan for the period 1904-33.[39]

A qualification is in order at this point. Granted that economies of scale make it feasible, both economically and technically, that large-scale "borrowed" technology be introduced, the relative shortage of industrial skills can be eased. Nevertheless, the choice of technology is still subject to the principle of cost minimization. In a capital-scarce economy which is richly endowed in industrial unskilled labor of high quality, the entrepreneur will try, inasmuch as possible, to lower the capital-output ratio (K/O) by substituting unskilled labor for capital wherever possible. Apropos to this point, Garnick has contended that such was indeed the case for the Soviet metal working industry. According to him, "labor has generally been substituted for fixed-capital equipment where this was technically feasible,"[40] even at the expense of not adopting the latest technology. In addition, he noted that both organizational and socio-cultural conditions had some bearing on the problem. By the same token, we may surmise that certain minor operations such as the production of auto parts are comparatively prone to the substitution of unskilled manual labor for capital. If so, it may be to the benefit of large corporations to subcontract such minor operations. In this way the company can "exploit" unskilled (or lower-grade semi-skilled) labor more freely and avoid the complaints due to wage differentials between skilled and unskilled workers.

We have tried so far to sketch one aspect of the interplay between demand and supply relationships for industrial skills. In brief, we subscribe to the view that the Japanese economy has experienced a surge of excess demand for skilled and high-grade semi-skilled industrial labor since the turn of the century in association with the introduction of capital-intensive technology (epoch (iii)). Since heavy industries are characterized by the indivisibility

[36] A hazardous extension of the Gerschenkron thesis seems to suggest such inducement.
[37] H. Kumagai [19], pp. 276–77.
[38] Gerschenkron [8], p. 7.
[39] T. Watanabe [57], p. 25.
[40] D. Garnick [7], p. 273. Also, [6].

of economic processes to a greater extent than light industries, the "borrowed" technology almost always means large-scale operations. Consequently, the shortage of well-trained industrial skills was most keenly felt by large-sized firms. The wages for skilled and upper-grade semi-skilled labor were thus inclined to be demand-determined. It does not seem to be a pure coincidence that the emergence of intra-industry wage differentials is spotted in this epoch. Such then was the process by which skill differentials relative to the size of the enterprise were formed and with them the intra-industry wage differentials.[41]

IV. *Internal and External Markets of Labor*

(*a*) *The Impact of Technology on the Structure of the Labor Market*

Now we proceed to discuss another important aspect of labor markets. The problem is specifically related to the manner in which industrial skills are cultivated. In order to make our point succinctly, it is convenient to use artisan skills as the frame of reference and to draw the contrast between the two.

If the skill is of the type that is transmitted by the apprenticeship system, it is usually well-defined in reference to its occupational category and is clearly distinguishable from other skills. In artisan-type occupations, the workman "gets his security not from the individual employer but from his skill"[42] and "is known as a carpenter and not as an employee of a certain company."[43] The job contents may be described with little room for ambiguity, and the workers' movement in the market is characteristically horizontal. In the United States, this class of occupations is roughly identified within the jurisdictions of "craft" unions, illustrative examples of which are building, printing, maritime and teamster trades.[44]

By contrast, descriptions of industrial skills often lack precision and are related more to experience and knowledge rather than manual dexterity and artistic sophistication. As we have pointed out in the previous section, the nature of industrial skills is largely dependent on the production process. As Hildebrand puts it,

> Technology makes certain jobs key positions from the standpoint of labor cost and as the strategic points for certain processes, around which other jobs become automatically grouped——for example, extrusion press operator and his helpers, or miner and mucker underground. By automatically invoking particular lines of job progression, technology also puts a premium upon accumulated plant experience, operating at the same time through mechanization and work simplification to downgrade former skills, while creating or preserving others in the upper tiers of each specific promotional sequence. In turn, the greatly increased importance of training on the job makes promotion-from-within a logical development of personnel policy, a practice that draws added support from the natural tendency of the vertically-oriented production worker to consider himself permanently "in the plant" once he has passed the probationary period ....[45]

[41] Cf. Ohkawa-Rosovsky [31], pp. 77–83.
[42] C. Kerr [18], p. 98.
[43] *Ibid.*
[44] *Ibid.*, p. 97.
[45] G. Hildebrand [13], p. 268. See also Livernash [24] for a similar view.

It follows that for large manufacturing concerns, which are representative of the epochs (iii) and (iv), market forces operate in a dual fashion: both "inside" and "outside" the firms. The wage rate set by the labor market at large ("external" market) has no more than an indirect effect on the actual determination of the firm's "internal" wage structure. This is because the former exerts its influence on the latter only "through 'market-oriented' jobs, that is, jobs that are fairly uniform in duties and vocational requirements as among firms in the local area."[46] Such "market-oriented" jobs, e. g., starting jobs in production, maintenance work, etc., were once described by Kerr as "ports of entry" to the market.[47] Once a worker joins a firm, however, the important market for him becomes the internal one, where "movement is vertical . . . instead of horizontal as in the craft markets."[48]

The upshot is that industrial skills must typically be cultivated inside the firm, either through a formal training system or on-the-job training. Owing to the nature of the skill and investment cost that such educational activities require, economic calculations by both employers and workers would suggest that labor turnover should be maintained at a minimum.[49] Hence the internal market is organized so that: (1) there is one "port of entry" at the lowest job level and (2) the plant offers several alternative promotional ladders to which individual workers are assigned in due course of time according to their personal abilities and skill attainment. Herein lies the special need for each plant to develop a system of wage and personnel administration. Put differently, "the allocation of labour *within* an organization is a function not of a market in the strict sense (though of course it is influenced by the outside labour market); it is a matter of 'administration'."[50] It is not easy, however, to establish an objective measure of workers' contribution to the value of final output. The difficulty is demonstrated by the fact that management is incapable of knowing an individual laborer's net worth without consulting some artificial scheme of job evaluation.[51]

Let us further observe that a similar argument may be extended to draw a distinction

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[46] Hildebrand, *op. cit.*, p. 274.

[47] Kerr [18], p. 101 ff.

[48] *Ibid.*, p. 100. It is very important to recognize that this vertical progression of job structure seems to underlie the theory of occupational wage differentials of Professor Reder. See his [42] (esp., p. 314) and the references cited there.

Empirical findings on hiring practices of firms in the San Francisco Bay area by Gordon [10] seem consistent with our view. On the firms' hiring policies, Mrs. Gordon observes: "Emphasis on a policy of promotion from within figured most prominently in explanations of their hiring policies, while the influence of the pension plan was a close second." (*Ibid.*, p. 1202)

[49] One may put the matter in terms of the distinction between "general" and "specific" training as developed by G. Becker. According to him, the employer in the competitive labor market will not expend on the former type of training, for the benefit of the training accrues to the worker, not to the management. For this reason, all the cost of a "general" training will be born by the workers (Becker [1], pp. 8–29 or [2], pp. 10–25). This reasoning, incidentally, may be used to justify the government's social-overhead spending on general education. Obviously, it is "special" training that is our main concern in the present context.

[50] Parsons-Smelser [39], p. 123. The italics are original.

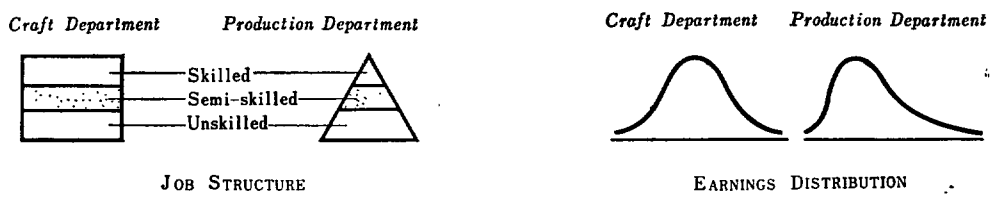
[51] An interesting attempt in this regard is the union-management job evaluation scheme introduced by some major American steel firms since 1947. See J. Stieber [49]. His investigation indicates, however, that the introduction of the scheme made little difference in the inter-plant occupational earnings structure. In contrast, job classifications show a high degree of uniformity among the firms under the plan. See *ibid.*, Ch. XIV; also, pp. 317–18.

between two types of white-collar workers, namely (1) technicians and other clerks with professional skills, and (2) general office workers (including salesmen). By and large, the workers in the first category exhibit the characteristics analogous to artisan-type skilled workmen while the latter resemble industrial manual workers.

Technical staffs such as engineers, laboratory assistants and airplane pilots require long educational training (both mental and physical) which entails in most instances a college degree or the equivalent before entering the labor market. Consequently, their occupations are clearly distinguishable from others, and they enjoy a relatively large measure of freedom to move horizontally in their respective labor markets. On the other hand, on-the-job training weighs heavily in the case of general office workers, who become of greater value to the firm in proportion to their accumulated experiences. Moreover, their skills are neither easily transferable nor describable——such as personal contacts, the sense of dependability, leadership, and the like. As a result, general office workers tend to move vertically on the job ladder according to their seniority.

We have argued that there are, broadly speaking, two types of markets for industrial workers: "external" and "internal." The distinction may be made on a different dimension: namely between artisan and industrial skills. An interesting example of the contrast may be drawn from a case study of a large steel firm in Great Britain for the fiscal year 1950–51.[52] The authors observed that the steel workers were composed of two heterogeneous classes: "craft" workers vs. "production" workers (corresponding to our categories (A) and (B), respectively). Each skill in the "craft" department had a precise meaning of its own such as the skill of fitters, bricklayers, electricians. Due to the apprenticeship requirement, there was a sharp dividing line between skilled men and the rest. A skill in the "production" department was, in contrast, usually "specific to a particular steel making process," and it was "conferred by seniority on the job."[53] Consequently, the workers in the former class were uniformly distributed among the skill groups (i.e. skilled, semi-skilled, and unskilled), and the latter could be arranged in a pyramid-shape. By the same token, the earnings distribution was typically bell-shaped for the "craft" workers, whereas it was skewed to the left for the "production" workers (see the illustrations).

FIG. 2



JOB STRUCTURE EARNINGS DISTRIBUTION

[52] S. W. Ostry, *et. al.* [37].
[53] *Ibid.*, p. 229.

(*b*) *Labor Costs: Variable or Fixed*

The above observations suggest that regular labor costs in large manufacturing firms should be regarded as *fixed*, rather than as variable, costs. The only current labor outlays are the payments to the temporary workers.[54]

Labor as a factor of production is normally (at least in the neo-classical analysis) bought and sold as a *flow* commodity (that is, it is the man-hour of labor that is marketed). Accounting practices today seem generally in agreement with this tradition. However, where there is a personal (or any other type of) commitment of an employee to a particular work place for a certain period of time (e. g. for the life time of the employee), labor *stock* is also involved in the transaction. To the extent that this is the case, the firm will be interested in spending some money for the "investment in human capital." Thus, in the places where a life time job commitment is practiced, the relevant concept seems to be the lump-sum labor cost instead of simple wage rates. The internal wage structure is established according to the specific needs of the organization, and it is then related to the external market only through a few "ports of entry." Viewed this way, the labor cost partially constitutes a capital expenditure and it does not enter the short-run decision making of the firm. One may even stretch the argument further and contend that management, under these circumstances, will concern itself not so much with the price of labor service (flow) as with the current rate of return on invested capital. The latter will be regarded as the most important guidepost for managerial decision making.

Let the expected cost at time t due to the new labor (n_t) be C_t; the wage rate for an employee who has been with the company for j years, be w_j; and the rate of discount (the interest rate) be r. Further, let the training cost of labor be T_t, and the hiring cost be H_t. T_t and H_t are clearly functions of n_t, i. e., $T_t=T_t(n_t)$ and $H_t=H_t(n_t)$. Then we may write C_t as

$$C_t=n_t \sum_{j=0}^{m-1} w_j(1+r)^{-j} + \sum_{j=0}^{h} T_j(n_j)(1+r)^{-j} + H_t(n_t),$$

where $(m-1)$ is the age of retirement and $h \leqq m-1$. The demand for the desired stock of labor, say N_t^*, is a function of the output level and of factor prices. That is to say

$$N_t^*=f(y_t, x_t, C_t, k_t, U),$$

where y_t is the level of current output, x_t is the price of current input, k_t is the discounted price of capital input, and U is an unspecified variable.[55] Obviously the specific form of f depends on the type of production function, the assumption made as to the behavior of the firm (such as maximization of net worth), and the condition of the markets for inputs and outputs. Assuming that a constant proportion (d) of total labor retires each year and that there is a slight lag of adjustment, say

$$N_t-N_{t-1}=b(N_t^*-N_{t-1}), \qquad 1 \geqq b \geqq 0,$$

we may express the demand function for new labor, n_t, as

[54] Curiously enough, a slightly similar argument was put forth in 1953 by the United Automobile Workers' Union (U. S.), according to which labor costs should be regarded as "annual costs" like interests, depreciation charges, taxes, and executive salaries. For the consequence of this argument, see L. Ulman [55], p. 439 ff.

[55] N_t is defined as a row vector $N_t=(n_1 \cdots n_{m-1})$ where n_j stands for the number of employees with j years of service. It follows that the total labor cost at time t may be represented by $N_t W$, where W is a column vector such that $W'=(w_1 \cdots w_{m-1})$, w_j standing for the wage rate for the employees with j years of service.

$$n_t = N_t - N_{t-1} + dN_{t-1}$$
$$= bf + (d-b)N_{t-1}.^{56}$$

The discussion so far has concentrated on the labor demand of the "large" firms. The smaller corporations, in contrast, normally lack a strong hold on their employees. Put another way, the labor service is a *flow* for them, and a considerable labor mobility may be expected among these firms. If in fact this is the case, we may safely employ the ordinary demand function of labor where labor service is contracted as a current input so that

$$n_t = g(y_t, x_t, w_t, k_t, U).^{57}$$

It has been observed that large firms in the Japanese manufacturing sector are usually characterized by a long-term employment tenure. This normally allows a turnover of labor only through entry and retirement. In this sense, the labor market is said to be of a "closed type"——with a possible exception of woman employees. In addition, such companies generally provide an extended training program for the newly hired. In some cases, they may even operate their own technical schools for production workers. Side by side with the regular employees, the so-called "temporary" workers are contracted on a short-term basis (say, six months), in order to hedge against cyclical fluctuations in the demand for labor.

Employment tenure is quite beneficial to the employees themselves in that it guarantees them complete job security.[58] On the other hand, the companies are anxious to invest in various facilities with the purpose of providing employees with fringe benefits; such as recreational facilities, lodging services, dormitories, and family health-service plans. Apparently, such "non-wage" payments serve as an indispensable function for the enterprise when it attempts to attract better quality labor, as well as to keep the morale of the employees high. From this point of view, nothing is more unrealistic than to describe this so-called industrial paternalism as "irrational."

Finally, Japanese unions, with the one notable exception of the Japan Seamen's Union, are organized on an enterprise basis.[59] Moreover, the unions are stronger, the larger is the size of the company. This structure fits very well into the general picture described above, and is a by-product of the employment-tenure system. This in turn serves to reinforce the "Balkanization" of the labor market.

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[56] This model is merely an illustration and is not necessarily meant to be a faithful description of reality. For instance, an important problem remains to be solved in connection with f: how to represent technological progress. Needless to say, this point is closely related to the specification of the production function. In developing this idea, I have benefited from reading A. Harberger [11] and W. Oi [36].

[57] Even in this case, it may be a better alternative to treat labor as a quasi-fixed factor of production.

[58] The significance of job security to workers *in general* can be testified from the American scene, where the rate of labor turnover is most frequent among young employees (see, e. g., Parnes [38], pp. 102–09) and where several mechanisms have been developed to increase job security, e. g., the seniority system, unemployment compensation, and the like. Many recent labor disputes have also been related to this issue: protection of the job right. Cf. F. Meyers [26]. Meyers writes: "Workers do in fact tend to regard themselves as having some kind of right of possession in a job, and to devise institutions which wrest control over incumbency from the hands of the employer and which express objectively a vesting of property-like rights in the worker." (*Ibid.*, p. 112)

[59] See, e. g., S. B. Levine [21], Ch, IV.

(*c*) *Wage Rate vs. Lump-sum Earnings*

At this point, we may perhaps be allowed to insert a historical example of the conceptual difference between the wage *rate* as opposed to the lump-sum wage *income* with special reference to Japan. In the economies which have experienced growth over a long span of time, "artisan skills" have generally become institutionalized in the form of an occupational job market at an early stage of industrialization.[60] Consequently, labor services were evaluated and paid for at the prescribed market prices, i.e., at the wage *rate*. The distinction between payment by time and by output naturally became one of the focal points of disputes between employers and workers. The practice of quoting the prices of labor by wage *rate* has persisted to date, even after the proportion of "industrial skills" has grown more numerous than "artisan skills." The relative differences between the two rates of different labor services have not only an economic significance but also serves as a measure of relative social prestige. Consequently, their values often show a certain degree of resistance to change. About ten years ago Hicks expressed his concern that such relative rigidity might be a cause of inflation.[61] Needless to point out, we can no longer grasp the entire picture of contemporary wage issues in terms of wage rates alone. In more recent years, the seriousness of the wage drifts in western European countries has come to a head; on the other hand, we cannot possibly ignore various forms of fringe benefits (some pecuniary, others non-pecuniary) in the United States.[62] But, despite these changes, it remains true that the "pri madonna" of collective bargaining in these countries is still wage rates.

The situation has been quite different in a "follower" country like Japan which has faced with the predicament of plunging suddenly into the stage of accelerated growth. We suspect that this process deprived her of the opportunity to firmly establish the practice of relying on rates as the indicator of the tightness of market conditions. On the supply side, the population pressure tended to make workmen more conscious of lump-sum compensation rather than a remuneration rate. The shortage of industrial skills was acutely felt at the relatively early phases of industrialization, and private enterprises found it necessary to raise their own reserves of skilled workers. It has been pointed out that this system has brought at least two important consequences: (1) a strong inclination of each firm to develop its "special" skills which are not necessarily applicable in other places and (2) an impediment to the development of modern personnel management system. As we have discussed above, the wages of industrial skills are dominated by the forces of internal markets where there has been little stimulus to develop the concept of market wage rates.[63]

V. *Concluding Remarks*

We are only too aware that we have paid very little attention to socio-cultural, institutional aspects of the labor market in this paper. Such aspects of the issue should of course not be ignored. For one thing, the abundance of labor intensifies the degree of uncertainty for a supplier in securing the desired employment opportunity. Thus labor mobility is discouraged.

[60] Perhaps such a tradition may be traced well back to the days of medieval gilds.

[61] J. R. Hicks [12].

[62] See the footnote (58) immediately above.

[63] For an excellent historical analysis, see R. Nibuya [28], p. 199 ff.

On the other hand, the small share of output that accrues to labor (for which "unlimited" supplies of unskilled labor are certainly responsible) does little, if anything, to motivate management toward eliminating imperfect elements in the market. These and other institutional aspects are obviously of great importance. However, we believe that the ultimate driving forces of the employment-wage relations should be first sought in economic and technological factors. For this reason, we have deliberately ignored institutional complications in building our analytical framework.

If our framework is indeed an acceptable one, it seems easier to explain why intra-industry wage differentials exist. The gist of the argument in Section IV has been that the nature of labor costs is different between large and medium-small firms: it is more of a fixed cost for the former and a variable cost for the latter. We have underscored this contention by noting the distinction and the relationship between "internal" and "external" markets. The development of the internal market is an aspect of modern technology which often differentiates large manufacturing concerns from the smaller ones. In brief, skill differentials arise mainly from technological factors, which have a strong hold on the types of labor demanded by the firm. Our discussion in Section III implies that the extent to which the intra-industry wage differentials appear in the market is conditioned by the speed of industrialization. Furthermore, other economic considerations should be taken into account in order to present a complete picture of the case at hand. Along with the Marshallian line of thought, one may argue that the wage differentials tend to persist more easily (a) the smaller the proportion of labor cost is to the total cost of the firm, and (b) the less elastic the demand is for the output.[64]

In more recent years, the wage rate of new-entry labor has registered no discrepancy between firms of different sizes. There is, *pari passu*, a tendency for the intra-industry wage differentials to diminish.[65] This clearly corresponds to the change in supply conditions: that the labor market has reached a turning point, as it were, from the "unlimited" to the "semi-limited" phase of development. Our consideration in this paper suggests, however, that the intra-industry wage differentials will not disappear completely as long as the technological basis remains in force.[66]

REFERENCES

[1] Becker, Gary S. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education.* N. B. E. R. Series, N. Y.: Columbia University Press, 1964.

[2] Becker, Gary S. "Investment in Human Capital: A Theoretical Analysis." *Journal of Political Economy*, LXX, No. 5, Supplement (Oct. 1962), 9-49.

[3] Denison, Edward F. *The Sources of Economic Growth in the United States and the Alternative Before Us.* N. Y.: Committee for Economic Development, 1962.

[64] A. Marshall [25], pp. 384-87.

[65] In the cases where on-the-job training is practiced extensively, however, the wage rate for the new-entry is likely to be lower than the actual marginal productivity of labor. For a proof, see Becker [2] pp. 10-25.

[66] I have shown elsewhere that a considerable magnitude of intra-industry wage differentials does exist in a certain number of manufacturing industries in the United States; K. Odaka [30].

[4] Eckaus, R. S. "The Factor Proportions Problem in Underdeveloped Areas." *American Economic Review*, XLV, No. 4 (Sept. 1955), 539–65.

[5] Fujino, Shozaburo. *Nihon no Keiki Junkan* (Business Cycles in Japan). Tokyo: Keiso Shobo: 1965.

[6] Garnick, David. "Economic Development and Productivity Analysis: The Case of Soviet Metalworking." *Quarterly Journal of Economics*, LXXI, No. 2 (May 1957), 205–33.

[7] Garnick, David. "Technological Policy and Economic Calculation in Soviet Industry." In G. Grossman, ed., *Value and Plan*, Berkeley and Los Angeles: University of California Press, 1960, 271–86.

[8] Gerschenkron, Alexander. "Economic Backwardness in Historical Perspective." In Bert F. Hoselitz, ed., *The Progress of Underdeveloped Economy*, Chicago: University of Chicago Press, 1952, 3–29.

[9] Glass, D. V., ed. *Social Mobility in Britain*. London: Routledge and Kegan Paul, 1954.

[10] Gordon, Margaret S. "The Older Worker and Hiring Practices." *Monthly Labor Review*, 82, No. 11 (Nov. 1959), 1198–1205.

[11] Harberger, Arnold, ed. *The Demand for Durable Goods*. Chicago: University of Chicago Press, 1960.

[12] Hicks, John R. "Economic Foundation of Wage Policy." *Economic Journal*, LXV, No. 259 (Sept. 1955), 389–404.

[13] Hildebrand, George. "External Influence and the Determination of the Internal Wage Structure." In J. L. Meij, ed., *Internal Wage Structure*, Amsterdam: North-Holland, 1963, Ch. 5 (260–99).

[14] Ishihara, Koichi. *Nihon Gijutsu Kyoiku-shi-ron* (A Historical Analysis of Industrial Training in Japan). Tokyo: San'itsu Shobo, 1962.

[15] Ishikawa, Shigeru. "A Comparison of Size Structure in Indian and Japanese Manufacturing Industries." *Hitotsubashi Journal of Economics*, 2, No. 2 (March 1962), 50–80.

[16] Johansen, Leif. "A Note on the Theory of Interindustry Wage Differentials." *Review of Economic Studies*, XXV(2), No. 67 (Feb. 1958), 109–13.

[17] Johansen, Leif. "Substitution Verses Fixed Production Coefficients in the Theory of Economic Growth: A Synthesis." *Econometrica*, 27, No. 2 (April 1959), 157–76.

[18] Kerr, Clark. "The Balkanization of Labor Markets." In E. W. Bakke, *et. al.*, *Labor Mobility and Economic Opportunity*, Cambridge: The Technology Press of M. I. T. and N. Y.: John Wiley, 1954.

[19] Kumagai, Hisao. *Shihonshugi Keizai to Koyo* (Capitalistic Economy and Employment). Tokyo: Nihon Hyoron Shinsha, 1957.

[20] Kuznets, Simon. *Six Lectures on Economic Growth*. Ill.: The Free Press of Glencoe, 1959.

[21] Levine, Solomon B. *Industrial Relations in Postwar Japan*. Urbana: University of Illinois Press, 1958.

[22] Lewis, W. Arthur. "Economic Development with Unlimited Supplies of Labour." *The Manchester School of Economic and Social Studies*, XXII, No. 2 (May 1954); reprinted in Agawala and Singh, eds., *The Economics of Under-development*, N. Y.: Oxford University Press, 1958.

[23] Lewis, W. Arthur. *The Theory of Economic Growth.* London: George Allen and Unwin, 1955.
[24] Livernash, E. Robert. "The Internal Wage Structure." In George Taylor and Frank Pierson, eds., *New Concepts in Wage Determination*, N.Y.: McGraw-Hill, 1957, 140-72.
[25] Marshall, Alfred. *Principles of Economics.* 8th ed., London: Macmillan, 1920.
[26] Meyers, Frederick. *Ownership of Jobs: A Comparative Study.* Los Angeles: Institute of Industrial Relations, University of California (Los Angeles), Monograph 11, 1964.
[27] Minami, Ryoshin. "Economic Growth and Labour Supply." *Oxford Economic Papers*, 16, No. 2 (July 1964), 194-200.
[28] Nibuya, Ryu. "Chingin Taikei no Rekishi-teki Kaiko (A Historical Analysis of Wage Systems in Japan)." In Showa Dojinkai, *Wagakuni Chingin-kozo no Shiteki Kosatsu* (Historical Analyses of the Japanese Wage Structure), Tokyo: Shiseido, 1960, 199-335.
[29] Nishikawa, Shunsaku. "Membosekigyo no Chingin Hendo to Chingin Kakusa (Changes in Wages and Wage-differentials in Cotton Spinning Industry)." *Mita Shogaku Kenkyu* (Mita Business Review), 3, No. 5 (Dec. 1960), 16-49.
[30] Odaka, K. "The Relations of Wage Differentials to Size of Enterprise in the United States." A seminar paper, University of California (Berkeley), 1962.
[31] Ohkawa, Kazushi and Henry Rosovsky. "A Century of Japanese Economic Growth." In William W. Lockwood, ed., *The State and Economic Enterprise in Japan*, Princeton: Princeton University Press, 1965, 47-92.
[32] Ohkawa, Kazushi. "The Differential Employment Structure of Japan." *Annals of the Hitotsubashi Academy*, IX, No. 2 (April 1959), 205-17.
[33] Ohkawa Kazushi. "Kajo Shugyo ni Tsuite (On Overemployment)." In K. Ohkawa, ed., *Kajo Shugyo to Nihon Nogyo* (Overemployment and Japanese Agriculture), Tokyo: Shunjusha, 1960.
[34] Ohkawa, Kazushi and Ryoshin Minami. "The Phase of Unlimited Supplies of Labor." *Hitotsubashi Journal of Economics*, 5, No. 1 (June 1964), 1-15.
[35] Ohkawa, Kazushi. "Rodo Kyokyu ga Han-seigen-teki na Keizai (Semi-limited Supplies of Labor)." *Keizai Kenkyu* (The Economic Review), 15, No. 3 (July 1964), 254-57.
[36] Oi, Walter Y. "Labor as a Quasi-fixed Factor." *Journal of Political Economy*, LXX, No. 6 (Dec. 1962), 538-55.
[37] Ostry, Sylvia W., H.J.D. Cole and K.G.J.C. Knowles. "Wage Differentials in a Large Steel Firm." *Bulletin of the Oxford University Institute of Statistics*, 20, No. 3 (Aug. 1958), 219-64.
[38] Parnes, Herbert S. *Research on Labor Mobility: An Appraisal of Research Findings in the United States.* N.Y.: Social Science Research Council, Bulletin 65, 1954.
[39] Parsons, Talcott and Neil J. Smelser. *Economy and Society: A Study in the Integration of Economic and Social Theory.* London: Routledge and Kegan Paul, 1956.
[40] Radner, Roy. *Notes on the Theory of Economic Planning.* Athens: Center of Economic Research, Training Seminar Series, No. 2, 1963.
[41] Reder, Melvin W. "Wage Differentials: Theory and Measurement." In *Aspects of Labor Economics: A Conference of the Universities-National Bureau Committee for Economic Research*, Princeton: Princeton University Press, 1962, 257-317.
[42] Reder, Melvin W. "Wage Structure and Structural Unemployment." *Review of Economic Studies*, XXXI(4), No. 88 (Oct. 1964), 309-22.

[43] Rosovsky, Henry. *Capital Formation in Japan, 1868-1940.* N.Y.: The Free Press of Glencoe, 1961.

[44] Rosovsky, Henry and Kazushi Ohkawa. "The Indigeneous Components in the Modern Japanese Economy." *Economic Development and Cultural Change*, IX, No. 3 (April 1961), 476-501.

[45] Samuelson, Paul A. *Foundations of Economic Analysis.* Cambridge: Harvard University Press, 1947.

[46] Scitovsky, Tibor. *Papers on Welfare and Growth.* London: George Allen and Unwin, 1964.

[47] Slichter, Sumner H., James J. Healy and E. Robert Livernash. *The Impact of Collective Bargaining on Management.* Washington, D.C.: The Brookings Institution, 1960.

[48] Smith, Adam. *An Inquiry into the Nature and Causes of the Wealth of Nations.*

[49] Stieber, Jack. *The Steel Industry Wage Structure.* Cambridge: Harvard University Press, 1959.

[50] Stigler, George J. "Information in the Labor Market." *Journal of Political Economy*, LXX, No. 5, Supplement (Oct, 1962), 94-105.

[51] Straus, George. "Apprenticeship: An Evaluation of the Need." In A.M. Ross, ed., *Employment Policy and the Labor Market*, Berkeley and Los Angeles: University of California Press, 1965, 299-332.

[52] Sumiya, Mikio. *Nohon Chinrodo-shi-ron* (A Historical Analysis of Japanese Wage Labor). Tokyo: University of Tokyo Press, 1957 (revised, 1958).

[53] Tsujimura, Kotaro. "Koyo Kozo to Rodo Bumpairitsu (Employment Structure and the Relative Share of Labor)." In Ryutaro Komiya, ed., *Sengo Nihon no Keizai Seicho* (The Economic Growth in Postwar Japan), Tokyo: Iwanami, 1963, 103-28.

[54] Ulman, Lloyd. "Labor Mobility and the Industrial Wage Structure in the Postwar United States." *Quarterly Journal of Economics*, LXXIX, No. 1 (Feb. 1965), 73-97.

[55] Ulman, Lloyd. "Unionism and Collective Bargaining in the Modern Period." In S.E. Harris, ed., *American Economic History*, N.Y.: McGraw-Hill, 1961.

[56] Umemura, Mataji. *Chingin, Koyo, Nogyo* (Wages, Employment, and Agriculture). Tokyo: Taimeido, 1961.

[57] Watanabe, Tsunehiko. "Economic Aspects of Dualism in the Industrial Development of Japan." *Economic Development and Cultural Change*, XIII, No. 3 (April 1965), 293-312.

[58] Williams, Gertrude. *Recruitment to Skilled Trades.* London: Routledge and Kegan Paul, 1957.