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# A QUANTITATIVE ANALYSIS OF WAGE DETERMINATION IN JAPAN\*

by

*Yōko Sano*

## ***1. Preface***

In the preceding part of this paper\* we described the objects of our study, observed institutional structures of wage determination, and presented some quantitative analyses of the mechanism in Japan. The analyses were intended to inquire into the determinants of the so-called "spring offensive" of wage rises, in which equations about the wage level-up in enterprises of major industries were measured. This sequential paper also follows the same line of study but in particular aims to clarify the following points.

(1) In the macro-economic nexus of price-wage-employment, what concern measurements about the determination of the rate of money-wage change are comprehensively called Phillips curve. In this paper I will attempt some theoretical positionings and measurements placing focus on the Phillips curve, in which, however, our approach as the first step will mainly be referred to the relations of wage changes to the variables to explain them, since induction of the problem of price would lead to a too wide expansion of the problem.

(2) Our former determinant equations on the spring-campaign wage offensive were built with the *amount* of wage rise, not the *rate*. This was due to the experienced recognition that labor-management negotiations had been carried out in terms of amount rather than of rate, and the fact that in my trial measurements on a few cases in terms of both amount and rate better results had been shown with regard to the former. In this paper, however, only the rate of wage rise will be discussed since most arguments on the Phillips curve up to date, as well as usual measurements, analyses or planning

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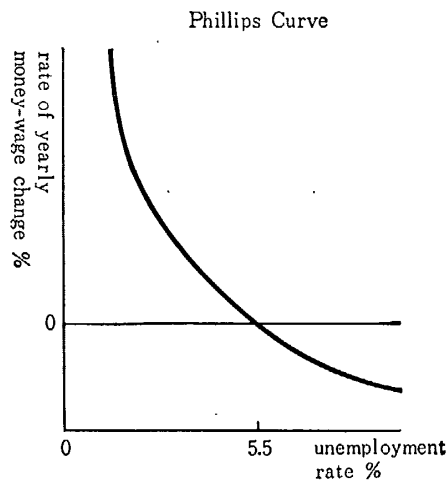
\*This is a revised translation of my paper in Japanese: "Wagakuni Chingin Kettei Kiko no Keiryō Bunseki" *Mita Gakkai Zasshi*, Vol. 61 (July 1968), pp. 767-796, which was from a joint study with Haruo Shimada.

of economic variates, have been conducted on rate-term.

## 2. *Discussions surrounding Phillips Curve*

That between the rate of money-wage change and the rate of unemployment there had been a "trade-off" (inverse) correlation, stable over a long period, was found by A.W. Phillips in 1958. This curve has been called the Phillips curve or, on account of later theoretical fulfilments by Lipsey, the Phillips-Lipsey curve. Phillips discovered, on the base of long-run time series data, that when the rate of money-wage increase is high the level of unemployment rate is low, while the unemployment rate is high when the wage-increase rate is not high, and this relation is not linear but reciprocal. This is an application to money-wage changes the assertion that generally prices of goods and services are determined by their supply-demand positions and the speed thereof depends on the wideness of gaps. In other words, the larger the excess of demand for labor, the higher is the rate of wage increase. Since the volume of excess demand is measurable by unemployment rate, the latter can explain wage changes. Yet unemployment rate alone is not sufficient to explain. A second factor is whether the phase in question involves an increasing demand for labor or a decreasing one. In a phase of booming business condition, hence declining unemployment rate, enterprises take active attitudes admitting also wage level-up. Contrastively when unemployment is growing, they will be reluctant to approve wage-up. Hence the rate of change in unemployment rate must be taken into account. As a third factor Phillips takes the rate of change in retail prices. This is the factor to adjust wages for living costs, so it is suggested that the wage changes are considered in terms of real wages to some extent.

Further theoretical refinings and fulfilments were performed by R.G.



Lipsey. The empirical facts found in Britain as the Phillips-Lipsey curve have henceforth shown developments on various aspects. This theory has attracted wide attention particularly because it was connected with the problems of cost inflation (creeping inflation or wage inflation) experienced in many countries after World War II excepting the postwar recovery period. That is to say, by medium of this Phillips curve it was accepted that there exist definite and unitary relations between money-wage changes, unemployment and price changes. Following Lipsey, theoretical explanations of the curve in more general terms have been given by E.A. Kuska [43]\*, B. Corry & Laidler [47] and others. On the other hand, tests on the curve and measurements of wage-adjustment functions on the base of "unemployment hypothesis," which Phillips-Lipsey implied, have been conducted in a large number in many countries, whose results may be summarized as follows according to an article of Uchida [61].

(1) The prototype of Phillips curve, i.e., unemployment rate as the variable to explain money-wage change, is sometimes significant but sometimes not.

(2) In all countries more effective explanation can be given by a combined set of variables including, beside unemployment rate, consumer price or profit rate, and so on. Especially for America, with a numerous number of calculated cases, the explanatory power of single unemployment rate has obviously declined after War.

(3) Although the data or objects of measurement are varied, utterly contradictory results have been obtained, on which we have not yet any hypothesis or calculation case that can furnish unitary explanations.

These are just the reason why the Phillips curve is still raising new discussions. We shall make some examinations along the line of theories of wage determination, leaving aloof from the voluminous pile-up of measurements. Needless to say these measurements have been conducted on an intention of approaching to the theory of wage determination and further solving the problems of price. Some of them, however, seem to have simply sought better-fitting results falling into a failure in grasping clear theoretical meanings or presenting them in descriptions. This inclination is particularly notable where the measurement has been carried as a part of economic-model calculation. In the below we shall first discuss the problem of "unemployment" vs. "profit" hypothesis on the aggregate level, and then proceed to introduce some of more detailed results, dis-aggregated by industry or region.

Phillips-Lipsey attempted to explain wage changes by medium of unemployment rate because they conceived that it makes a good indicator of excess demand for labor, and that money-wage determination has a close relation with the supply-demand balance in labor markets. Let's call this "unemployment hypothesis." It is not clear how they appreciated institutional aspects

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\*[ ] denotes numbers in the annexed bibliography.

**Results of Measuring on the Phillips Curve**  
(explanatory factors of wage-change rates)

Name of Measurer	Source Period	Explanatory Variables Significantly Measured ([ ] not significant)
U.S.A. Klein	1921-1941 <sup>1)</sup>	unemployment in current term, ditto in preceding term, money-wages in preceding term, time trend
Klein-Goldberger	1929-1952 <sup>2)</sup>	unemployment in current term, change of general price indices in preceding period, time trend
Valavanis	1869-1953 <sup>3)</sup>	unemployment rate, change of general price indices, rate of labor union organization
Dunlop	1929-1952 <sup>4)</sup>	unemployment rate in preceding term, gross profit rate of corporations in preceding term (to sales)
Samuelson-Solow	[13]	unemployment rate
Bhatia	[16]1900-1958	[level of unemployment rate], [change of unemployment rate], change of consumer prices
Bhatia	[24]1935-1959	profit level, rate of profit change
Bowen	[10]1947-1959	unemployment (for long-run term)
Bowen-Berry	[27]1900-1958	rate of unemployment-rate change, level of unemployment rate (as proxy variable for cyclical unemployment)
Eckstein-Wilson	[25]1948-1960	unemployment rate, profit rate, [productivity], [rate of consumer price change] (for trunk industries)
Berry	[34]1947-1960	unemployment rate, change of living costs in the term before preceding, profit rate in the term before preceding, increment in profit rate
Bodkin	[38]1898-1957	change of unemployment and consumer prices, time trend, [profit], productivity (determinant of wage drifts)
Brookings Model	[37]1948-1960	unemployment rate, profit rate, change of prices (time lag of one term), rate of wage change in the last one year
Kuh	[49]1950-1960	productivity
Britain Phillips	[3]1867-1957	unemployment rate, rate of unemployment-rate change, [rate of consumer-price rise]
Lipsey	[12]1923-1957	unemployment rate, rate of consumer-price rise
Lipsey-Stewer	[15]1870-1958	[profit]
Klein-Ball	[6]1948-1956	unemployment rate, price change, [productivity change], [profit rate]

Name of Measurer	Source Period	Explanatory Variables Significantly measured ( [ ] not significant)
Dicks-Mireaux & Dow	[5]1946-1956	index of excess demand for labor (estimate on unemployment and hire), consumer-price indices, [pressure of labor union]
Cowling-Metcalf	[44]1960-1965	spill-over, unemployment-rate change by regions
Hines	[33]1893-1961	consumer prices, [unemployment rate], rate of change in unionization rate, level of unionization rate
<b>Canada</b>		
Kaliski	[30]1946-1958	level of unemployment rate, rate of change in unemployment rate, consumer-price change,
Vanderkamp	[42]1947-1962	level of unemployment rate, change in unemployment rate, productivity, consumer price, [spill-over], [profit rate] above being divided into high-rate unionization sector and low-rate one
<b>New Zealand</b>		
Brownlie-Hampton	1950-1963 <sup>5)</sup>	rate of job vacance, rate of change in general wage schedules, [consumer prices], [productivity], [profit], [profit rate to capital]
<b>Japan</b>		
Klein-Shinkai	1930-1959 <sup>6)</sup>	[unemployment rate], price change,
Watanabe	[53, 55]1929-1964	unemployment rate, consumer prices, bargaining power of union (dummy),
Uchida-Kuribayashi-Yajima-Watanabe	1953-1964 <sup>7)</sup>	unemployment rate, consumer prices
Uchida (Mitsuho)	[61]1955-1965	[unemployment rate], consumer prices

- 1) Klein, L.R., *Economic Fluctuations in the United States: 1921-1941*, N.Y.: John Wiley & Sons, Inc., 1950, p. 121.
- 2) Klein, L.R. and Goldberger, A.S., *An Economic Model in the United States: 1929-1952*, Amsterdam: North Holland Publishing Co., 1955, pp. 18-19, p. 52, p. 91.
- 3) Valavanis-Vail, Stefan, "An Economic Model of Growth: U.S.A., 1869-1953," *American Economic Review*, Papers and Proceedings, (May 1959), pp. 208-221.
- 4) Dunlop, John T., "The Task of Contemporary Wage Theory," *The Task of Wage Determination*, John T. Dunlop, ed., London: Macmillan & Co., 1957, pp. 3-27.
- 5) Brownlie, A.D., and Hampton, P., "An Econometric Study of Wage Determination in New Zealand," *International Economic Review*, October, 1967.
- 6) Klein, L.R., and Shinkai, Y., "An Economic Model of Japan, 1930-1959," *International Economic Review*, IV January, 1963.
- 7) Tadao Uchida, Sei Kuribayashi, Akira Yajima, Tsunehiko Watanabe, *Keizai Yosoku to Keiryō Model*, Tokyo: Nihon Keizai Shimbun-sha, 1966.

of labor markets and pressures of labor unions, but doubtlessly they stressed the importance of supply-demand conditions of labor markets, which have been fairly stable for a long period, as the determinant of wages. A strong point of this unemployment hypothesis lies in the fact that the wage changes over a long period covering almost a century were explained by means of unemployment rate by Phillips and others, and also various results of measurement supporting their explanation for other countries or periods have been obtained. As against this unemployment hypothesis, which assumes a highly-competitive market mechanism where prices move so that supply-demand gaps may be adjusted, there has been emerged another hypothesis which holds that wages are determined by collective bargaining and are independent of market positions. Thus by Kaldor [7] it is more realistic to conceive that wages are determined by collective bargaining between unions and employers rather than that they fluctuate according to excesses of demand. The determination of wages depends on the relative power of bargaining. Relative power is decided by profit in the preceding year. Kaldor says if unemployment or living costs are to affect on wages, it is only through profit, and hence profit is more direct and better to take for the explanatory variable than unemployment is. This view is called "profit hypothesis" as opposite to the unemployment hypothesis. By the profit hypothesis, profit represents ability to pay wages, and a larger profit means a larger cost of strikes to be incurred by enterprises, while larger ability to pay may bring forth larger pressures for wage rise by workers or the general mass of people. In any way, the larger the profit is, the higher will the wage rise be. Kaldor merely suggested a hypothesis but subsequently measurements to testify it were tried by Lipsey-Stewer [15] utilizing British data. Their results showed, however, that unemployment is more effective to explain wage changes than is profit, supporting the unemployment hypothesis. Yet by the numerous measurements on the base of American data the unemployment hypothesis has not always been attested. It is Bhatia who has first attempted measurement on the basis of both opposite hypotheses [16, 24]. There, instead of the level and change of unemployment rate, those of profit were more significant in explanation. Later there have been results that negate the unemployment hypothesis, for example Hines [33], yet at the same time those are few that stand for the profit hypothesis alone. Cases of measurement are increasing in which—instead of looking as opposite—both hypotheses are employed, taking a direction toward increased explanatory variables to elevate the explanatory power. And, in many cases price is included as a second variable into both unemployment and profit hypotheses.

In the end the discussions around the Phillips curve on the macro-level are not likely to show further progress. To increase the number of explanatory variables merely for elevating the explanatory power will lead to theoretical unreasonableness, while it will be difficult to say these variables are mutually independent on the macro-level perfectly. It might be a way of

evading this problem to formulate an econometric model, yet at the present state of study what could be done is at most to find conformity between available data and various equations, still hopeless is to constitute a model plausible as the equation of wage determination. On the other hand, either the "excess demand for labor," on which the unemployment hypothesis is based, or the "ability to pay," which the profit hypothesis is to represent, is of high-degree abstractness. Selection of actual indicators would pose a problem that might govern the results of measurement. Dicks-Mireaux & Dow [5] look "unemployment rate" as improper for the indicator of excess demand for labor. Even if the indicator is found in unemployment rate as in the unemployment hypothesis or in profit as in the profit hypothesis, these would show substantial differences according to definitions or methods of measuring. So such equations must be formulated that, while preserving theoretical conformity, can serve conveniently as an actual indicator.

Here brief comments will be made about the effects of those variables that are not involved in the unemployment and profit hypotheses. Prices, consumer prices and living costs have been taken into consideration in most measurements yet their implications are not so clearly described. Insofar as the implications are defined, they can be grouped under three standpoints. The first one of relatively early type holds that prices must be taken up as the adjustment term of money wages since wages can have significance only as real wages. This view has been taken by Phillips-Lipsey [3, 12]. The second is a standpoint that negates the role of prices as in Eckstein-Wilson [25]. They maintain that price changes have no theoretical ground to explain wage changes because, excepting periods of severe inflation, labor will not always show response to prices while on the side of management there will be no need to raise wages in accordance with price rises. The third view, which is common with the implication in the profit hypothesis, insists that consumer prices find stronger response in wages where pressures from labor unions are more powerful, on account of the practices of unions that they use prices for the basis of wage rise or enter agreement of escalator clause. This view is most distinct in Vanderkamp [42] to be observed later. And, a theory involving another factor is the "productivity hypothesis" advocated by Kuh. He has introduced productivity as the factor affecting the demand curve for labor and obtained better results of measurement by the unemployment or profit hypothesis. Of course Kuh is not the first one who has thought of productivity, yet its significance in the wage theory is quite unobvious; whether he denies adjustments by market competition as in the unemployment hypothesis or affirms it, and whether he holds that wages are determined by the bargaining power as in the profit hypothesis.

I entertain a feeling that the above-observed discussions on the macro-level have now reached a limit. Different contrivances may be required to preserve the independency between explanatory variables, while doubts exist



on the reliability of data unless more detailed analyses are put on. So far I have mentioned nothing on the rate of wage change, the dependent variable. Throughout all the countries observed the situation is similar that the aggregated average wages present deviations from the concept of wage rate. On the same individual wage rates, the average wages may change with a change in manpower composition and/or a change in over-time hours. In respect of this condition, some recent analyses on the dis-aggregated level are of interest. To leave the macro-level may be said a step toward the goal, if viewed from the intention of Phillips and other subsequent researchers who have pursued the determinants of wage changes, although it is problematic whether this can be called a development of the Phillips curve. On the *micro*-level, or sometimes in case studies, empirical researches of wage determination have been undertaken substantially, if not always by econometric methods, and naturally not in connection with prices. Here we shall review only those econometric analyses based on dis-aggregation from the macro-level. Their contents, however, show close approximation to those on the macro-level. This is a phenomenon particularly observable in America. Such a linkage of studies between economists, standing on the Phillips curve consciousness, and labor economists, who are partially related to labor-management theories, will make a good mutual contribution.

The dis-aggregated analyses (structural approach) to be reviewed here comprise those of (1) Eckstein-Wilson, (2) Cowling-Metcalf, and (3) Vanderkamp. It is interesting to note that all of them take the "spill-over" (extension over other sectors) of wages into consideration. So they may be said a spill-over hypothesis. Putting aside the point whether this spill-over phenomenon is conceivable as independent of the adjustment mechanism of labor market or is taken to involve the unemployment hypothesis it should be said near to the profit hypothesis since it is set up on the basis of institutional role of collective bargaining. A feature of difference from the profit hypothesis is, however, that, distinguishing spill-over *effecting* sector and spill-over *effected* sector, in the former—the so-called key sector—the profit hypothesis is taken to apply, while the latter follows determinations in the former. So this hypothesis actively appreciates the role of collective bargaining, leading to a thought of "pattern bargaining." Letting alone possible contradictions to or duplications with either the unemployment or the profit hypothesis, it may be said a theory going a step ahead of the macro-views.

(1) Eckstein-Wilson Model [25] (U.S.A.)

This is a model based on the spill-over hypothesis that a wage determination in the key sector spills over the non-key sector. Hypotheses concerning the wage determination in the key sector are well known, as are repeated below.

- 1 Wages are determined under collective bargaining.
- 2 Markets of both products and labor affect wage determination.
- 3 Most part of changes of wage-rise rate can be explained by profit rate and unemployment rate.
- 4 Wage determinations within heavy-industry group are interdependent.
- 5 Wages are determined at wage rounds.

On such assumptions measurements were tried on a theme that the wage-change rate of heavy-industry group is determined by the unemployment rate and profit rate for respective units of wage-round. Although the sample size was small ( $n=5$ ), the results were statistically significant in respect of standard errors of the multiple correlation coefficient and partial regression coefficients. It should be highly appreciated that their hypothesis is very full of suggestion and has worked no small influence on the later studies.

(2) Vanderkamp Model [42] (Canada)

Whether unemployment rate or labor productivity or consumer prices, all were adopted by Vanderkamp for the determinants of wage-rate change in the sense that these work effects on the bargaining power of labor and management. These indicators were used for the reason that, beside being pure market factors, they make the objects of bargaining as the basis of wage determination. Next he divided labor markets into two sectors — that is, industries with more than 40% of union organization (mining, manufacturing, transport, construction, electricity-gas-water utilities) and those with lower organization ratio (agriculture-forestry, commerce, finance, services), and made measurements on each sector with unemployment rate, its change, productivity change, consumer-price change for the explanatory variables. Naming the two sectors as organized and unorganized groups, the former has larger coefficients for both changes in unemployment rate and consumer prices. In particular as for consumer prices the coefficient in the unorganized group is not significant, suggesting that the connection between consumer prices and wages is maintained through the power of labor unions. And in the organized group productivity change is significant while unemployment change is not significant: in the unorganized group the latter is significant while the former is non-significant. Vanderkamp revealed that the expected results are different between the two groups, that is to say, in the unorganized group the expectation is dependent on the change of unemployment rate while in the organized group it is represented by the change in productivity. He further measured the effects of profit rate in the Eckstein-Wilson Model but the result was not significant. And he attempted to testify the spill-over hypothesis as a formula that the wage determination in the organized group affects that of the unorganized group, but this also was not significant.

(3) Cowling-Metcalf Model [44] (Britain)

Cowling and Metcalf contrived three models using regional data. In Model-1 it is assumed that the rate of wage change in a region is explained by the regional unemployment rate and its change. However, since a wage change in a region is not independent of unemployment rates of other regions theoretically seen, in Model-2 nation-wide unemployment rate is used instead of regional rate, leaving the rate of change as it is. Model-3, which is a substitute of Model-1, assumes that wage change in regions with high growth of demand for labor is determined by the supply-demand balance of labor there (unemployment rate) whereas in regions of low growth rate of demand wages are affected not only by the unemployment rate of the region but also by spill-over effects of the former-said region. By the tests on these three models intensive relations were found between wage change and unemployment-rate change, but significant results were not derived as for unemployment-rate level. However, the spill-over effects on wages due to the difference of the growth rates of demand for labor was measured significantly. It is not clear which hypothesis (unemployment or profit?) is actively supported in conclusion, and what contributions have been made by this model to the wage determination theory, yet it is interesting that they have tried disaggregation on the level of region and pointed out greater dispersion among regional unemployment rates than that among wage changes.

### *3. Quantitative Analyses of Wage-Change Rate in Japan*

#### *1. Phillips curve in Japan*

The measurements of the Phillips curve in Japan are not numerous, as is shown in the list in the previous section. From among them, I will introduce four cases of Klein-Shinkai, Watanabe, Ono and M. Uchida.

(1) Klein-Shinkai model

In this model an explanation of the wage-rate changes for a period 1930–1959 (excluding 1937–50) was attempted adopting the unemployment hypothesis and using two variables of price change and unemployment rate. By the result, however, the coefficient of unemployment rate was not significant, and also fitness as the whole was not good.

(2) Watanabe model [55]

In the Watanabe model, unlike Klein model, explanation was tried separating prewar (1929–39) and postwar (1955–64) periods. Rates of money-wage changes (wage indices of regular employees) were explained by means of unemployment rates (Monthly Estimates of Unemployment for prewar, and unemployment insurance statistics for postwar) and consumer prices. For both periods the two variables were found significant, but the constant term and the effectiveness of unemployment on wage adjustments are varied between prewar and postwar periods. Wage changes in the unemployment hypothesis

are more inelastic in the postwar period. It makes a problem whether this can be taken to be a difference due to the power of labor unions. Watanabe tried to explain this difference by the rates of unionization and labor-dispute participants but was not successful, he says.

(3) Ono model [60]

As to the dependent variable, wages, Ono first estimated wage indices in manufacturing with fixed weight (industry, age, sex, firm scale) in order to eliminate the effects of structural changes in manpower. As for the explanatory variables he considered (1) rate of change in profit-sales ratio in manufacturing, (2) rate of change in profit-capital ratio in manufacturing, (3) level of profit-sales ratio in manufacturing, (4) rate of change in value-productivity per hour in manufacturing, (5) rate of change in the consumer-price index in all cities, (6) rate of labor-dispute participation in manufacturing and (7) ratio of applicants to opening jobs (for each year from 1954 to '63). The result showed that the effect of labor dispute is overwhelmingly large compared with price, supply-demand balance of manpower, ability to pay, and structure of manpower.

(4) Uchida model [61]

On the data of 1955 to 1965 (quarterly), the growth rate of changes in wages per employed worker was explained by perfect-unemployment rate (in Labor Force Survey), rate of change in consumer prices and growth rate of labor productivity. All the three variables showed satisfactorily explanatory power. Yet Uchida proceeded to divide the period into pre-1959 and post-1959, the latter being the rapid-growth period, and examined whether the situations were the same for both the periods. Then it was found that either for 1955-59 or 1960-65 neither the coefficient of unemployment rate nor that of productivity growth is significant, only consumer-price change is conformable. And also the multiple correlation coefficient is not significant at 5% level. So it is supposed that he derived superficial correlations in the former case due to pooling of data which are primarily in no correlation. Anyhow, in Japan as well as in the foreign countries the explanatory power of the unemployment hypothesis is weak after the war. This is supposed to correspond to the increasing market power of trade unions. On these points Uchida concluded that more detailed studies were to be made.

## ***2. Problems concerning the measurements in Japan***

Also in Japan the results have been varied according to periods covered, data, or combinations of variables. Common and stable relations can be observed only with consumer price. As to the unemployment hypothesis two opposite standpoints are seen, proponent (Watanabe, Ono) and opponent (Klein-Shinkai, Uchida). In Britain the Phillips curve first came under discussion in 1958, thereafter studies of that kind being piled up, while in Japan it is only after 1965 that such measurements have been conducted. True we have

an advantage of utilizing those pioneer works in foreign countries, yet it must be said that there still exist gaps as against American or British levels. So some points shall be mentioned about the gaps that must be filled at the present.

(1) Trials have been few to test the profit hypothesis or spill-over hypothesis actively. This relates to the poor theoretical examination of ours on the Phillips curve as well as the mechanism of wage change. In particular, the power of labor unions in wage determination and the role of collective bargaining appear to have been given up in all the models. In the United States, however, on these points there are numerous fruits of study as either quantitative or qualitative analysis. Instead of importing only the mechanical aspects of measurement of Phillips curve, its implications in the nexus of backgrounding wage theories must be considered. In order to weigh the effects of trade unions on wage determination and further the effects of the series of social-institutional structures, our study ought not to be confined to macro-economic researches but be linked with micro-institutional studies.

(2) A second problem concerns the data. Although some examinations have been made in the said Ono model on the measurement of wage series or explanatory variables, generally examination of data is not intensive. This is a theoretical problem in the other face of coin. What a range of average wages should be covered for wage changes? What a kind of indicator should be adopted to represent the supply-demand conditions of labor markets of Japan where there is a large amount of under-employment? And isn't there any difference among the statistical series of the same variable? And, if exists, why? In short it is urgently desired to coordinate and arrange basic data for the aim of analyzing the mechanism of wage changes.

### ***3. Functions of the labor market and wage determination***

In connection with the mechanism of wage changes, the theoretical scheme of wage determination may be described in brief as follows.<sup>8)</sup>

(1) If a labor market is in a state of perfect competition as assumed in economics, that is, if labor is perfectly free to move and no frictional elements exist, the mechanism of wage determination is simple. Wages, the price of labor, are determined sheerly by the supply-demand balance of labor; hence equivalent wages to equivalent labor. If the balance moves in the static sense, at once wages and employment volume change. Putting aside the speed of adjustment to extra demands, the relation is that wages show a linear change with a shift of supply and demand curves. Phillips has assumed the unemployment hypothesis as a primarily dynamic process. In this sense it does not necessarily stand opposite to the profit hypothesis which is primarily

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8) The following discussions are treated in more details in Y. Sano, *Pattern Bargaining to Chingin no Heijunka* ("Pattern Bargaining and Wage Standardization"), *Mita Gakkai Zasshi*, Vol. 60, No. 4, April 1967.

static. However, it is also possible to treat the unemployment hypothesis as a static process. To consider in the sense of relation between supply-demand balance and wages, it may be conceived that it is the balance in the whole economy, not individual industries or enterprises, that affect wages. Important is the fact that wages change only in accordance with the supply-demand position of labor market that corresponds to the whole economy, irrespective of industries or enterprises in which the relevant workers are being employed. In this sense, under perfect competition neither the profit hypothesis nor the spill-over hypothesis can theoretically establish itself.

(2) In the reality, however, labor markets cannot be perfectly competitive. Beside the inherent low mobility of labor as compared with other goods, impediment factors have been intensified by the advances of economic society, that is to say, workers' attachment to enterprise has been increased by economic-technical requirements on the one hand, and developments of labor unions or other institutions on the other. Such attachment is higher for trunk labor of production than for simple labor. In the case of some skilled labor, mobility is high among those workers who have techniques of popular use, while low for such particular type of labor force that is brought up within a firm. It is not easy to see that actual labor markets are perfectly competitive. However, an important point is that not all labor force is uniformly immobile; between two polars of the most attached stratum and the most mobile one, there are observed various, continuous grades. In cases of the stronger attachment the effects of supply-demand relation of the labor market are worked more indirectly and with larger span of time lag. And particular conditions of individual industries or enterprises are conceived to be more tightly linked with attached labor. So in this case the utility of the unemployment hypothesis is supposed to become minor. It is under a situation where such attached labor force is combined with collective bargaining system that the profit and spill-over hypotheses must be induced.

(3) Taking generally, labor markets comprise high-wage labor of big enterprises or male trunk labor and labor of smaller enterprises and female simple labor. It may be possible to simplify the matter in such a way that wages of attached labor are in most cases determined by collective bargaining while those of mobile labor by supply-demand positions of the labor market. The mechanism of determination of bargaining-wages may be clarified by analyzing the structure of pattern bargaining. Even attached labor, however, cannot be wholly independent of the effects of competition in labor markets. (Of course, on the other hand, wages of mobile labor cannot be free from the spill-over effects.) In this sense examination of the unemployment hypothesis is required, too.

In economics, price determination under imperfect competition is primarily indeterminate. It is thinkable that the discussion to clarify this indeterminateness has shown the biggest progress with respect to the price of labor.

In the below the wage changes in big enterprises of thirteen industries, the so-called key group, which make the core of the spring campaign, will be studied, in which it is assumed that these concern the attached stratum of labor and the wages are determined within the framework of collective bargaining, being in principle separated from the condition of labor markets. In this sense our analysis stands on the profit hypothesis of Kaldor, but the spill-over hypothesis will also be employed since spill-over phenomena are observed also in this sector as is obvious from the structure of pattern bargaining. Again, for an intention to measure the effects of labor markets with some indicators, the test of the unemployment hypothesis will be involved.

#### *4. Determinants of wage-change rate*

Our analysis refers not to the rate of change in the aggregated average wages assumed in the normal Phillips curve, but the wages of attached labor of big enterprises (mainly male) that plays leading part in the determination of bargaining-wages in Japan by, e.g., participating in the spring offensive. This study is expected to be a further step of the several studies we have made previously [56, 59, 62], in which particularly intended are (1) mechanism of wage change in the rate, not amount, (2) effects of the supply-demand relation in labor markets upon the determination of bargaining-wages, (3) examination of the effects of price-rise rate, (4) examination of the indicator of ability-to-pay, and (5) reexamination about the period prior to 1960.

Here a word shall be spoken on unemployment rate. On the question whether unemployment rate can serve as an indicator of excess demand for labor, both affirmative arguments from Phillips side and negative views represented by Kaldor have already been mentioned. Let us consider the problem confining it to the case of Japan. As the data of unemployment rate after the war we have "perfect-unemployment rate" by the labor force survey and "rate of unemployment-insurance benefits" (ratio of unemployed persons for whom benefits were paid to total insured workers). Movements of the two are shown in Figure 1. The level of unemployment rate in Japan is extremely low compared with other advanced countries. A problem may lie in the definition and measurement of unemployment. Yet such unemployed who are perfectly income-less are very rare in Japan. What is meant by the perfect-unemployment that fluctuates between 1.4% and 0.8%? As to the contents of the unemployment-insurance benefit rate, benefits for retiring women and seasonal workers are known to account for a large portion. The movement of benefits for seasonal workers is more closely linked with business cycles than that of retiring women. In the above said Watanabe model this insurance-benefit rate was used to testify the unemployment hypothesis. In other models the perfect-unemployment rate was used, yet without showing good results. This is because wage-change rates correspond to business cycle in appreciable closeness. By our computation, the simple correlation co-

efficient between the average wage-rise rate in nongovernment sector (by the Labor Administration Bureau of Ministry of Labor) and unemployment rate, it is 0.687 for the insurance-benefit rate and 0.543 for the perfect-unemployment rate (yearly computation for eleven years 1956 to 1966). The correlation to the perfect employment is not significant, but to the insurance-benefit rate significant, at 5% level. Possibly this difference was the element that influenced on the Watanabe model in deciding whether the unemployment hypothesis is supportable or not. If so, he would have obtained better results for the average wage changes if, in place of the insurance-benefit rate, a more business-sensitive indicator such as profit had been employed. This involves a common point with Kaldor's criticism to Phillips, and is not to be looked theoretically improper, though depending on the views on labor markets.

We abandon the general concept of unemployment rate in the measurement of effects of the labor market, and instead adopt employment change, which in a sense corresponds to the unemployment rate by industry of Eckstein.<sup>9)</sup> That is to say, enterprises with smaller increase in employment are conceived to be affected less distinctly by labor markets than are enterprises with larger increase, since labor markets work effect through new hire. Of course this is also an unsatisfactory indicator. Suppose that an enterprise wanting employment increase abandoned new hire on account of a sharp rise of wages, then it would be conceived to have been little affected by labor markets due to its small increase in employment. However, it seems rather unrealistic to assume that even under such a situation demands for labor are not sensitive to wage levels among big enterprises. So we use growth rates of employment by industry for the indicator of the factor of labor market conditions by industry. As is seen in Figure 2, which shows only one industry, the growth rate is measured as of end-2nd-half of year-before-last *vs.* end-2nd-half of last year (similarly for all industries).

Now let us consider the factors that affect wage determination in collective bargaining on the basis of the profit and spill-over hypotheses. In the above it has been observed that, in the case of attached labor, business conditions of individual industries or enterprises exert much effect. To speak exactly, however, what is affected by business conditions surpassing the bounds of management units (here enterprises) ought to be taken as spill-over rather than ability-to-pay. And even among enterprises with different degrees of ability-to-pay, if competition on the same labor market is assumed, the competition may be sufficient to explain, needless to mention spill-over effects. Anyhow it appears that the competition can be most effectively measured by the actual in-and-off of workers.

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9) The idea of unemployment rate by industry as in the Eckstein-Wilson model is difficult to understand unless labor markets are organized by industry. Yet it may be more appropriate than the general unemployment rate where, as in the United States, lay-off and hire are carried according to seniority.



And, since the unit of measurement is industries (by two digit grouping), it is assumed that, detracting within-industry spill-overs, the profit by industry shows ability-to-pay and the profit of whole-industry represents spill-over effects, as regards wage changes by industry. To take the two-digit profit for the indicator of pay-ability and the whole-industry profit for that of spill-over could be conformable only when the two are used contrastively; it would be an inadequate indicator if only either one is used. As for the indicator of profit, unlike other variables, there are too many ways of measurement possible, whose selection would pose a problem. For this aim, we chose a series of profit data that can most clearly explain wage-change rate, rather than making a selection *a priori* theoretical, which is shown in Figure 3. Two concepts of profit have been considered — “amount of net current profit” and “rate of return to total capital.” The net current profit seemed more conforming to wage-rise rate, but the calculation of its growth rate on the industry concerned was unable to carry smoothly, showing minus values perhaps due to technical problems. So “return rate to total capital,” which resembles most closely profit indices of foreign countries, was applied to the whole-industry and industry concerned. An interesting fact here is that, by any indicator, the speed of response to profit appears to have changed with about 1962 as the turning point, that is to say, the wage changes as against the profit-increase rates prior to 1962 took longer time of adjustment than in the later period. So as the rate of increase in “net current profit” for the pre-1961 period the rates of 2nd-half of year-before-last over 2nd-half of year-before-last-last were used, and for 1962, the turning year, average values of preceding and later years were applied.

Consumer's prices are considered to make an independent factor similarly with labor-market conditions, ability-to-pay or spill-overs from outside, because here the matter concerns wage determination under collective bargaining. As has been pointed out by many studies it can be conceived that changes in living cost are sensitively reflected in wages just because of collective bargaining. (Refer Vanderkamp, [42]). But here comparison with case without labor unions was not attempted.

Lastly some remarks shall be made about the dependent variable, the rate of wage change. Although data are dis-aggregated ones by industry, wage-rise rates by bargaining are exclusively used in order to evade the problem relevant to the aggregated average wages. They are simple averages of the rises by industry negotiated on the level of respective unions. Since the denominator, the base wages, is weighted average, the problem of average wages is not perfectly evaded. And, the ultimate rate of rises (rate for all employees) is unascertainable since distributions to individual workers are not always uniform. However, the rate of rise by bargaining is much more competent to the concept of wage rate than is average wage by the Monthly Labor Survey, and represents just the data of bargaining wages of attached

labor, so this was adopted.

Simple correlation coefficients between the variables are shown in the table below. On these values thirteen combinations of variables were formed, and, pooling time series and cross sections, coefficients of the variables were estimated by least squares method. The results are shown in the table.

Simple Correlation Coefficients (13 industries × 12 years)

	n=12 X <sub>1</sub>	n=12 X <sub>2</sub>	n=13 X <sub>3</sub>	n=12 X <sub>4</sub>	n=12 X <sub>5</sub>	n=13 X <sub>6</sub>	n=13 Y
X <sub>1</sub> profit-increase rate of whole-industry	1.000	0.182	0.098	-0.248	0.595*	0.226*	0.406**
X <sub>2</sub> employment-increase rate of whole-industry	0.182	1.000	0.374**	0.240	0.523	0.255**	0.062
X <sub>3</sub> employment-increase rate of industry concerned	0.098	0.374**	1.000	0.084	0.173	0.457**	0.300**
X <sub>4</sub> price-rise rate	-0.248	0.240	0.084	1.000	-0.132	-0.134	0.278**
X <sub>5</sub> total-capital-return rate of whole industry (after tax)	0.595*	0.523	0.173	-0.132	1.000	0.386**	0.307**
X <sub>6</sub> capital-return rate of industry concerned (after tax)	0.226*	0.255**	0.457**	-0.134	0.386**	1.000	0.326**
Y wage-change rate	0.406**	0.062	0.300**	0.278**	0.307**	0.326**	1.000

\*\*significant at 1% level, \*significant at 5% level

(The 13 two-digit industries comprise private railway, steel, electrical machinery, shipbuilding, metal goods, electric wire, vehicle, chemical, oil, cement, paper & pulp, coal, and electric power. For some years data are lacking.)

Contents of Variables

X <sub>1</sub>	profit-increase rate of whole-industry	2nd-half/2nd-half 1963 and after .....1967-1966/65 1966-1966/64 1962 .....(1961/60+1960/59) ÷ 2 1961 and before .....1961-1959/58	Bank of Japan, <i>Shuyō Kigyō Keiei</i> <i>Bunseki</i>
X <sub>2</sub>	employment-increase rate of whole-industry	2nd-half last year/ 2nd-half last-last-year 1967.....1966/60 1966.....1965/59	do
X <sub>3</sub>	employment-increase rate of industry concerned	do	do

$X_4$	price-rise rate	rise over last year	Statistics Bureau, Prime-Minister's Office, consumer price index.
$X_5$	capital-return rate of whole industry (after tax)	2nd-half last year Y: 1956-2nd-half 1955 1957-2nd-half 1956	Bank of Japan, do
$X_6$	capital-return rate of industry concerned (after tax)	do	do
Y	wage-change rate	increase over last year	Ministry of Labor, <i>Shuyō Rōso no Shunki Chin-age Jōkyō</i>

## Result of Measurement

theoretical equation  $Y = a_0 + \sum a_i X_i$ 

case	$a_0$ constant term	$a_1$ $X_1$	$a_2$ $X_2$	$a_3$ $X_3$	$a_4$ $X_4$	$a_5$ $X_5$	$a_6$ $X_6$	R multiple correlation coefficient	$\bar{R}$ multiple correlation coefficient adjusted for d. f.	d. f.	covered year
1	9.54 (±0.40)		-0.0694 (±0.1081)	0.154 (±0.044)				0.304 **	0.280	127	1956~1967
2	8.71 (±0.30)	0.0395 (±0.0081)		0.126 (±0.037)				0.482 **	0.470	127	1956~1967
3	6.45 (±0.52)	0.0497 (±0.0077)		0.106 (±0.034)	0.485 (±0.095)			0.604 **	0.592	126	1956~1967
4	11.46 (±1.41)	0.0305 (±0.0185)		0.138 (±0.036)	-0.311 (±0.216)			0.586 **	0.563	74	1962~1967
5	4.65 (±1.47)					1.37 (±0.58)	0.554 (±0.202)	0.381 **	0.362	127	1956~1967
6	3.77 (±1.56)		0.576 (±0.201)			-0.183 (±0.114)	1.88 (±0.65)	0.403 **	0.377	126	1956~1967
7	4.87 (±1.46)			0.355 (±0.221)		0.0918 (±0.0437)	1.38 (±0.57)	0.417 **	0.393	126	1956~1967
8	3.24 (±1.40)			0.702 (±0.208)		0.0685 (±0.0371)	2.19 (±0.56)	0.641 **	0.625	87	1961~1967
9	2.22 (±1.51)			1.580 (±0.536)	0.490 (±0.210)	0.0629 (±0.0416)	0.421 (±0.100)	0.525 **	0.502	125	1956~1967
10	9.05 (±0.37)	0.0415 (±0.0082)	-0.149 (±0.100)	0.148 (±0.040)				0.496 **	0.478	126	1956~1967
11	6.73 (±0.51)	0.0555 (±0.0076)	-0.304 (±0.092)	0.147 (±0.035)	0.573 (±0.095)			0.645 **	0.630	125	1956~1967
12	6.55 (±0.53)	0.0526 (±0.0079)			0.518 (±0.097)			0.563 **	0.554	127	1956~1967
13	6.74 (±0.54)	0.0565 (±0.0081)	-0.171 (±0.092)		0.574 (±0.101)			0.579 **	0.566	126	1956~1967

\*\* significant at 1% level.

What are observed in the results may be summarized as follows:

(1) The rate of employment increase by industry, the labor-market factor, generally works significantly. The employment by two-digit industry should naturally affect with higher significance than that of the whole-industry since the former relates more directly. In order to test this, both employment data were contrasted, showing almost expected results. The whole-industry data are far worse, showing sometimes minus values, than the two-digit-group figures.

(2) The rate of price rise is also generally significant. By the addition of price, overall fitness was greatly improved. If the period is confined to post-1961-1962, however, price does not affect.

(3) Among the thirteen cases of measurement No. 3 and 8 presented

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 Standardized Values of Coefficients
 

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Case 3	
Rate of profit increase of whole-industry	0.48
Rate of employment increase of industry concerned	0.22
Rate of price rise	0.38
Case 8	
Rate of return to capital of whole-industry	0.17
Rate of return to capital of industry concerned	0.35
Rate of employment increase of industry concerned	0.33

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comparatively good results, for which relative values are as below.

#### 4. Conclusion

As above the mechanism of the determination of wage-rise rate for the key-group labor in the spring-offensive bargaining has been clarified to some extent, although it is doubtful if this could be called a link of chain in the measurement of Phillips curve in Japan. In this study the unemployment hypothesis of Phillips is taken in a static form, the supply-demand position of the labor market being shown by unemployment. Actually, however, the tightness of labor market affects on bargaining through new hire, so in this sense the employment increase has been adopted for the indicator of labor market competition. This corresponds to the so-called "competitive hypothesis" in the field of labor economics, rather than the unemployment hypothesis. In conclusion it may be said that the wage changes in Japan can be best explained by a combination of the spill-over hypothesis, including the profit hypothesis, and the competitive hypothesis. The weight of such competitive hypothesis in the whole structure, however, must be fairly small in the case of Japanese key sectors, too, as has been shown in postwar America. Yet this means that consumer prices exert effect through bargaining, not that on the contrary wage changes affect prices. I wish to repeat that the scope of this study is nothing but the determinants of wage changes.

Figure 1. Wage-Rise Rates and Unemployment Rates  
(wage rises under major bargaining)

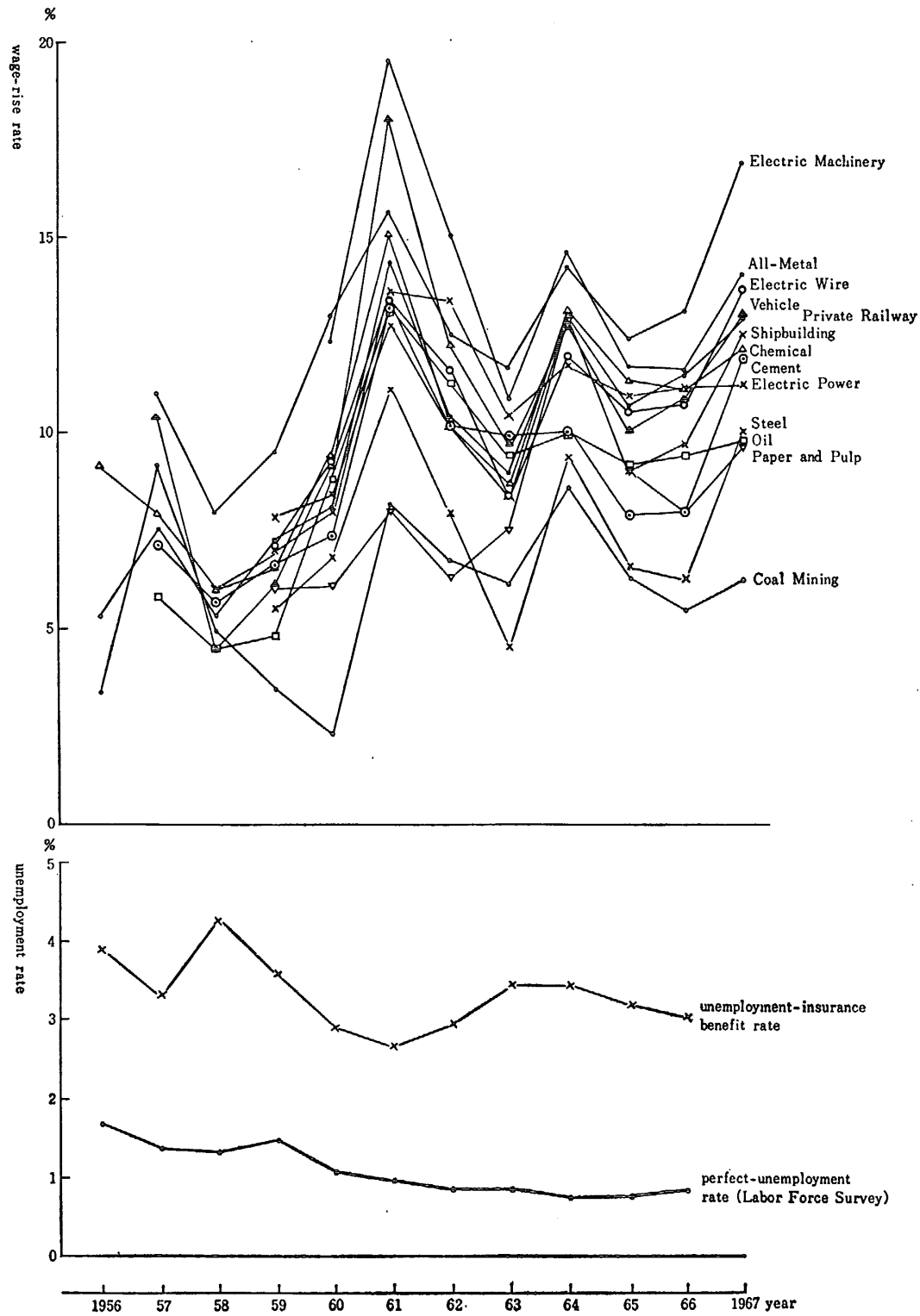
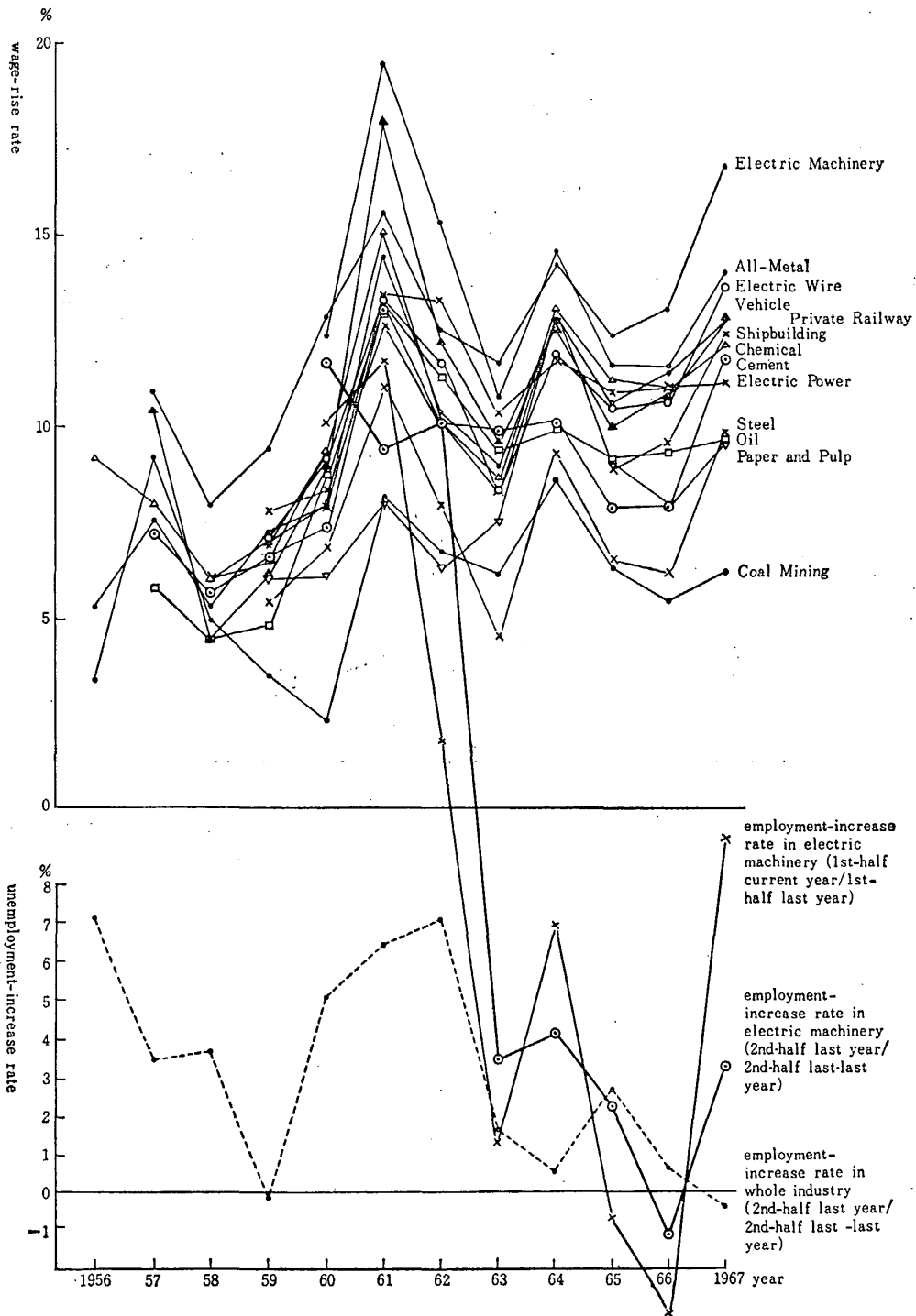
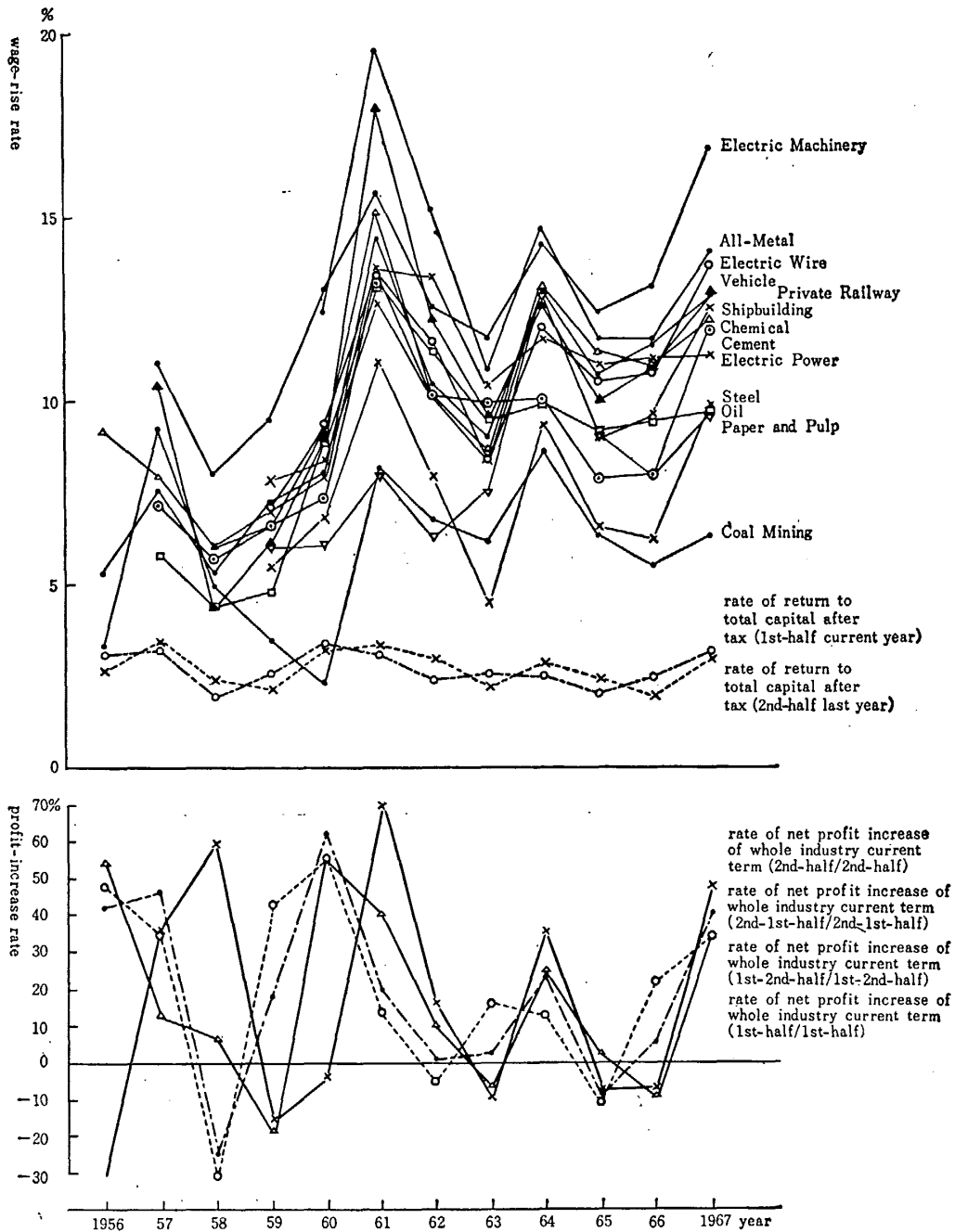


Figure 2. Wage-Rise Rate and Employment-Increase Rates  
(wage rises under major bargaining)



Source: Bank of Japan, *Shuyo Kigyo Keiei Bunseki*.

Figure 3. Wage-Rise Rate and Profits  
(wage rises under major bargaining)



net profit of whole industry for current year term.  
 [1st-half/1st-half] 1956~1961: 2nd-half last-last year/2nd-half last-last-last year  
 1962: (2nd-half 61/2nd-half 60+2nd-half 60/2nd-half 59)÷2  
 1963~1967: 2nd-half last year/2nd-half last-last year  
 [2nd-1st-half/2nd-1st-half] (2nd-half last year+1st-half current year) (2nd-half last-last year+1st-half last year)  
 [1st-2nd-half/1st-2nd-half] 1st-2nd-half last year/1st-2nd-half last-last year  
 [1st-half/1st-half] 1st-half current year/1st-half last year

Source: Bank of Japan, *ibid.*

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