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THE INCIDENCE OF CORPORATION INCOME TAX IN JAPANESE INDUSTRIES, 1920–63

SEIJI FURUTA

INTRODUCTION

This work aims at measuring positively and analytically, by the construction of new models, the incidence and the shifting of corporation income tax by different industries.

The positive analysis of corporation income tax incidence has been developed mainly in the United States. The application of such models as the Krzyzaniak-Musgrave Model (13), the Kilpatrick Model (12), and the Gordon Model (8) has produced persuasive results.(1)

The author has applied these American models to some corporate industries in Japan, and has discovered that while suitable for American industries, they are not always quite appropriate in the Japanese case.(2)

So, this work, taking into consideration to the structural difference between the markets of these two countries, attempts to find the degree of shifting by each different industry, rather than trying to find one which could be applied to the whole of Japanese industry.

I. THE TRANSITIONS OF CORPORATION INCOME TAX ,RATE OF RETURN ON CAPITAL, AND CORPORATE PROFIT SHARE IN JAPAN

Before the development of precision metric analysis, the author had to resort to the primitive method of positive analysis.(3) He was induced to do so as he felt that a conspicuous rise in corporation income tax would similarly occur in Japan as in the United States over the period before and after World War II.

The transition in the effective rate of corporation income tax in Japan was no more than 6 percent in the closing years of the 1920's. During the quasi-war period, it began to rise, and it reached as high as 50 per cent in the closing period of the war. After the war, although it did not go above the 50 per cent level, it rarely fell below 40 per cent.

(1) Numbers in parentheses refer to works listed in the Bibliography.

(2) Refer to the following publications for the existing conditions of the positive analysis of corporation income tax shifting: M. Krzyzaniak and R. A. Musgrave (13), Seiji Furuta (6), R. J. Gordon (8). Also, consult the Appendix for the application results of these models. This preliminary essay was written with the belief that this would help to put an end to the controversy on the positive analysis of tax shifting. Yet, any correction or criticism is welcome for its improvement. Thanks are due to Mr. Masahiro Kuroda who helped the writer in computing the model figures. This work has been made possible by a grateful grant from the Keiogijiku Study Encouragment Fund.

(3) Refer to Seiji Furuta (4).

In the second place, an examination of the transition in the rate of return on capital over the period before and after World War II, shows that it rose along with the rise of the corporation income tax rate, and that the rate of return on capital after tax was pretty much the same as it was before the war. This trend can similarly be seen in the rate of return on equity capital. (See Table I).

TABLE I. INDEXES OF THE RATES OF RETURN ON CAPITAL AND PROFIT SHARE, PRE-WAR AND POST-WAR

Items / Years	Corporate Profit Share (Current Profit/Sales)	Corporate Rate of Return			
		Gross Rate of Return on Total Capital[a)]		Rate of Return on Equity Capital[b)]	
		I	II	After Tax	Before Tax
1935, 2nd half	9.94%	9.27%	12.30%	11.22%	13.22
1957, 1st half	10.83	12.24	16.21	15.55	25.51
1958, 1st half	8.20	8.21	12.09	7.89	13.18
1959, 1st half	9.99	9.68	14.03	11.05	18.72

Sources: The Inquiry Commission on the Taxation System: Explanation of the Contents and Process concerning the Replies and Discussion on the Pressing Reform in the Taxation System, 1960, p. 109. The Mitsubishi Economic Institute: Growth and Profitability of Firms, 1961, p. 40, p. 58.

a) gross rate of retorn on toral capital I (II) $= \frac{[\text{net profit} + \text{taxes} + \text{interest paid (+depreciation)}] \times 2}{\text{total capital}}$

b) rate of return on equity capital after (befors) tax $= \frac{\text{net profit after (before) tax} \times 2}{\text{equity capital}}$

Looking over the long-term transition in the rate of return on capital in the United States, we find that the rate of return on capital after tax has tended to remain constant. This fact is used as evidence that the shifting of the long term incidence of corporation income tax in America is nearly completed. Likewise, Japanese corporation income tax also can be presumed to have nearly completed its long-term shifting.

Looking at the corporate profit share, another index used to measure corporation income tax incidence, we find that, in spite of a rise in the rate of corporation income tax, the long-term change in corporate profit share before tax in the United States remained fairly constant. However, the corporate profit share after tax seems to have decreased with the rise of the tax rate. This fact was claimed to be evidence of the impossibility of further corporate income tax shifting then.

In Japan as in America, the transition of the corporate profit share over the long pre- and post-war period—to say nothing of a short transition—seems to have been constant, that is, there has been no further shifting. (See Table I.) At any rate, the three corporate income tax phenomena—the effective corporate tax rate, the rate of return on capital and the rate of corporate profit share—seem to show a surprising similarity between Japan and the United States, with reference to the shifting and the incidence of corporation income tax.

This preliminary essay is an attempt to construct a new long-term model with a classification of market structures, and to examine how corporation income tax incidence is treated in Japan, while giving full consideration to the characteristics of the metric models that were applied in the study of corporation income tax shifting in the past.

It is characteristic of my model, that: 1) it considers—as can be seen by the phrase, "with a classification of market structures"—the competitive industries and the oligopolistic industries by means of tax incidence models with the characteristics mentioned in the following Section, and 2) due to the necessity of considering a "long-term series", it takes up the question of the effect of the transitions, as shown in the K-M model and the G model which deal with the question of how corporation income tax rate effects the indicence of the corporation income tax over the pre- and post-war period.

II. MARKET CONDITIONS IN JAPAN AND CORPORATION INCOME TAX SHIFTING

It seems that certain implicit conditions are assumed by Americans when they construct tax-shifting models. Therefore, in order to use an American model for Japanese industry will be it necessary to assume that certain conditions are the same in the United States and in Japan; for example, with reference to industrial structure or market conditions. Where such an assumption cannot be made, it will be necessary to modify the models to some extent. Before we proceed to explain some of the American tax shifting models which can be used in Japan, we present here a simple comparison between Japanese market conditions and American market conditions within the applicable limits of taxshifting analysis techniques.

Kilpatrick assumed that, compared with other industries, an industry with fairly extensive monopoly power can raise its profit rate and shift its corporation income tax accordingly. He adopted the "concentration ratio" as the measure of monopoly power. This concept has been useful in the preliminary examination of the possibility of shifting of corporation income tax in the United States. However, if we are to assume that monopoly power, through price control, is the controlling factor for the profit share rate, and that, in turn, the profit share rate is the controlling forctor for corporation income tax shifting, it will be necessary to inquire into the difference in the form and function of monopoly power in Japan and the United States, and then to clarify the consequent differing influence on prices and profit shares.

The differences in the form and function of monopoly power in Japan and the United States can be clearly seen in the provisions of their respective anti-monopoly laws and their effectuation. Apart from the fact that anti-monopoly laws and other monopoly control policies in the United States have problems of their own, there is no question that they are strict in prescription and severe in enforce-

ment when compared with those of Japan.

The "concentration ratio" in the major industries of pre-war Japan was fairly high,[4] not only because the quasi-war time conditions called for an oligopolistic economy, but also because the tendency toward monopoly centered around the financial cliques seems to have reached an intensity higher than some of their overt monopolistic conduct indicated. This is an important point which should be carefully studied, since this work covers the pre-war time when traditional plutocracy war rampant.

Even in the post-war period, the divergence of Japanese monopoly regulation from that of the United States seems to be fairly marked, despite the fact that monopoly regulation in Japan as well as in the United States is enforced with the object of controlling market activities such as price, amount of production, the peculiarities of the manufactured goods, sales expenses, company behavior which effects a change in research expenses, etc., rather than monopoly itself. For example, the anti-monopoly laws forbid unjust restrictions in transactions, monopolization, enterprise combinations which would restrict competition, unjust methods in transactions, etc.

Apart, however, from the exact provisions of the anti-monopoly laws, an examinination of their practical effects shows that the difference between the United States and Japan is impressive. In the United States all cartel activities such as price agreements, production amount restrictions, sales sphere agreements, etc. are considered to be unconditionally illegal, while in post-war Japan, especially after 1953, all sorts of exceptions have been allowed for the purpose of protecting enterprises from depression or when competition appeared too hard. (In the United States, agricultural cooperative unions and export cartels are exempted from the application of the monopoly laws, but these exceptions affect the corporation income tax shifting analysis very little.)

The post-war Japanese laws which provide for exceptions to the Anti-Monopoly Law refer to the Smaller Enterprise Stability Law, the Foreign Export and Import Transaction Law, and the the Industrial Equipment Disposal Cartel Law, and to such specific measures as the "depression cartel" and the "rationalization cartel". All these are more or less related to the exercise of monopoly power. In Japan, besides "exceptions to the law", there are other ways to restrict competition; for example, there are the various advisory proposals by MITI (Ministry of International Trade and Industry) such as the "operation curtailment directive", the "open sale system" in iron and steel, the "equipment restriction directive", the "government purchasing agency", the "stock-freezing management", and the "re-selling price maintenance system." The importance of these methods of restricting competition, which take the place of cartels and which are enforced as governmental directives, should not be underestimated in the analysis of corporation income tax, for cartels, along with these practices, were quite effective in

(4) Consult the "Pre-war Market Control Intensity", the table attached to the end of (14), published by The Fair Transaction Commission.

maintaining a profit rate far above the commercial level, independent of the "concentration ratio" as an index of monopoly power. Table II shows the ever-enlarging role that cartels and operation curtailment advice played in the post-war period, thus nullifying the effect of the Anti-Monopoly Law.

TABLE II. THE TRANSITION OF CARTELS AND OPERATION CURTAILMENT DIRECTIVES

	Number of Agreements	Number of Depression Cartels and Rationalization Cartels in the Agreement (a)	Number of Enterprises	Number of Depression Cartels and Rationalization Cartels in the Agreement (a)	Operation Curtailment Directives and and Other Similar Directives (b)
1953, end of March	53	—	8	—	—
1954, "	79	0	19	0	—
1955, "	162	0	27	0	—
1956, "	224	4	53	4	—
1957, "	312	7	72	5	—
1958, "	401	7	92	5	18
1959, "	523	13	134	9	40
1960, "	609	13	173	9	28
1961, "	728	12	189	8	19
1962, "	882	11	198	7	15
1963, "	1,002	12	212	8	28

Source materials: The Fair Transaction Commission: *The Existing Condition of Cartel*, 1963.

Note: (a) Total number of depression cartels and rationalization cartels effectuated by the Anti-Monopoly Law, Article 24: 3 and 4.

(b) Total number of operation curtailments, open-sale systems, government purchasing agencies, stock-freezing managements, equipment restriction proposals.

It is generally conceded that the "concentration ratio" is merely one of several important economic factors which affect the conduct of enterprises existing within the limited scope of a particular market. Especially in Japan, it is very difficult to look analytically into the characteristics of market structures as related to corporation income tax shifting by means of the "concentration ratio" only. To facilitate the analysis of corporation income tax shifting in Japan, it is also important to classify market structures according to the type of industry.

So far, no proper classification of market structures has been made for the purpose of analyzing the shifting of taxes, including corporation income tax. Usually, in conducting a theoretical analysis of tax shifting, it is assumed that the actual market lies some where between the two extremes of a free competitive market on the one hand, and a pure monopolistic market on the other. Instead of following this old method, we adopt here the following new classification of markets as a preliminary solution to the problem: (1) the administered price type of market,

(2) the oligopolitic type of market, (3) the cartel price type of market, (4) the competitive price type of market. This four-fold classification of the market is based on the patterns of industry, entailing various degrees of corporation income tax shifting.

Usually, it is very difficult to draw a clear-cut line between the "administered price" and the "monopoly price", since the "administered price", if defined in a certain way, differs little from the "oligopoly price." Generally, the establishment of an "administered price" requires the following conditions: (1) the existence of an oligopolistic industry with a high concentration ratio of production, (2) the existence of a corporation with powerful leadership in price-determination, (3) products that are relatively the same in quality and standard, and a price that is little susceptible to change in demand, is stable and is of downward rigidity.

Trying to classify price control patterns or industrial groups according to these conditions, we are confronted with such difficult questions as, what degree of production is to be called "high" and what is meant by "relatively" when we say "relatively the same in quality and standard." Such questions are important because definitely prescribed quality and standards of production make a big difference in where the line between an administered price and an oligopolitic price ought to be draws.

In order, therefore, to distinguish clearly between the administered price type of market and the oligopolitic price type of market, we here introduce two other factors: 1) the growth rate of different industries and 2) the profit rate on total capital. These two factors, as well as the "concentration ratio," will be used to differentiate between these two types of markets. These newly adopted measures can also be used on each part of our four-part classifacation of markets.

Table III shows the actual markets classified by the "concentration ratio", growth rate and the profit rate on total capital: (1) the administered price type of industry includes plate glass, beer, and aluminum; the growth rates of thsee industries are not very high, but their profit rates are fairly high, (2) the oligopolitic industries, such as the automobile and synthetic fiber industries, are have high growth rates, and fairly high profit rates, (3) the cartel price industries, such as the chemical fertilizer and paper industries, have both low growth and profit rates, characteristically being lower than the average for all manufacturing industries.

These characteristics of different types of markets are very useful in the positive analysis of corporation income tax shifting. The administered price type of industry aims primarily at the maintenance of a high profit rate, with growth rate only a secondary factor. On the other hand, the oligopolitic type of industry aspires first of all to maintain a high growth rate and a high profit rate and considers the degree of market control power to be a secondary matter, to be dealt with only to the extent that it does not interfere with the attainment of the primary goals. Finally, the cartel price type of industry takes primarily defensive measures to guard against a dwindling of the growth rate, and thus of necessity

TABLE III. THE RATES OF RETURN ACCORDING TO THE DIFFERENT TYPES OF MARKET STRUCTURE

Administered Price Type	%	Oligopolitic Type	%	Cartel Price Type	%
Plate Glass .....2 companies	5.92	Automobile .....6 companies	6.81	Steel .....under cartel A	2.96
Beer .....3 companies	6.47	Synthetic Fiber .....5 companies	3.92	Cotton Staple Fiber .....17 companies	2.78
Glutamin Acid Soda .....1 company	7.67	Electric Apparatus .....7 companies	4.71	Oil Refinery ..... 8 companies	3.33
Film .....2 companies	4.27			Chemical Fertilizer .....10 companies	1.97
Timepiece .....2 companies	10.85			Paper.....10 companies	1.34
Tin .....1 company	2.39				
Aluminium.....1 company	4.40				
		Average Manufacture	3.74%		

Yasushi Konishi: *Monopoly Price and Profit* (Dokusen-kakaku-to-Rijun), p. 79.
Takahide Nakamura, edit.: *Monopoly Capital in Modern Japan* (*Gendai Nihon no Dokusen-shihon*, 2, *Monopoly Price* (*Dokusen Kakaku*), source material: Mitsubishi Economic Institute: *Analysis of the Business Results in Japan*
Note: Rate of return on total capital is the average of the second semi-annuals, 1958–1962.

has to be satisfied to look upon market control power as merely a secondary matter necessary to maintain the status quo.

Corporation income tax shifting, classified by industries, is influenced by the relative merits of their objectives, and thus naturally their tax shifting patterns have to be altered to a fairly large extent according to internally conditioned differences or changes in growth rate, profit rate or market conrol power in each industry.

III. THE CONSTRUCTION OF GENERAL MODELS CLASSIFIED BY MARKET STRUCTURE

In order to apply econometric analysis to corporation income tax shifting by industries, it is essential first to create a theoretical model and then, on that basis, construct a metric model in order to determine the required positive measurement. To accomplish this, we here apply the G model (or, the K–M model, which was applied to a different phase of the G model). We have adopted the same line of G model because it seems to be the best approach to the analysis of tax-shifting in the Japanese market structure.

We must first decide how we should set the pattern of function for the determination of corporate profit. In case of an ordinary complete simultaneous estimation model, what remains after the deduction of the wages and the factor incomes is the profit. Unfortunately, data on the factor incomes is not available. Therefore, we have to resort to a different method to realize our end; that is, we have to construct a special model to determine the corporate profit by effecting a linear transformation of all the factor incomes. First of all, we introduce the profit determination equation for representative industries, and then the corporation income tax is to be introduced following the same procedure as in the G model. First, the profit identity equation of the representative industries is given as follows:

Eq. 1. $$Z = pQ - W - I - T_i - D$$

where Z is profit before corporation income tax,
pQ is the output of the industry concerned and
Q is real output
W is wages
I is interest paid
M is raw material expense
D is depreciation allowances
T_i is any indirect tax levied on the industry concerned. (The reason why indirect taxes are included here is not for the purpose of examining their effects, but is merely to show that we intend to limit our consideration to the analysis of the shifting of the tax levied on corporate profits and not of the various other taxes imposed.)

Suppose Z' represents the gross profit including the interest paid and the depreciation allowances, in other words, $Z' = Z + I + D$, and t represents the effective tax rate of the indirect tax imposed on the industry concerned—then $T_i = t(pQ)$. Then equation 1 can be rewritten as:

Eq. 2 $$Z' = (1 - t)pQ - W$$

The above equation is merely a definition equation. However, to conduct a linear transformation with equation 2, it is necessary to set up some hypotheses. The first hypothesis is co ncerned with raw material, M; it is assumed here that a change in raw material costs would not affect seriously the objective of a tax shifting analysis. Of course, the level of the gross profit of an industry is greatly influenced by the change in raw material costs and the utilization level of raw materials. So, starting with the hypothesis that the change in raw material costs exercise very little effect in the whole productive process, we can safely say: 1) the change in raw material costs has very little effect on output, and thus 2) there is very little short term substitutability between intermediate goods—raw materials in a broader sense—including the goods in process, and other productive factors, and thus 3) at least one of the three assumptions, the one holding that a change in raw material costs affects the objective of corporation income tax shifting very little, has to be admitted.[6]

These assumptions, with the exception of assumption 1 which is rather problematical if the differences in industries are taken into consideration, have a fairly high value of practical application. As to assumption 2, a conspicuous fluctuation in raw material costs (M/Q) would of necessity affect the profit in the cycle of prosperity and depression, but there is no guarantee that a fluctuation in profits will not be avoided by marking up the prices of products. Indeed, the marking-up of product prices for this purpose was widely carried out in the period under consideration. Assumption 3 implies that increasing or decreasing corporation tax can never greatly influence the demand and supply of raw material among corporations. This assumption has been derived from the following empirical information: Eighty percent of the corporations answered in the negative to the question,[7] "Do you expect that you can shift your corporation income tax to raw material suppliers?" This means that they were unable to get raw material suppliers to comply with their request to lower their prices, and that raw materials are always purchased at the lowest possible price regardless of corporation income tax. This explanation seems rather convincing.

Assumption 2 concerns wages. Expressing wage-rate by w, and manpower by Nh we can give W as $W = w(Nh)$. It is then necessary to determine the behavioral equation for w. Given that the wage-rate is a function of the unemploy-

(6) In forming the hypothetical models of this preliminary essay, the works by M. K. Evans [3] and E. Kuh [16] [17] were referred to.

(7) The Inquiry Commission of Taxation System (21): "Reports of the Views on Corporation Income Tax", pp. 560 ff.

ment rate, U_{n-1}, of the previous year, and the consumer price level, p_{c-1}, of the previous year, we can assume that the wage function is linear. Since we can assume a close relationship between the unemployment rate as related to the price level of consumer goods in the previous year and to the level of economic activity, the wage rate can presumably be determined by the GIP (gross industrial product) pQ_{-1} of the previous year and the average labor hour of the current year; in other words, $w = kh(pQ)_{-1}$. The second variable, manpower (Nh), is not divided into two groups of laborers, the direct laborers and the indirect laborers, as is done in the G model. To divide laborers into two groups, as in the G model, presents the problem of apportioning to each of the two kinds of laborers the recurring productive variation per capita. One way to overcome this difficulty is to assume that manpower consists of some fixed cost plus a constant percentage of output. In other words, $Nh = gQ + F_1$, where F_1 is the fixed cost related to the manpower calculation. If this transformation is made, equation 2 becomes:

Eq. 3 $Z' = (1 - t)pQ - [gh\ Q(pQ)_{-1}] - F$, where $F = F_1kh(PQ)_{-1}$

If $Q(pQ)_{-1}$ in this equation is transormed linearly, the first approximation equation: $Q(pQ)_{-1} \cong Q(\overline{pQ})_{-1} + (pQ)_{-1}\bar{Q} + c_1$ is obtained, where $c_1 = -\bar{Q}(\overline{pQ})_{-1}$ and the bar denotes the average value.[8]

By this linear transformation, the gross profit function of equation 3 becomes:

Eq. 4 $$Z' = (1 - t)pQ - g'Q - h'(pQ)_{-1} - F + c_1$$

where $g' = kgh(\overline{pQ})_{-1}$, $h' = kgh\bar{Q}$

Next $(1 - t)pQ$ is transformed. If $(1 - t) = a + b = a'$, it follows that $(1 - t)pQ = ap\bar{Q} + bpQ$. Then we transform it into $b(pQ) \cong b[p\bar{Q} + Q\bar{p} + c_2]$; a similar transformation is made of $a(pQ) \cong a[p\bar{Q} + Q\bar{p} + c_3]$, where $c_2 = c_3 = -\overline{pQ}$.

Here a remark should be made of the sign condition of $b(pQ)$. Since g' can be regarded as the labor share of income at the full utilization ouptut, $b(pQ)$ would be greater than zero, if b is larger than $g'(\bar{p} \cong 1)$. By this sort of transformation, equation 4 can further be transformed as follows:

Eq. 5 $$Z' = a'(p\bar{Q}) + b'Q - h'(pQ)_{-1} - F + c'$$

where $b' = a\bar{p} + b\bar{p} - g'$, $c' = c_1 + ac_2 + bc_3$

Concerning equation 5, there are two Problems to be raised: the first is related to the gross profit Z', the dependent variable, which doesn't comprise an independent price variable p, but it does include the ouput variable Q. It is true that this is not necessarily contradictory to the hypothesis of marking-up so long as the price variable is not included as an exogeneous one. But the mere fact that the output variable is included as an exogeneous element, shows we cannot definitely

(8) The linear transformation has been made according to the Klein's method. L. Klein [13] p. 121.

conclude that it is not contradictory. So some sort of transformation is required.

Another point we should pay attention to is that, as long as our interest is centered around the idea that the way corporation income tax shifting is carried out differs according to the structural differences in markets, the pressure variable, as a prosperity and depression affecting factor determining the gross rpofit level of the different corporations with different structured markets, is not included.

In order to deal with these two points, equation 5 is adjusted on the assumption that the fixed cost F takes a definite proportionate rate of capital stock, K, to become:

Eq. 6 $$Z' = a'(p\bar{Q}) + (b'Q + f'K) - h'(pQ)_{-1} + c'$$

Next, choosing capacity utilization C_p, as the pressure variable, and setting the ratio of the actual output Q to the maximum output Q^*, we obtain $C_p = Q/Q^*$. Also, denoting the output/capital coefficient with the maximum output Q^* as m, we get the equation: $Q^* = m(K)$. Thus we obtain the equation, $C_p = (1/m)(Q/K)$. Here again, concerning the actual output coefficient Q/K, the following transformation can be made:

$$\frac{Q}{K} \cong \frac{1}{\bar{K}}Q - \frac{Q}{\bar{K}^2}K - c_4$$

where $c_4 = \bar{Q}/\bar{K}$

Further, we assume the following as an approximation,

$$\frac{1/\bar{K}}{\bar{Q}/\bar{K}^2} = \frac{\bar{K}}{\bar{Q}} \cong \frac{b'}{f'} .$$

This being assumed, the approximation: $b'Q - f'K \cong QK$ is established.

From the above, and also granting $c = c' + c_4$, the before-tax profit determing equation becomes as follows:

Eq. 7. $$Z' = a'(p\bar{Q}) + m(C_p) - h'(pQ)_{-1} + c$$

This gross profit determining equation as an independent variable includes current sales $p\bar{Q}$, the capacity utilization C_p, and previous sales $(pQ)_{-1}$. Each independent variable, however, requires a different explanation depending on whether the market structure is competitive or oligopolistic.

If a market is competitive with a large number of firms, a high level of sales does not necessarily mean a high level of sales to individual firms. For that reason, the current sales would be less important as the profit determining factor than in the case of an oligopolistic market. Also, since the barriers to entry of new firms can be almost completely disregarded in a competitive market, the influence of the new firms on the gross profit can be inferred to have appeared when the correlation to the sales of the previous period is negative.

On the contrary, in an oligopolistic market, current sales and capacity utilization seem to be the important factors in the determination of gross profit, and previous

sales, in comparison with the above two factors, is not very important. So to the extent that the industry we select as the object of our test is oligopolistic in nature, unit labor cost and labor productivity, taking the place of previous sales, gain in explanatory significance as a replacement variable or as on additional variable.[9] Therefore, the profit rate and the profit share before tax are formulated as follows:

Eq. 8. $$\frac{Z'}{K} = a'\frac{p\bar{Q}}{K} + m\frac{C_p}{K} + h'\frac{(pQ)_{-1}}{K} + u$$

Eq. 9. $$\frac{Z'}{R} = a'\frac{p\bar{Q}}{R} + m\frac{C_p}{R} + h'\frac{(pQ)_{-1}}{R} + u$$

where $R = pQ$, namely current sales.

The next step we take is to introduce the element of tax shifting measure to the profit rate before tax and the profit share defined above, preparing the way to the estimation operation discussed in the following section. The procedure we follow is the same as was adopted for the K–M model and the G model. So, the peculiarities only are described here.

The tax shifting measure of the K–M model coincides with the regression coefficient of the tax variable involved in the regression equation, and it is independent of corporation tax level and profit rate. In the G model, this function is cleverly enlarged so as to be applied not only as the profit rate index but also as the profit share index.

Supposing that the after-tax profit is π^n, the profit without imposition of tax is π', and the percentage shifted out of the amount of tax liability, T, is α, then:

Eq. 10. $$\pi^n = \pi' - T + \alpha T$$

In the case where no tax burden is shifted, $\alpha = 0$ and $\pi^n = \pi' - T$.

In the case where the entire tax burden is shifted, $\alpha = 1$ and $\pi^n = \pi'$ and the after-tax profit amounts to the same as when no corporation profit tax is levied. These two cases define what zero shifting and 100 percent shifting are. These definitions are in line with the traditional approach to the matter.

To continue, if π^g is before-tax profit, and v is the tax rate, we then get the definitive equations $\pi^g = \pi^n + T$ and $T = v\pi^g$.

By substituting these definitive equations into equation 10, and dividing them by K or R (for brevity's sake, K only is applied), we get:

Eq. 11. $$\frac{\pi^g}{K} = \frac{\pi'}{(1 - \alpha v)K}$$

Looking at the parameter α, equation 11 is intrinsically nonlinear, and thus there is no way for equation 11 to be linearly transformed. So some other method

(9) For details of a view which gives weight to the importance of labor productivity as an explanatory variable for the fluctuation of the corporate profit share, see Kuh (17).

must be used to deal with the nonlinear aspect of the G model estimation. Using the Newton method, which has been previously used in applying the G model to Japan,[10] the final regression equation concerning the estimation of α, that is, the tax shifting coefficient can be expressed with the profit rate index R as follows: (Replacing K by R will give the expression with the profit share index.)

$$\text{Eq. 12.} \quad \frac{\pi^g}{K} = a' \frac{p\bar{Q}}{(1-\alpha v)K} + m \frac{C_p}{(1-\alpha v)K} + h' \frac{(pQ)_{-1}}{(1-\alpha v)K} - \frac{(I+D)}{(1-\alpha v)K} + u'$$

In equation 12 we have a corporation profit regression euqation which includes the tax shifting coefficient, α, and which is different from the K–M model, because it has been derived from the explicit theoretical model. It also differs from the G model by including the corporate profit explanatory variables.

The question which we raise now is to what extent these presumed degrees of shifting differ from the ones obtained by looking at different market structures. This point will be clarified in the following section.

IV. THE ESTIMATED RESULTS OF THE MODELS CLASSIFIED ACCORDING TO THE MARKET STRUCTURES

In the Newton method, otherwise called the linearization method or the Taylor's series method, an initial value must be selected and repeated calculations must be made by utilizing the Taylor's series method. In other words, repeated calculations are necessary to find a true approximate value when searching for any nonlinear equation.

0.50 is given as the initial value for each one of the tax-shifting coefficients sought by the regression equation. The repetitive calculation is limited to eleven steps. The reason why the initial value is set at 0.50 is that this value is midway between the zero and the 100 per cent points of shifting including, of course, cases of minus shifting and excessive shifting. The reason why the repetitive steps of calculation are confined to eleven is that generally ten steps are considered adequate, although the number may vary according to the degree of exactness in the selected differential coefficient for the ultimate tax shifting and according to the size of the selected initial value.

The estimated result is fairly different from those so far obtained by the K–M model, the K model and the G model. The shifting degree is far from being 100 percent, but it is clearly not near zero either. However, this shifting degree, as observed by looking at the different market structures, is relatively high in an administered price market, and is not necessarily high in a cartel price market,

(10) For information on the nonlinear type deductive method which has been used previously in the application of the G model to the Japanese manufacturing industry, refer to Seiji Furuta [7] Section 5 ff, Gyoichi Iwata, Masahiro Kuroda [10] and N. R. Draper, H. Smith [2].

as has been presumed by economic theory.

Table IV shows the estimated results of the cement, steel, paper and glass industries with the rate of return index Z^*/K (profit standardized by total capital stock) and the profit share index Z^*/R (profit standardized by total revenue), as dependent variables. The observed periods for the cement industry are from

TABLE IV. THE ESTIMATED RESULTS CLASSIFIED ACCORDING TO DIFFERENT MARKET STRUCTURES

( ) denotes t-value

Dependent Variables	Independent Variables				$\bar{R}$	D-W	Shifting Parameter	Observation Periods
(I) Cement								
$\frac{Z^*}{K}$	$\frac{p\bar{Q}}{K}$	$\frac{Cp}{K}$	$\frac{(pQ)_{-1}}{K}$	v				
	.167 (2.633)	1.271 (.310)	.051 (.685)	.230	.985	.72	.230	1929—1941+ 1952—1963
$\frac{Z^*}{R}$	$\frac{p\bar{Q}}{R}$	$\frac{Cp}{R}$	$\frac{(pQ)_{-1}}{R}$	v				
	.325 (5.039)	1.093 (.299)	−.115 (−1.590)	.386	.981	.65	.386	1929—1941+ 1952—1963
(II) Steel								
$\frac{Z^*}{K}$	$\frac{p\bar{Q}}{K}$	$\frac{Cp}{K}$	$\frac{(pQ)_{-1}}{K}$	v				
	.191 (4.114)	−36757.7 (2.959)	.0117 (.215)	.299	.983	.89	.299	1952—1963
$\frac{Z^*}{R}$	$\frac{p\bar{Q}}{R}$	$\frac{Cp}{R}$	$\frac{(pQ)_{-1}}{R}$	v				
	.214 (5.144)	−35016.7 (3.361)	−.0128 (.275)	.322	.987	.94	.322	1952—1963
(III) Paper								
$\frac{Z^*}{K}$	$\frac{p\bar{Q}}{K}$	$\frac{Cp}{K}$	$\frac{(pQ)_{-1}}{K}$	v				
	.223 (4.747)	673.1 (.297)	−.076 (1.444)	.194	.997	1.88	.194	1952—1963
$\frac{Z^*}{R}$	$\frac{p\bar{Q}}{R}$	$\frac{Cp}{R}$	$\frac{(pQ)_{-1}}{R}$	v				
	.221 (4.552)	158.7 (.0623)	−.0702 (1.290)	.116	.997	2.02	.116	1952—1963
(IV) Plate Glass								
$\frac{Z^*}{K}$	$\frac{p\bar{Q}}{K}$	$\frac{Cp}{K}$	$\frac{(pQ)_{-1}}{K}$	v				
	.376 (5.073)	−3865.4 (6.824)	−.140 (1.644)	.500	.995	1.35	.500	1952—1963
$\frac{Z^*}{R}$	$\frac{p\bar{Q}}{R}$	$\frac{Cp}{R}$	$\frac{(pQ)_{-1}}{R}$	v				
	.426 (4.447)	−4244.2 (5.460)	−.159 (1.477)	.195	.993	1.25	.195	1952—1963

1929 to 1941 (pre-war) and from 1952 to 1963 (post-war). The other industries are covered from 1952 to 1963 only.[11]

Using Table IV, we have examined the significance of the regression coefficients. They were all subjected to a one-sided t-test. First taking up the α coefficients, we find that with cement, its value at the 5% level is 1.721 and its value at the 1% level is 2.518; with the other industries, the value at the 5% level is 1.860 and the value at the 1% level is 2.896. According to these standards, all eight α coefficients are significant at the 1% level, and their sign conditions are also fulfilled. Looking over the m coefficients which follow, we find that four of them are significant at the 1% level, and that their sign conditions are also fulfilled, but that the remaining four are not only of no significance, but their signs run counter to the expected direction.

The h' coefficients cannot be considered significant at the 5% level, but the signs are all in the expected direction except in two cases.

Generally speaking, these industries show oligopolistic market characteristics as distinct from competitive market characteristics, exhibiting a high degree of confidence in sales in the current period, as was expected; but in the matter of utilization activities and their sales in the previous period, they fell somewhat. We are impressed by the fairly high degree of confidence of regression coefficients in the glass and steel industries, and the lack of same in the cement industry.

As the next step to test the efficacy of this preliminary model, it is necessary to determine whether or not the estimated value is the best unbiased estimator. In the cement industry, we can assume there exists a serial auto-correlation according to the Durbin-Watson ratio. In the other industries, however, it is impossible for us to perform a similar test because of the smallness of the samples. An examination of the tax-shifting coefficients, which are our primary concern, shows that the degree of tax shifting ranges from a low of 11 to a high of 50 per cent, although there are only eight samples.

The high of 50 per cent tax shifting is found in the glass industry's rate of return; we should be aware that the glass industry stands high above the others in price control power and is classified as one of the more powerful industures in the administered price market.

The paper industry, which shows a shifting degree of 11.6 per cent, the lowest, is commonly classified as an industry of the cartel type of market, and has very little price control power. Examining the tax-shifting degree with the profit rate and profit share as index respectively, we find that the rate of return ranges from a low of 19 per cent to a high of 50 per cent, and the profit share ranges from a low of 11 to a high of 38 per cent. Taking the average of the shifting degrees

(11) See Showa Dojinkai, edit: [19] p. 179 for the prefand post-war degree of capacity utilization of the cement industry. Concerning the post-war degree of capacity utilization of industry in general, the Keidanren (The Federation of Economic Organizations), edit: [11] was used. Concerning the other variables, pre-war and post-war, the Mitsubishi Economic Institute, edit.: [18] was mainly used.

of the rate of return and the profit share indexes respectively, we find that the former is 30.6 per cent, which is somewhat higher than the latter, which is 25.5 per cent.

Another point about the estimated results of this preliminary model which shounld be mentioned is the difference in the regression coefficients of the paper industry and the glass industry, especially with reference to the shifting parameter of corporation tax. We found, as we had expected, that in both industries, the variable of current sales is a more important factor than the variable of previous sales.

We did not expect the capacity utilization variable to be as important in these two industries as the current sales variable. Our expectations proved to be true in the paper industry, but not in the glass industry. Examining both these industries with reference to the corporation tax coefficient v, the plate glass industry exhibited a considerably higher shifting than did the paper industry with reference to their indexes. Such a difference in shifting capacity is expected to occur since the plate glass industry is classified as an administered price industry and the paper industry, as a cartel price industry.

According to the Fair Transactions Commission on Industrial Concentration, the paper industry, being essentially a competitive one, is low in concentration. And throughout the period under our consideration, it was actually dwindling in concentration, being characterized by a stagnancy in growth and a low profit rate.

The Ōji Paper Manufacturing Company held 85% of the paper manufacture market before the war, but in 1950 (immediately after the company split), the three Ōji Companies held only 37.7 per cent of the market, and in 1959, it dropped to 22.8%.

Besides, due to intense competition caused by a rapid increase in smaller enterprises about this time, (in spite of some business curtailment both voluntary or governmentally directed) the wholesale price index of paper and pulp has followed a general downward trend since 1954. Needless to say, large corporation tax shifting cannot be expected in such an industry.

The plate glass industry is different. The Asahi Glass Company and the Japan Plate Glass monopolized the glass market before the entry of the Central Company. Under the 3 companies' monopolistic control which followed, the glass industry did not only have steady prices, but had high and firm profit rates. Plate glass production requires a huge amount of capital and calls for highly developed technology, and thus has a relatively stable growth.

The difference in tax shifting in the paper and glass industries should be primarily clarified in terms of the competitive factors among the various enterprises. However, the mere consideration of such factors as the market concentration and the rate of fluctuation in price and its frequency does not compeletely explain the difference in question. All we can say here is that it should be elucidated by further inquiry into the internal behavior patterns of different types of industry.

V. EVALUATION OF THE ESTIMATED RESULTS OF THE PRELIMINARY MODEL

Differing from the G model, this preliminary model did not attempt to construct an aggregate equation concerning the manufacturing industry in general, for market structure was theoretically assumed to be a significant factor in the determination of the degree of tax shifting. In other words, a manufacturing industry or industry as a whole can hardly be credited as a tax-shifting entity either theoretically or from the standpoint of corporation income tax policy.

Using this preliminary model, we have come to the conclusion that a degree of tax shifting from 11 to 50 per cent is usual. This conclusion was reached as a result of a study of four industries. With this model, we expect to be able to obtain some information on corporation income tax shifting as an industrial policy, by considering a larger number of industries.

The merits of this preliminary model (held in common with the G model) consist in not having a differential contradiction in the degree of tax shifting of the two equations for the rate of return index and the profit share index, as seen in the estimated results of the K–M model, and also in not resorting to a seemingly arbitrary independent variable as do the K–M model and the K-model in the process of model specification.

Despite the above merits, the author welcomes any criticism from experts in the field, for he thinks that the analytical study of tax shifting, not only of corporation income tax but of all other taxes, has just entered a new phase.

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APPENDIX

Estimated Shifting Degrees for Japanese Corporations obtained by the K–M, K and G Models

(i) Results obtained by the K–M Model

The well-known conclusions by Krzyzaniak and Musgrave are that in the short-run in U.S. manufacturing more than 100 per cent of the burden of corporation income tax is shifted forward to the consumer.

K–M present the following regression equation of Y_{gt} on the set of independent variables listed below, using Z_t^* as an instrumental variable.

$$Y_{gt} = a + a_1 \Delta C_{t-1} + a_2 V_{t-1} + a_3 J_t + a_4 L_t + U_t$$

Y_{gt}: Gross rate of return on capital in the coporate sector. Equity and total capital base. Total capital is defined as equity capital plus interest-bearing debt.

ΔC_{t-1}: Change from year t–2 to year t–1 in the ratio of consumption to GNP.

V_{t-1}: Ratio of inventories to sales in the corporate sector in year t–1.

J_t: Ratio of tax accruals (other than the corporate income tax) minus government transfers to GNP in year t.

G_t: Ratio of government purchases of goods and services to GNP in year t.
L_t: Ratio of corporate income tax liability to capital in year t.
U_t: Stochastic variable in year t.
Z_t^*: Effective tax rate in year t.

In line 1 of tables 1–A and B, we have estimated the coefficient of the variables given in the above equation for Japanese manufacturing. For Japanese manufacturing, we may briefly summarize the results of our estimates as follows: judging from the interpretation of tables 1–A and B below, we tentatively conclude that the degrees of the short-run forward shifting of the tax had an upper limit of 181 per cent (in the case of equity capital base) and a lower limit of 144 per cent (in the case of total capital base) for Japanese manufacturing from 1928 to 1963. Needless to say, other factors besides corporation tax shifting, may have worked to bring about the above figures, and thus it is necessary to give thought to their influence and have some doubt about the figures, as was done in the U.S. where the influences of inflation and public expenditures were taken into account.

It is interesting to observe that in the U.S. the short-run shifting of an increased tax proved to be 170 per cent whereas that of a decreased tax was only 7 per cent. We also tried to determine whether businessmen in Japan behaved differently with respect to tax increases and decreases (see Table 2A–B).

We found in Japanese manufacturing that in years with tax increases there was a shifting of 230 per cent. In the electrical power industry, the estimated degree of shifting for the positive change was 192 per cent, but for the negative change, it was minus 150 per cent. This makes a great contrast not only with the U.S., but also with the rest of Japanese manufacturing. These results can be explained by the different pricing policy of the electrical power industry from that of others in Japan. The electrical power business is under the ordinance on public utilities, and its charges are set according to original costs, inclusive of corporation income tax and other taxes. It is important to note here that corporation income tax is woven into the general original costs because otherwise the "tax deducted legitimate profit" could not be secured. We should be aware that the determination of price in the electrical power business is managed in an entirely different way from that of any other incorporated enterprise.

Due to the obtained degrees of shifting, we may conclude that the pricing performance of the Japanese electrical power industry ranks first, in the sense that the price of electricity has changed almost symmetrically according to tax increases and decreases. U.S. manufacturing comes second, for it increased prices in years with tax increases, but it neigher increased nor decrease prices in years with tax decreases. In Japanese manufacturing, prices went up in years with tax increases and they also went up in years with tax decreases.

(ii) Results obtained by the K Model

It is interesting that the degrees of shifting estimated by Kilpatrick's standard model for U.S. manufacturing extend from 62 to 94 per cent; and his conclusion

TABLE 1-A. ESTIMATES FOR JAPANESE CORPORATIONS BASED ON THE K-M MODEL (EQUITY CAPITAL BASE) 1928–41 + 1952–63

Industry	Constant	Regression Coefficients (t valves in ( )) Independent Variables					$\overline{R}$ Multiple Coeffic. Adjust. by d. f.	D Durbin Watson Statis.	Shifting Degree
		ΔC_{t-1}	V_{t-1}	J_t	L_t	E_t			
(1) Manufacturing	28.4815	0.0038 (0.2201)	−0.0622 (−0.9092)	−1.5346 (−2.4547)	1.8105 (6.2871)		0.950	0.864[d]	1.8105
(2) Paper	21.9543	−0.0067 (−0.3542)	0.0338 (0.7372)	−1.6805 (−2.4500)	2.0052 (11.5318)		0.946	1.374[c]	2.0052
(3) Printing	5.2293	−0.0197 (−1.3662)	0.2832 (2.0147)	−0.8778 (−1.3574)	2.4474 (24.4335)		0.990	1.729[a]	2.4474
(4) Electricity	5.2535	−0.0218 (−2.4589)	0.0224 (2.4930)	−0.2318 (−0.6624)	1.9071 (7.0777)		0.856	1.165[c]	1.9071
(5) Iron & Steel	70.7772	−0.0609 (−0.6590)	0.1897 (0.8254)	−7.3658 (−3.0986)	3.9142 (2.6989)		0.567	1.475[c]	3.9142
(6) Shipbuilding	21.9901	−0.0256 (−1.5724)	−0.0365 (−4.3988)	−0.8750 (−1.9246)	1.8630 (35.7083)		0.995	1.997[a]	1.8630
(7) Manufacutring	54.6797	0.0133 (0.7129)	−0.0380 (−0.5386)	−0.9694 (−1.2468)	1.6871 (5.5731)	0.7182 (1.1972)	0.951	1.010[c]	1.6871

Notation for Table 1 is the same as K-Ms', except E, which denotes rate of employment.

Symbols attached to Durbin-Watson statistics are

[a] Hypothesis of no serial correlation accepted at 5 per cent level.

[b] Also at 2.5 per cent level.

[c] Test inconclusive at 5 per cent level.

[d] Also at 2.5 per cent level.

[e] Also at 1 per cent level.

TABLE 1-B. (TOTAL CAPITAL BASE)

Industry	Constant	Regression Coefficients (t valves in ( )) Independent Variables					$\bar{R}$ Multiple Coeffic. Adjust. by d. f.	D Durbin-Watson Statis.	Shifting Degree
		ΔC_{t-1}	V_{t-1}	J_t	L_t	E_t			
(1) Manufacturin	22.4736	−0.0003 (−0.0341)	−0.0427 (−1.1062)	−1.3533 (−4.2523)	1.4379 (3.4043)		0.811	1.018[c]	1.4379
(2) Paper	17.3720	−0.0075 (−0.9748)	0.0061 (0.3311)	−1.3448 (−4.9211)	2.0741 (13.6514)		0.954	1.375[c]	2.0741
(3) Printing	7.7285	0.0119 (−1.4117)	0.1036 (1.1428)	−0.6726 (−1.9261)	2.1942 (11.7457)		0.957	1.503[c]	2.1942
(4) Electricity	5.7878	−0.0127 (−2.6092)	0.0070 (1.2725)	−0.3265 (−1.5508)	1.4154 (2.9936)		0.783	1.138[c]	1.4154
(5) Iron & Steel	13.2761	−0.0218 (−0.4801)	0.1244 (1.1318)	−1.9843 (−1.7508)	6.6978 (4.6691)		0.761	0.977[c]	6.6978
(6) Shipbuilding	12.8453	−0.0099 (−1.5999)	−0.0145 (−4.1025)	−0.7144 (−4.1744)	1.6314 (8.2343)		0.944	2.249[a]	1.6314
(7) Manufacturing	21.9893	−0.0003 (−0.0257)	−0.0425 (−1.0050)	−1.3506 (−3.4139)	1.4365 (3.1901)	0.0046 (0.0121)	0.799	1.019[c]	1.4365

TABLE 2-A. DIRECTIONAL CHANGES OF TAX SHIFTING (EQUITY CAPITAL BASE)

Industry	Constant	Regression Coefficients (t valves in ( )) Independent Variables						$\bar{R}$ Multiple Coeffi. Adju. by d.f.	D Durbin Watson Statis.
		$\Delta^2 C_{t-1}$	ΔV_{t-1}	ΔJ_t	$\Delta^+ L_t$	$\Delta^- L_t$	ΔE_t		
(1) Manufacturing	−0.4271	0.0002 (1.6268)	−0.0457 (−0.7256)	−1.1770 (−1.7356)	2.4282 (4.4838)	2.2981 (7.1445)		0.927	1.715[c]
(2) Paper	−1.9003	0.0003 (1.5182)	−0.0074 (−0.1083)	−1.3205 (−1.3150)	4.7289 (4.0403)	1.7724 (5.6019)		0.901	1.300[c]
(3) Printing	2.0301	0.0001 (−0.0257)	−0.2136 (−0.4578)	0.4513 (0.2057)	0.7231 (0.9618)	2.6169 (2.7758)		0.559	2.144[a]
(4) Electricity	−0.4509	0.0007 (0.8941)	−0.0895 (−3.0309)	0.4563 (1.3011)	1.9244 (2.7571)	−1.5020 (−0.4596)		0.709	1.864[a]
(5) Iron & Steel	−0.3345	−0.0008 (−0.7466)	0.1748 (0.8792)	−5.0384 (−0.9089)	7.0884 (3.3942))	5.3555 (2.6099)		0.727	2.170[a]
(6) Ship Building	−2.1981	0.0001 (5.5946)	0.0098 (0.4232)	−0.6014 (−0.5235)	1.8528 (3.4311)	1.8485 (19.3747)		0.979	2.224[a]
(7) Manufacturing	−0.4919	0.0003 (1.8208)	−0.0247 (−0.3627)	−1.0089 (−1.4157)	1.9669 (2.5507)	2.1461 (5.7859)	0.7302 (0.8483)	0.926	1.503[c]

TABLE 2-B. TOTAL CAPITAL BASE

Industry	Constant	Regression Coefficients (t valves in [ ]) Independent Variables						$\bar{R}$ Multiple Coeffi. Adjust. by d.f.	D Durbin Watson Statis.
		$\Delta^2 C_{t-1}$	ΔV_{t-1}	ΔJ_t	$\Delta^+ L_t$	$\Delta^- L_t$	ΔE_t		
(1) Manufacturing	−0.6679	0.0001 (1.1642)	−0.0752 (−1.4401)	−0.4368 (−0.7632)	1.5223 (2.6043)	0.8944 (1.4289)		0.624	1.873[a]
(2) Paper	−0.0178	0.0002 (1.5662)	−0.0164 (−0.3023)	−0.2175 (−0.2864)	5.0579 (2.7570)	0.6311 (1.3269)		0.581	1.128[c]
(3) Printing	−0.5922	0.0001 (0.1788)	−0.0099 (−0.0766)	−0.0147 (−0.0256)	3.2069 (4.2405)	−1.8791 (−3.8640)		0.834	0.814[e]
(4) Electricity	−0.2249	0.0001 (1.3319)	−0.0576 (−3.7795)	0.2484 (1.3756)	1.4456 (1.9166)	−0.8861 (−0.3261)		0.703	1.835[a]
(5) Iron & Steel	−0.6631	−0.0001 (−0.2193)	0.0915 (1.1365)	−1.2929 (−0.5799)	8.8227 (6.0543)	8.0949 (4.9295)		0.894	1.716[b]
(6) Shipbuilding	0.0630	0.0001 (0.9597)	0.0041 (0.5065)	−0.2148 (−0.5010)	1.3112 (1.6090)	1.7633 (4.5237)		0.774	2.542[a]
(7) Manufacturing	−0.7361	0.0002 (1.8810)	−0.0304 (−0.5976)	−0.3332 (−0.6497)	0.6428 (0.9780)	0.3421 (0.5587)	1.1448 (2.1998)	0.717	1.334[c]

All of the above results are obtained by direct least squares method.

thus makes an interesting contrast with both K-M's and Gordon's models.

His argument is based on four major types of approach: goals other than profits, conflict between long-run and short-run profit maximization, ineffective price leadership in an oligopoly, and average cost pricing and other rules of thumb. The implications drawn from these approaches for the relationship between shifting and monopoly power are tested by a multiple cross-section regression analysis of the factors which determined the interindustry percentage changes in profit rates from before the Korean War and afterwards.

Instead of applying his single regression equation directly to Japanese manufacturing, we modified his model as follows:

$$\frac{p_1}{p_0} = a + b_1 C + b_2 \Delta C + b_3 p_0 + b_4\left(\frac{Z_1}{Z_0}\right) + b_5\left(\frac{W_1'}{W_0'}\right) + b_6\left(\frac{M_1'}{M_0'}\right) + b_7\left(\frac{P_0}{S_0}\right) + b_8\left(\frac{A}{N}\right) + b_9\left(\frac{B_0}{B_1}\right) + u,$$

where the subscripts "0" and "1" refer, respectively, to the periods before and after the corporation income tax rise; and where the symbols identifying variables are:

p	profit rate
C	concentration in 1954
ΔC	concentration in 1954 less concentration in 1950
Z	value of shipments
W'	ratio of payroll to sales
M'	ratio of input materials to sales
P/S	ratio of profit to sales
A/N	ratio of amortization to net worth in 1955
B	percentage change of net worth

The existence of shifting will be thus tested by whether the coefficient of C is significantly greater than zero. If the regression results are consistent with short-run forward shifting, the degree of shifting will be estimated from the coefficient of C.

The table 3-A below contains alternative statistical results based on varying assumptions. The standard case is represented by equation No. 2 in the original Kilpatrick model, but in the modified model, the fit of estimations is better in the case of No. 4 and No. 5 than in that of No. 2.

Accroding to the different ways of computation of degrees of shifting given by the Kilpatrick Model, different plausible values are given in table 3-B above. If we choose equation No. 2 in the first table as the standard case, the degrees of shifting thus estimated for manufacturing extend from 42 to 50 per cent. If instead, however, we choose equations No. 4 and 5 as the standard cases, we are led by these significant coefficients to a tax shifting in the 39–56 per cent range in manufacturing.

TABLE 3–A. ESTIMATES OF THE EQUATIONS: 1950 AND 1954 (VALUES OF t IN PARENTHESES)*

	a	C	p_0	Z_1/Z_0	ΔC	W_1'/W_0'	M_1'/M_0'	P_0/S_0	A/N	B_1/B_0	R^2
1	191.860	0.47603 (0.8563)	−0.51292 (−0.7499)	0.07912 (1.5597)	1.07185 (0.6001)	−0.78420 (−0.8507)	0.33965 (0.6113)	−1.29723 (−0.4530)	−5.72957 (−2.1086)	0.05141 (−0.8896)	0.532
2	25.562	0.79936 (1.1613)	− 0.19517 (−0.4291)	0.04989 (1.0469)							0.090
3	31.493	0.75738 (1.1009)	−0.17273 (−0.3802)	0.05592 (1.1678)	2.54322 (1.0605)						0.127
4	91.8200	0.52705 (1.0067)	−0.54565 (−1.4864)	0.07257 (1.5850)		−0.37475 (−0.4436)					0.405
5	41.5288	0.44573 (0.8308)	−0.65593 (−1.9693)	0.08617 (2.6940)			0.15123 (0.3409)				0.403
6	25.8232	0.78769 (1.0940)	−0.25179 (−0.2725)	0.04984 (1.0271)				0.27373 (0.0708)			0.090
7	89.4091	0.77081 (1.1373)	−0.36571 (−0.7876)	0.04631 (0.9860)					−0.05058 (−1.3808)		0.150
8	12.7261	0.73569 (1.0701)	−0.18090 (−0.3995)	0.00856 (0.1426)						0.7986 (1.1225)	0.131

* All of equations are estimated by direct least squares.

TABLE 3-B. THE ESTIMATED DEGREE O SHIFTING FOR JAPANESE MANUFACTURING

Characteristics of Basing Estimates	Estimates			
	Total Shifting		Differential Shifting	
	Average Tax Rates of Corporations with Net Income	Statutory Tax Rates	Average Tax Rates of Corporations with Net Income	Staturory Tax Rates
Concentration measure: C	%	%	%	%
1. Equation No. 1	50	172	42	144
2. " No. 2	84	287	70	240
3. " No. 3	80	272	67	228
4. " No. 4	56	190	47	159
5. " No. 5	46	158	39	132
6. " No. 6	83	283	69	237
7. " No. 7	81	276	68	231
8. " No. 8	77	261	64	219
9. " No. 4	43	43	36	36
Estimates for b reduced in such a proportion that shifting by the most concentrated industry is 100%				

(iii) Results obtained by the G Model

In contrast to the conclusion of over-shifting made by K–M, Gordon asserts that tax-shifting in U.S. manufacturing is not significantly different from zero, i.e., the estimated degrees of shifting are less than 11.5 per cent in the whole of manufacturing, while the degree is less than 11 per cent in individual industries.

His study analyzes time-series observations of aggregated variables whose values should reflect short-run forward shifting. He describes the determination of profits for a representative firm practicing mark-up pricing in a no-tax world. The final descriptions of the rate of return and income share concepts in the no-tax case are as follows:

$$\frac{Z_t'}{K_t} = \alpha_1 \frac{R_t}{h_t K_t} + \alpha_2 \frac{R_t^*}{h_t K_t} + \alpha_3 \frac{\Delta p_t}{p_t} + \alpha_4 \frac{\Delta Q_t}{Q_t} + u_t'$$

$$\frac{Z_t'}{R_t} = \alpha_1 \frac{1}{h_t} + \alpha_2 \frac{R_t^*}{h_t R_t} + \alpha_3 \frac{\Delta p_t}{p_t} + \alpha_4 \frac{\Delta Q_t}{Q_t} + u_t'$$

where Z_t' is cash flow as the difference between gross sales R_t and operating cost C_t, K_t total assets, R_t^* potential sales by full utilization of productive factors, p_t wholesale price index, Q_t hybrid real output in constant dollars, h_t the ratio of material prices (p_t) of the industries concerned to the general price index (p_t^g), and u_t' the error term.

After constructing the equations, he introduces into them the corporation income tax rate, assuming that the firm can reduce the impact of any given tax rate on its after-tax profits by shifting the burden of the tax. Results derived

from the Gordon Model for Japanese manufacturing are presented in Table 4 below.

TABLE 4. RESULTS FOR JAPANESE MANUFACTURING BASED ON G MODEL*

Dependent Variables	Independent Variables					$\bar{R}$	D-W	Shifting Parameter	Years
$\frac{Z_t^*}{K_t}$	$\frac{R_t}{h_t K_t}$	$\frac{R^*}{h_t K_t}$	$\frac{\Delta p_t}{p_t}$	$\frac{\Delta Q_t}{Q_t}$	v_t				
	−5.173	2.896	−1.165	1.096	.986	.905	1.23	.986	1929–41
	[−7.464]	[6.542]	[−2.631]	[1.446]					+ 1952–63
$\frac{Z_t^*}{K_t}$	$\frac{1}{h_t}$	$\frac{R^*}{h_t R_t}$	$\frac{\Delta p_t}{p_t}$	$\frac{\Delta Q_t}{Q_t}$	v_t				
	−3.674	2.000	−1.752	.544	.942	.903	1.02	.942	1929–41
	[−1.631]	[5.632]	[−3.539]	[.628]					+ 1952–63

* These results are obtained by non-linear estimation technique.

While, for U.S. manufacturing, all coefficients had the expected signs and all were highly significant except for the price change coefficient in the equation Z_t^*/K_t and the tax-shifting parameters, they have the opposite signs for Japanese manufacturing except for $\Delta Q_t/Q_t$ and fewer than half of them are not highly significant. However, observing the tax-shifting coefficients for Japanese manufacturing, they are considerably high and are not significantly different from 100 per cent. It is not an easy task to compare the results on the evidence of tax shifting for U.S. and Japanese manufacturing. Even though both results are obtained by using the G model, the Japanese results seem to give a description of tax-shifting behavior contrary to that of the U.S.