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| Abstract | The purpose of this paper is to discuss the development of themeasures of capital input in current and constant prices for each ofthe thirty sectors in Japan for the period 1960-1979. In accordancewith the methodological formulation developed in our study, the translogindex framework is applied to accomplish the task.Our analytical framework requires the flow of productive servicesprovided by capital assets to be separated between quantity of the flowof services and the service (rental) price per unit of flow. If weobserve the amount of capital service time utilized, say machine hours, andthe rental rate per machine hour, then the measurement of sectoral capitalinput would be a relatively straightforward task. The markets for capitalinputs, however, are asymmetric to labour markets in that the demand side(the users of capital services) and the supply side (the suppliers ofcapital services) are not in general distinguishable. Particularly inJapan, evidence suggests that most capital inputs are owner-utilized.And for those markets where the distinction between the owners' capitalassets and the users of capital services can be made, data on market serviceprices and quantity flows are only sparsely available.The lack of explicit capital service price and quantity in the market'requires a methodological framework that enables us to impute these flowvariables. We can infer the level of capital input from the level ofcapital stock.We should begin the measurement of sectoral capital input by estimatingthe stock levels of various capital assets in each sector. The methodologicalframework for the measurement of sectoral capital input and capitalstock is discussed in measurement procedure Section 2.and the dataSection source 3 discusses in detail the for sectoral capital stocks. |
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# KEIO ECONOMIC OBSERVATORY OCCASIONAL PAPER

January 1985


## The Measurement of Sectoral Capital Input*


by

Masahiro Kuroda

and

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CALAMVS GLADIO FORTIOR

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## 1. Introduction

The purpose of this paper is to discuss the development of the measures of capital input in current and constant prices for each of the thirty sectors in Japan for the period 1960-1979. In accordance with the methodological formulation developed in our study, the translog index framework is applied to accomplish the task.

Our analytical framework requires the flow of productive services provided by capital assets to be separated between quantity of the flow of services and the service (rental) price per unit of flow. If we observe the amount of capital service time utilized, say machine hours, and the rental rate per machine hour, then the measurement of sectoral capital input would be a relatively straightforward task. The markets for capital inputs, however, are asymmetric to labour markets in that the demand side (the users of capital services) and the supply side (the suppliers of capital services) are not in general distinguishable. Particularly in Japan, evidence suggests that most capital inputs are owner-utilized. And for those markets where the distinction between the owners' capital assets and the users of capital services can be made, data on market service prices and quantity flows are only sparsely available.

The lack of explicit capital service price and quantity in the market requires a methodological framework that enables us to impute these flow variables. We can infer the level of capital input from the level of capital stock.

We should begin the measurement of sectoral capital input by estimating the stock levels of various capital assets in each sector. The methodological framework for the measurement of sectoral capital input and capital stock is discussed in Section 2. Section 3 discusses in detail the measurement procedure and the data source for sectoral capital stocks.

## 2. Capital Input and Capital Stock, The Methodology

On the basis of the theoretical framework, we measure sectoral capital input in terms of the trans-log quantity index. We propose a trans-log aggregator function for sectoral real capital input:

$$(1) \qquad K^j = \exp\left[\sum_m \alpha_m^j \ln K_m^j + \frac{1}{2} \sum_{mk}\sum \beta_{mk}^j \ln K_m^j \ln K_k^j\right]. \qquad (j = 1,\ldots,J)$$

The translog aggregator is linearly homogeneous with respect to its components if and only if the function satisfies the following conditions:

$$(2) \qquad \sum_m \alpha_m^j = 1,$$

$$\sum_k \beta_{1k}^j = 0,$$

$$\sum_k \beta_{kM}^j = 0. \qquad (j = 1,\ldots,J)$$

Denoting by $\{p_{Km}^j\}$ the service price of the m-th component of the j-th sector's capital input, the value share $\{v_{Km}^j\}$ of the m-th component in the total capital compensation of the sector is:

$$(3) \qquad v_{Km}^j = \frac{p_{Km}^j K_m^j}{\sum_m p_{Km}^j K_m^j}. \qquad (j = 1,\ldots,J)$$

Necessary conditions for producer equilibrium imply the value shares to be as follows:

$$(4) \quad v^j_{Km} = \alpha^j_m + \sum_k \beta^j_{mk} \ln k^j_k. \qquad (m = 1,\ldots,M;\ j = 1,\ldots,J)$$

Considering capital input data for the j-th sector at any two discrete points in time, the translog quantity index of change in sectoral capital input can be written as the weighted average of the growth rates of different types of capital input:

$$(5) \quad \ln K^j(T) - \ln K^j(T-1) = \sum_m \bar{v}^j_{Km}[\ln K^j_m(T) - \ln K^j_m(T-1)],$$

$$(j = 1,\ldots,J)$$

where the weights are given by the average value shares of the j-th industry's total capital compensation accruing to respective types of capital services:

$$\bar{v}^j_{Km} = \frac{1}{2}[v^j_{Km}(T) + v^j_{Km}(T-1)]. \qquad (m = 1,\ldots,M;\ j = 1,\ldots,J)$$

We discussed earlier that direct estimation of machine hours is not feasible in the measurement of quantity of capital services, and that an alternative measure of the service quantity must be obtained through the estimation of capital stocks. For each of the m components of capital input in the j-th sector during the T-th period of production $\{K^j_m(T)\}$, we regard the flow of capital services to be proportional to corresponding capital stock existing at the beginning of that period $\{A^j_m(T-1)\}$. An alternative formulation of the translog quantity index ( 5) facilitates the allocation of the change in sectoral capital input to two sources: (1) the change in total sectoral capital stock, and (2) the change in quality of sectoral capital stock. Letting $\{b_m^j(T)\}$ denote the proportion of the m-th asset type on the j-th sector's total capital stock $\{A^j(T-1)\}$, where the latter is defined as the unweighted sum over all assets, we have the following:

$$(6) \qquad K_m^j(T) = b_m^j(T)A^j(T-1). \qquad (m = 1,\ldots,M;\ j = 1,\ldots,J)$$

The translog quantity index of change in sectoral capital input can then be expressed as follows:

$$(7) \qquad \ln K^j(T) - \ln K^j(T-1) = [\ln A^j(T-1) - \ln A^j(T-2)] + \sum_m \bar{v}_{Km}^j[\ln b_m^j(T) - \ln b_m^j(T-1)]. \qquad (j = 1,\ldots,J)$$

The first term accounts for the change in the quantity of total capital stock in the j-th sector. The second term is the weighted average of the change in the proportion of different types of assets, and reflects the change in the structure of capital stock in each sector over time. The weights are income shares, which are identified with output elasticities of the respective types of captial under the assumption of producer equilibrium. Thus, the last term measures the impact of structural change in the j-th sector's capital stock upon its output; and it can be interpreted to account for the change in the quality of capital input per unit capital stock. We refer to this expression as the translog index of change in sectoral capital quality.

We choose the perpetual inventory method as the methodological framework to estimate the stocks of depreciable capital assets. Let $\{I_m^j\}$ be the quantity of gross investment made in the m-th asset in the j-th industry, and $\{\mu_m^j\}$ the rate of replacement of the m-th asset utilized in the j-th industry ($0 < \mu_m^j < 1$). The method relates changes in the level of capital stock to current acquisitions of capital goods and replacement requirements; or, to put it in a different perspective, it links current level of captial stock to past acquisitions of capital goods as follows:

$$(8) \quad A_m^j(T) = I_m^j(T) + (1 - \mu_m^j)A_m^j(T-1)$$

$$= \sum_{S=1}^{T} (1 - \mu_m^j)^{T-S} I_m^j(S) + (1 - \mu_m^j)^T A_m^j(0),$$

$$(m = 1,\ldots,M; \; j = 1,\ldots,J)$$

where $A_m^j(0)$ is the benchmark capital stock for the j-th industry's m-th asset. It is the second formulation in (8) that becomes operational in the estimation of capital stock.

The key assumption in the formulation (8) is that the rate of replacement, i.e., the proportion of a stock replaced in each period incorporating the replacement of the initial investment as well as the following replacements in each succeeding replacement, is a constant and independent of the time path of past net investments for a given asset and an industry. The analytical foundation for this assumption lies in the fundamental result of the economic theory of replacement summarized by Jorgenson (1973). In short, the result establishes that under certain assumptions a sequence of time-dependent replacement rates generated by retirement or loss of efficiency of a capital asset tends asymptotically to a constant regardless (in most cases) of the manner in which the relative efficiency of a captial good declines over time.

The above result in replacement theory suggests alternative methods for the imputation of replacement rates. One is to assume, directly, that economic depreciation of an asset approaches a form of geometric distribution in the limit, thus resulting in a constant rate as an approximation to the true rate of replacement. In particular, the double declining balances form is commonly chosen as the specific form of the geometric distribution. The rate of replacement is then approximated as $\mu_m^j = 2/N_m^j$, where $N_m^j$ is the average economic life (as distinguished from tax life) of the m-th asset in the j-th industry.

This study chooses a method that utilizes the second formulation of ( 8), and carries out the estimation numerically to arrive at the implicit rate of replacement. We begin by noting that ( 8) can be rewritten as real polynomial P(x) of the T-th degree:

$$(9) \qquad P(x) = \sum_{S=0}^{T} a_S x^S = 0,$$

where

$$x = 1 - \mu_m^j,$$

$$a_0 = I_m^j(T) - A_m^j(T),$$

$$a_S = I_m^j(T-S), \qquad (0 < S < T),$$

and

$$a_T = A_m^j(0),$$

so that it is possible to compute $\mu_m^j$ as $1 - x$ where $x$ is the zero of the polynomial $P(x)$. (The industry superscripts and asset type subscripts are omitted from the polynomial expression for brevity.)

First, in order to compute the replacement rate from a zero of $P(x)$, all elements that compose the sequence of ploynomial coefficients $\{a_s\}$ must be observable. In particular, this requires that we observe both the initial and the terminal benchmark capital stocks $A_m^j(0)$ and $A_m^j(T)$. All components of $\{a_S\}$ are observable in our data base; and this will be discussed in seciton .3 below.

Next, we must show the existence and the uniqueness of <u>real</u> zero of the real polynomial $P(x)$ in the open interval $(0,1)$. The existence of real zero can be shown using the following two well-known theorems in the theory of polynomial equations:

<u>Theorem 1</u>

Every polynomial of degree $n$ has exactly $n$ zeros, counting a zero of multiplicity $n^*$ as $n^*$ distinct zeros.

<u>Theorem 2</u>

The complex zeros of a real polynomial occur in conjugate pairs.

From these two theorems, it follows that:

<u>Corollary</u>

The set of zeros to every real polynomial of <u>odd</u> degree contains at least one real zero.

As will be discussed below in Section 3, we take T = 15 (that is, the year 1970 starting with 1955 as T = 0) for the purpose of our polynomial computation. P(x) is then a real polynomial of the 15th degree, and the existence of real zero(s) is guaranteed.

The uniqueness of the real and positive zero can be proven by Descartes' Rule of Signs, one of the fundamental theorems in the theory of polynomial equations:

<u>Descartes' Rule of Signs</u>

The number of real positive zeros of a real polynomial

$$a_n x^n + a_{n-1}x^{n-1} + \dots + a_1 x + a_0 \qquad (a_n \neq 0)$$

is either equal to $\Gamma$, the number of variations of sign in the sequence $\{a_n, a_{n-1}, \dots, a_1, a_0\}$, or less than $\Gamma$ by an even integer. (A zero of multiplicity $n^*$ is counted as $n^*$ zeros.)

In (4.9), $a_S > 0$ for all $S > 0$, and $a_0 < 0$ since $I_m^j(T) < A_m^j(T)$ as long as $A_m^j(T-1) > 0$. Thus the sequence $\{a_S\}$ has $\Gamma = 1$ in general, so that P(x) has a unique real zero; and in fact it is positive.

Whether this unique real zero exists in the interval (0,1) can be seen by examining the signs of P(x) at the two end points of the open interval, 0 and 1. We know that $P(0) < 0$ since $a_0 < 0$. At the other end of the interval $P(1) = \sum_{S=0}^{T} a_S > 0$, for it must be true that

$A_m^j(T) < \sum_{S=0}^{T-1} I_m^j(T-S) + A_m^j(0)$. Thus we observe a reversal of the signs of P(x) at the two end points of (0,1); and we have shown that P(x) has a unique real zero in the open interval (0,1).

In order to approximate the real zero of the polynomial equation (9), we employ a straight-line iteration method for non-linear equations, specifically, the Newton-Raphson method. This method was proposed by Newton in 1669 and modified by Joseph Raphson in 1690 to give its present form. A distinguished feature of this method is that convergence occurs rapidly once the interate is sufficiently close to the root. Under certain conditions, the Newton-Raphson method can be shown to display the property of quadratic convergence.

The Newton-Raphson method is presented geometrically in Figure 4.1. The problem is to find a zero $\xi$ of $P(x) = 0$. Choose an initial approximation $x_0$. Compute $P(x_0)$ and find a tangent line to P(x) at the point $P_0$. The line crosses the abscissa at a point $x_1 = x_0 - P(x_0)/P'(x_0)$, which is expected to be a better approximation to $\xi$ than $x_0$. Repeat the process at $x_1$ which gives a new approximation to $\xi$, $x_2 = x_1 - P(x_1)/P'(x_1)$. This recursive procedure generates a sequence of real numbers $x_0$, $x_1$, $x_2$,... which converges to $\xi$ under the conditions discussed below. Formally, the algorithm may be stated as follows:

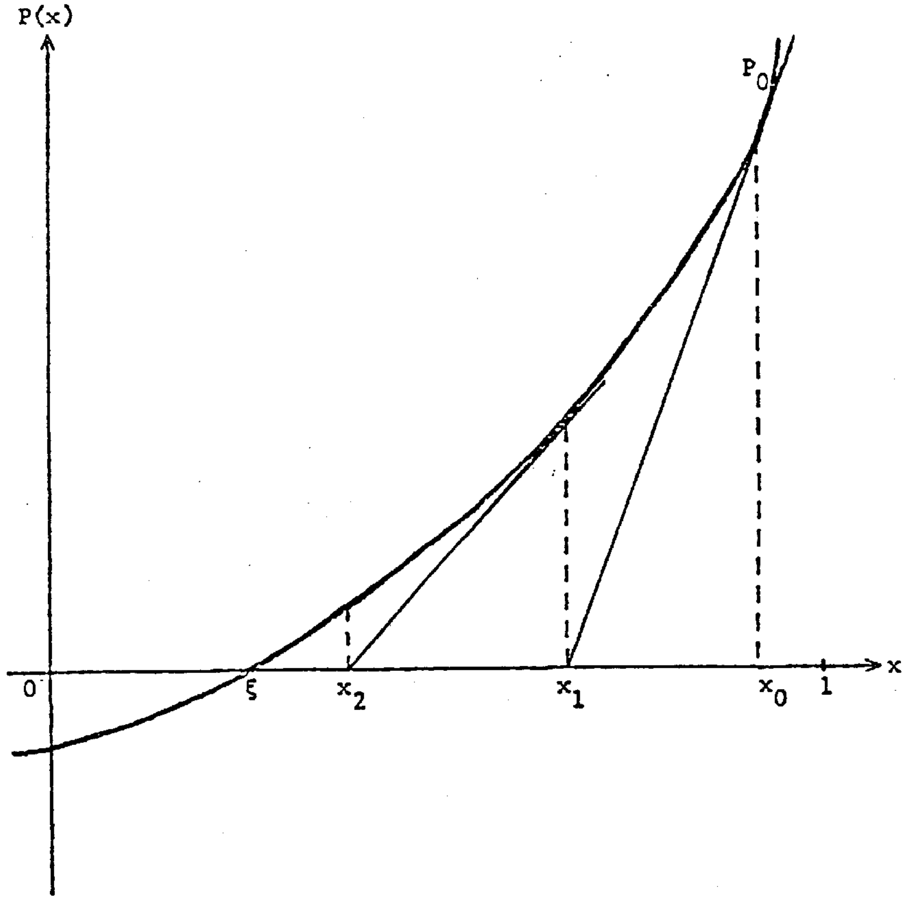
Algorithm

Let $x_0$ be an initial approximation to a zero $\xi$ of $P(x) = 0$. Generate the sequence $\{x_i\}$ by the following recursion formula,

$$x_{i+1} = x_i - \frac{P(x_i)}{P'(x_i)} \qquad (i = 0,1,2,\ldots)$$

The conditions for convergence of $x_i$ are as follows: (1) $P(x) = 0$ has a zero $\xi$ in a finite interval U. (2) $P'$ and $P''$ are non-vanishing in U. (3) $x_0$ must be chosen in U so that $x_1 \xi U$. From our discussion above, we know that the condition (1) is met for $P(x)$ in $U = (0,1)$, and since $a_S > 0$ for all $S > 0$, $P'$ and $P''$ are non-vanishing in (0,1). The condition (3) is satisfied by appropriate choice of an initialization value.

Compared to the measurement of depreciable capital stocks discussed so far, the methodological framework for the measurement of non-depreciable capital stocks (land and inventory) is straightforward. The measurement procedure simply is to deflate land and inventory series in current prices by relevant deflators. We shall discuss the measurement of these assets in detail in the next section.


P(x)
P0
0
ξ
x2
x1
x0
1
x

3. Capital Stock, the measurement

We are now ready to discuss the selection of data and computational details of the measurement of capital stocks by asset types for corporate and non-corporate sector of respective industry. The classification of industries has already been shown in the previous chapter. The classification of legal form of organization and the categories of capital assets divided is shown in [Table 1].

We begin with the non-residential depreciable assets. The first step is to select benchmark capital stocks in 1955 and 1970. The Economic Planning Agency's National Wealth Survey (NWS) [ ] conducted for 1955, 1960, 1965 and 1970 makes available, by assets and industry, the stock levels for private corporate, non-corporate and government enterprise separately. Unfortunately, the 1960 and 1965 surveys are meager in scale and quality compared to the other years, and must therefore be disregarded.

The 1955 survey reported the'net capital assets' by legal form of organization and industry. The 1970 survey reported the 'net capital assets' and 'gorss capital assets' by legal form of organization and industry. The 'gross' value of assets in NWS was estimated by multiplying the value at acquisition time by rate of the change in prices between the acquisition time and the survey year, which the net value was by multiplying the gross value by the remaining value ratio in proportion to life time and years elasped from acquisition time. Theoretically capital assets that we use in a perpetual inventory method as a benchmark have to be 'net' value corresponding to real capital service flow. However there are somewhat doubtful whether the estimates of 'net' value in NWS are consistent with the theoretical concept of 'net' capital stock. If capital has been replaced continuously, 'gross' value in NWS seems to be correspond to real capacity consistently with the capital service flow. On the other hand if capacity decreases in proportion to years elapsed from acquisition time, 'net' value in NWS seems to be correspond to real capacity. Since we do not have any information so definitely as to decide whether 'net' or 'gross' value in NWS is appropriate, we are obliged to try to estimate capital stock alternatively by using 'net value' and 'gross value' as a benchmark and select a appropriate benchmark empirically.

The stock figures of corporate industries and adjusted to include the government enterpriese for 1955 as well as 1970 series. 'Net value' of assets are available only in 1970. We estimate 'gross value' of assets after above mentioned adjustment in 1955 by multiplying the 'net value' in 1955 by the ratio of 'gross value' to 'net value' in 1970. The deflators for producer's durables, total and by asset (and in the case of machinery, by industry), are obtained from NWS in 1970. The 1955 stock values are then inflated using the price indices at the base year price of 1970. 'Net' and 'gross' capital stocks in 1955 are to be used alternatively for the implementation of the perpetual inventory method in order to impute the replacement rate.

The second step is to obtain investment series in constant prices. The gross investment series of non-residential producers' durables of private corporate and non-corporate sector are available by industry in the Economic Planning Agency's Gross Capital Stock of Private Firms (CSPF). Unfortunately the classification of namufacturing industry in CSPF is less precise than ours. Disaggregation of investment series into our manufacturing classification is made by using the deflated gross investment in Census of Manufacturing, Reported by Industry (CMRI). Deflator for investment of CMRI are estimated by reediting the deflator series by commodity with the weithts of commodities of capital formation vector in the Capital Formation Matrix of Input-Output Table, 1975. Gross investment series by industry do not contain any information about the distribution among different categories. Gross investment in corporate sector is divided into asset categories by using weights, which are calculated from Report on the Corporate Industry Investment Survey (RCIS).

The gross investment of government enterprise is added to above estimated investment of private sector by asset categories. Government enterprises covered here are listed in Appendix A. Gross investment of each government enterprise is estimated from the increment of the relevant asset items in the balance sheet and list of property of closing accounts and deflated by the investment price indices.

The last set of data required by our perpetual inventory method is the rate of replacement. With the two benchmark capital stocks in net and gross value obtained above from NWS, and the investment series during the period 1955-1970, the 'polynomial method' discussed in Section 2 is applied to impute the economic rate of replacement. Given the estimates of investment series in 1970 prices, the 1955 benchmark capital stock and the rate of replacement discussed above, the perpetual inventory method of the form (8) generates the estimated capital stock levels in 1970 prices for the depreciable assets in the corporate sector and the non-corporate sector of each of the thirty industries:

$$(10) \quad A_m^j(T) = \sum_{s=1}^{T} (1-\mu_m^j)^{T-S} I_m^j(S) + (1-\mu_m^j)^T A_m^j(1955).$$

The Economic Planning Agency's RCIS has been curtailed since 1974 and excluded any information of detailed asset types of investment. In order to generate the capital stock for each asset after 1975, we are obliged to estimate the gross investment devided by industry and assets by using the information of balance sheets of all firms whose common stocks are listed in Tokyo, Nagoya and Osaka stock market. There exist 964 firms in manufacturing industry and 335 firms in other industry except Agriculture-Forestry-Fisheries, Mining and Finance-Insurance. With respect to Agriculture-Forestry-Fisheries, Mining and Finance-Insurance, the proportions of asset categories during the period 1975-1979 are substituted by the ratios of 1974's which were reported in RCIS.

Nextly we discuss about the residential building, all residential buildings are regarded to be owned by real estate industry. This procedure is consisted with the concept of System of National Account and Input-Output Table, where the imputed rent of residential building is included in the value-added of real estate industry. Nominal values and deflator of the gross investment of residential buildings by legal form of organization are reported in Annual Report of National Income Accounts (ARNI). Capital stocks of residential building in 1955 and 1970 as a benchmark are available in NWS. The'polynominal method' is applied to impute the economic rate of replacement again and the perpetual inventory method generates the estimated capital stock level of residential building.

[Table 2] shows the results of the'polynominal method' for imputation of the economic rate of replacement. Our experiment has four alternatives as concerns about selection of benchmark stock data and flow series of gross investment.

Case I: Case in which we used 'net value' of capital stock in NWS as benchmarks and 'new investment plus used goods minus scrapping' as flow investment.

Case II: Case in which we used 'net value' of capital stock as benchmarks and 'new investment' as flow investment.

Case III: Case in which we used 'gross value' of capital stock in NWS as benchmarks and 'new investment plus used goods minus scrapping' as flow investment.

Case IV: Case in which we used 'gross value' of capital stock in NWS as benchmarks and 'new investment' as flow investment.

The Economic rates of replacement in six depreciables assets in corporate sector and one depreciable asset in non-corporate sector are estimated by tht 'polynominal method' in thirty industries. Estimated results shown in [Table 2] is average value of replacement rate by asset types for four alternative data basis. Estimated replacement rates in 'net value' base are higher than those in 'gross value' base and estimated rates in 'new investment plus used goods minus scrapping' base is lower than those in 'new investment' base. Estimates in 'net value' base seems to be over-estimated in the rate of replacement.

The estimated rates of replacement are reflected on the estimates of capital stock in the'perpetual inventory method' and the estimates of capital service price in the latter section. At this stage we do not have any information to decide which economic rates of replacement are more appropriate. However we decided to select estimates of economic rates of replacement in case IV as results of relevant estimates of 'rate of return on capital stock' in the next stage. [Table 3] and [Table 4] represent final results of estimates of economic rate of replacement by asset types and legal form and declining balance rates of each asset calculated from the expected life-time of assets reported in NWS shown in [Table 5].

We turn next to the capital stock estimation of non-depreciable assets, firstly land and then inventory. The 1955 NWS reports corporate and non-corporate land holdings in terms of actual <u>area</u> holdings by industry and legal form of organization. This is in fact the only sources of information on land for the non-corporate industries separately from the corporate.

The Ministry of Home Affairs reports the time series of land area holdings by type of land and legal form of organization in <u>Real Estate Survey</u> (RES).

For Agriculture-Forestry-Fisheries, we applied the annual growth rate of the total area holding of 'cultivate field', 'pond and marsh' and 'forest' by each legal form in RES to extraporate the land area holdings in 1955's NWS during the period 1955-1979. For Real Estate industry, we applied the annual growth rate of housing land in RES to the extraporation of the land area holdings in 1955. On the other hand deflators of land per area in these industries are calculated as the weighted average of price index reported in Survey of the Prices and the Rents of Cultivate Fields, Survey of the Prices of Forestries and Woods and Survey of the Price Indices of Land in Urban Area.

As for manufacturing industries, Census of Manufacturing, Report on Industrial Land and Water Use provides land area holdings, acquisition area by industry and nominal value of land acquisition. However unfortunately these data are not divided into legal form of organization. Therefore we estimate the land holdings and its price in manufacturing industry under the assumption that the same growth rate and the same prices of land were applied to the extraporation of 1955's NWS of land holdings both in the corporate and non-corporate secto5s.

For the remainder of industries, we obtain annual valuantion of corporate land holdings from RCIS during the period 1955-1974.

The NWS data above is applied to these values to obtain the corporate and non-corporate land in current prices. These values are then deflated using a composite index of land price by commercial, industrial and residential use reported by Japan Real Estate Research Institute (JREI). Since 1974 that RCIS was curtailed, annual valuations of land holdings are obtained from balance sheets reported in common stock market mentioned previously.

Finally, the stock levels must be estimated for the other non-depreciable asset, inventory. For both corporate and non-corporate sectors, the inventory level in current and constant prices are controlled to the control totals obtained as follows: 1955 NWS reports industry levels by industry and by corporate/non-corporate sectors. We aggragate the NWS series over industry, and apply the annual changes in inventory reported by NIS to generate the annual levels of inventory by corporate and non-corporate sectors.

This completes the measurement of real capital stocks. The results by industry and by the legal form is reported in the Appendix B as an average annual growth rate by asset types.

Table 1 The Legal Form of Organization and Categories of Production Assets

<table>
<tr><td rowspan="2">Legal Form</td><td colspan="2">Corporate Sector</td><td rowspan="2">Non-Corporate Sector</td></tr>
<tr><td>Private-Corporation</td><td>Government Enterprise</td></tr>
<tr><td rowspan="8">Assets</td><td>1 Residential Buildings</td><td>Residential Buildings</td><td>1 Residential Buildings</td></tr>
<tr><td colspan="2">2 Non-residential Buildings</td><td rowspan="6">2 Non-residential Producers' Durables</td></tr>
<tr><td colspan="2">3 Other Structures</td></tr>
<tr><td colspan="2">4 Machinery</td></tr>
<tr><td colspan="2">5 Water Transport Vessels</td></tr>
<tr><td colspan="2">6 Land & Air Transport Vessels</td></tr>
<tr><td colspan="2">7 Tools & Fixtures</td></tr>
<tr><td colspan="2">8 Land</td><td>3 Land</td></tr>
<tr><td></td><td colspan="2">9 Inventory</td><td>4 Inventory</td></tr>
</table>

The estima

The estimation of this capital stock data is divided broadly into three categories as follows:

(1) The stock data of non-residential producers' durables owned by industry and by legal form of organization (Corporate Sector: Asset 2-7, Noncorporate Sector: Asset 2),
(2) The stock data of residential buildings owned by industry and legal form,
(3) The stock data of land owned by industry and legal form.

[Table 2] A Comparison of Results from Four Cases of Perpetual Inventory Method

| Condition of Perpetual Inventory | | Case [I] | Case [II] | Case [III] | Case [IV] |
|---|---|---|---|---|---|
| Concept of Bench Capital Stock | | Net | Net | Gross | Gross |
| Source of Bench Capital Stock | | N.W.S. | N.W.S. | N.W.S. | N.W.S. |
| Concept of Investment | | It+St-Rt | It | It+St-Rt | It |
| Source of Investment | | G.I.E. | G.I.E. | G.I.E. | G.I.E. |
| Bench Year | | 1955 & 1970 | 1955 & 1970 | 1955 & 1970 | 1955 & 1970 |
| No. of No Solution | | 21 | 6 | 84 | 49 |
| **Estimated Results of Average Economic Rate of Depreciation** | **Expected Life time of Durables Assets (year)** | | | | |
| Corporate Sector | | | | | |
| (1) Residential Buildings | 41.6 | - | - | 0.0104 | 0.0124 |
| (2) Non-Residential Buildings | 34.7 | 0.0631 | 0.1211 | 0.0152 | 0.0382 |
| (3) Other Structures | 26.7 | 0.0907 | 0.1567 | 0.0243 | 0.0574 |
| (4) Machinery | 10.5 | 0.1702 | 0.2884 | 0.0275 | 0.0820 |
| (5) Water Transport Vessels | 9.7 | 0.3929 | 0.5176 | 0.2378 | 0.3236 |
| (6) Land and Air Transport Vessels | 5.6 | 0.1799 | 0.2917 | 0.0428 | 0.0544 |
| (7) Tool and Fixtures | 6.3 | 0.2712 | 0.4512 | 0.0478 | 0.0972 |
| Non-corporate Sector | | | | | |
| (8) Residential Buildings | 26.1 | - | - | 0.0104 | 0.0124 |
| (9) Producer's Durables | 18.0 | 0.1156 | 0.2037 | 0.0135 | 0.0465 |

Notes: (1) Net and Gross mean net capital assets and gross capital assets reported in National Wealth Survey.
(2) N.W.S. and G.I.E. represent National Wealth Survey and Gross Capital Stock Estimates of Economic Planning Agency.
(3) It, St and Rt denote new investment, purchases of used investment goods and scrapping respectively.
(4) 'No. of No solution' indicates number of "no solution" using the perpetual inventory method.

[Table 3] Estimate Economic Rate of Depreciation

| Industry | Corporate Sector Asset 1* | Asset 2* | Asset 3* | Asset 4* | Asset 5* | Asset 6* | Asset 7* | Non-Corporate Sector Asset 8* | Asset 9* | Gov. Enterprise Asset 10* |
|---|---|---|---|---|---|---|---|---|---|---|
| AGRICULTURE, FORESTRY | 0.0 | 0.00078 | 0.01909 | 0.06778 | 0.08044 | 0.02447 | 0.20682 | 0.0 | 0.03307 | 0.0 |
| MINING | 0.0 | 0.06885 | 0.09522 | 0.10137 | 0.27404 | 0.05900 | 0.16418 | 0.0 | 0.13743 | 0.0 |
| CONSTRUCTION | 0.0 | 0.22014 | 0.01909 | 0.03309 | 0.06874 | 0.25561 | 0.00238 | 0.0 | 0.09775 | 0.0 |
| FOOD, KINDRED PRODUCT | 0.0 | 0.00078 | 0.06893 | 0.07302 | 0.04108 | 0.06465 | 0.03526 | 0.0 | 0.03295 | 0.0 |
| TEXTILE MILL | 0.0 | 0.00078 | 0.05673 | 0.03309 | - | 0.00781 | 0.03126 | 0.0 | 0.03881 | 0.0 |
| APAREL, OTHER FABRIC. | 0.0 | 0.00078 | 0.01909 | 0.03309 | - | 0.07709 | 0.00238 | 0.0 | 0.00963 | 0.0 |
| LUMBER, WOOD, EXCEPT F | 0.0 | 0.00078 | 0.03773 | 0.03309 | 0.07935 | 0.00781 | 0.02549 | 0.0 | 0.02250 | 0.0 |
| FURNITURE, FIXTURES | 0.0 | 0.00078 | 0.01909 | 0.03309 | - | 0.08816 | 0.00238 | 0.0 | 0.02115 | 0.0 |
| PAPER, ALLIED PRODUCT | 0.0 | 0.00078 | 0.04926 | 0.06010 | - | 0.00781 | 0.00304 | 0.0 | 0.05913 | 0.0 |
| PRINT, PUBLISH, ALLIED | 0.0 | 0.00078 | 0.30095 | 0.03309 | - | 0.00781 | 0.03531 | 0.0 | 0.10542 | 0.0 |
| CHEMICAL | 0.0 | 0.02829 | 0.01909 | 0.07710 | 0.58847 | 0.18826 | 0.07090 | 0.0 | 0.00963 | 0.0 |
| PETROLEUM REFINERY | 0.0 | 0.03032 | 0.08757 | 0.06158 | 0.65585 | 0.26651 | 0.08311 | 0.0 | - | 0.0 |
| RUBBER, MISCELANEOUS | 0.0 | 0.11559 | 0.06595 | 0.12695 | - | 0.01060 | 0.25093 | 0.0 | 0.00963 | 0.0 |
| LEATHER | 0.0 | 0.12889 | 0.09936 | 0.15800 | - | 0.03814 | 0.28963 | 0.0 | 0.08471 | 0.0 |
| STONE, CLAY, GLASS | 0.0 | 0.00078 | 0.02034 | 0.05378 | 0.01365 | 0.00781 | 0.09292 | 0.0 | 0.07874 | 0.0 |
| IRON AND STEEL | 0.0 | 0.03768 | 0.04168 | 0.06440 | 0.31339 | 0.06708 | 0.13210 | 0.0 | 0.00963 | 0.0 |
| NON-FERROUS METALS | 0.0 | 0.00078 | 0.01909 | 0.03309 | - | 0.06470 | 0.03358 | 0.0 | 0.00963 | 0.0 |
| FABRICATED METAL | 0.0 | 0.04535 | 0.15671 | 0.04701 | - | 0.00781 | 0.00238 | 0.0 | 0.04787 | 0.0 |
| MACHINERY | 0.0 | 0.08373 | 0.08111 | 0.07697 | 0.47903 | 0.22127 | 0.00238 | 0.0 | 0.04362 | 0.0 |
| ELECTRIC MACHINERY | 0.0 | 0.01335 | 0.05327 | 0.07320 | - | 0.06482 | 0.12695 | 0.0 | 0.00963 | 0.0 |
| MOTOR VEHICLES | 0.0 | 0.00078 | 0.01909 | 0.05797 | - | 0.10326 | 0.11345 | 0.0 | 0.07854 | 0.0 |
| TRANSPORTATION | 0.0 | 0.02035 | 0.02313 | 0.09704 | 0.23115 | 0.14529 | 0.17069 | 0.0 | 0.11009 | 0.0 |
| PRECISION | 0.0 | 0.07836 | 0.11225 | 0.18907 | - | 0.14307 | 0.31900 | 0.0 | 0.12354 | 0.0 |
| MISCELLANEOUS MTG | 0.0 | 0.15304 | 0.11014 | 0.16242 | - | 0.06658 | 0.28844 | 0.0 | 0.06397 | 0.0 |
| TRANS. COMMUNICATION | 0.0 | 0.02711 | 0.01909 | 0.03309 | 0.30838 | 0.08468 | 0.13148 | 0.0 | 0.12094 | 0.0 |
| ELECTRIC, GAS, WATER | 0.0 | 0.00078 | 1.00000 | 0.03309 | - | 0.00781 | 0.00238 | 0.0 | - | 0.0 |
| WHOLESALE, RETAIL | 0.0 | 0.01175 | 0.06013 | 0.10014 | 0.17796 | 0.00781 | 0.00238 | 0.0 | 0.10435 | 0.0 |
| FINANCE INSURANCE | 0.0 | 0.04133 | 0.01909 | 0.09977 | 0.28111 | 0.34469 | 0.27708 | 0.0 | 0.05805 | 0.0 |
| REAL ESTATE | 0.01243 | 0.00562 | 0.01909 | 0.04000 | 0.27242 | 0.27069 | 0.26238 | 0.01243 | 0.00963 | 0.01243 |
| OTHER SERVICE | 0.0 | 0.05852 | 0.07334 | 0.39269 | 0.08111 | 0.00781 | 0.00238 | 0.0 | 0.02438 | 0.0 |

Notes: (1) Economic rates of depreciation are estimated by perpetual inventory method in each asset by industry during the period 1955-1970, where capital stocks of each asset in benchmark years 1955 and 1970 are available in National Wealth survey.

(2) Categories of asset are divided as follows:
Corporate sector: (1) Residential buildings, (2) Non-residential buildings, (3) Other structures, (4) Machinery, (5) Water transport vessels, (6) Land and air transport vessels and (7) Tool and fixtures.
Non-corporate sector: (8) Residential buildings and (9) Producer's durables.
Government Enterprises: (10) Residential buildings.

[Table 4] Declining balance Rate of Assets

| Industry | Corporate Sector Asset (2) | Asset (3) | Asset (4) | Asset (5) | Asset (6) | Asset (7) | Non-corporate Sector Asset (9) |
|---|---|---|---|---|---|---|---|
| 1 | 0.025506 | 0.374125 | 0.684550 | 0.796379 | 0.117436 | 1.116813 | 0.403442 |
| 2 | 2.017327 | 3.304116 | 0.861610 | 2.411568 | 0.371722 | 1.067186 | 1.099406 |
| 3 | 7.616798 | 0.465747 | 0.215065 | 0.570530 | 1.226923 | 0.013317 | 1.182765 |
| 4 | 0.025896 | 1.723298 | 0.832475 | 0.427261 | 0.316803 | 0.204529 | 0.510790 |
| 5 | 0.025272 | 1.429711 | 0.354029 | 0.0 | 0.039821 | 0.231352 | 0.601638 |
| 6 | 0.026442 | 0.313043 | 0.344105 | 0.0 | 0.400879 | 0.020689 | 0.149203 |
| 7 | 0.020046 | 1.011246 | 0.370574 | 0.920439 | 0.036698 | 0.175865 | 0.348800 |
| 8 | 0.021996 | 0.362672 | 0.403661 | 0.0 | 0.449609 | 0.014030 | 0.327766 |
| 9 | 0.026676 | 1.507320 | 0.763259 | 0.0 | 0.039820 | 0.024907 | 0.916450 |
| 10 | 0.027768 | 6.289779 | 0.403661 | 0.0 | 0.039040 | 0.250676 | 1.634021 |
| 11 | 1.046708 | 0.425670 | 0.663078 | 9.239004 | 1.355441 | 0.545960 | 0.149203 |
| 12 | 1.121968 | 1.952802 | 0.529560 | 10.296906 | 1.918888 | 0.639948 | 0.0 |
| 13 | 3.756647 | 1.655292 | 1.345723 | 0.0 | 0.054048 | 1.229538 | 0.149203 |
| 14 | 4.188845 | 2.493858 | 1.674760 | 0.0 | 0.194517 | 1.419201 | 1.312995 |
| 15 | 0.023166 | 0.663095 | 0.586196 | 0.227887 | 0.043725 | 0.529649 | 1.220425 |
| 16 | 1.352901 | 1.300352 | 0.869360 | 3.384635 | 0.771442 | 0.911482 | 0.149203 |
| 17 | 0.027620 | 0.591728 | 0.367266 | 0.0 | 0.394652 | 0.218257 | 0.149203 |
| 18 | 1.496609 | 3.431968 | 0.564100 | 0.0 | 0.039040 | 0.010700 | 0.742009 |
| 19 | 2.721290 | 2.206104 | 0.908226 | 6.466926 | 1.128452 | 0.013079 | 0.676067 |
| 20 | 0.467137 | 1.273200 | 0.746595 | 0.0 | 0.350014 | 0.660144 | 0.149203 |
| 21 | 0.026286 | 0.641357 | 0.614476 | 0.0 | 0.505958 | 0.465144 | 1.217401 |
| 22 | 0.685710 | 0.777050 | 1.028646 | 2.288337 | 0.711941 | 0.699843 | 1.706381 |
| 23 | 2.546809 | 2.817402 | 2.004111 | 0.0 | 0.729678 | 1.563094 | 1.914927 |
| 24 | 4.973681 | 2.764487 | 1.721677 | 0.0 | 0.339553 | 1.413370 | 0.991900 |
| 25 | 0.962563 | 0.643265 | 0.363957 | 4.995798 | 0.499621 | 0.946655 | 1.281960 |
| 26 | 0.026598 | 0.0 | 0.565788 | 0.0 | 0.040602 | 0.022591 | 0.0 |
| 27 | 0.414752 | 1.142417 | 1.091513 | 2.349019 | 0.037478 | 0.016646 | 1.993142 |
| 28 | 1.930059 | 0.572640 | 1.007659 | 2.558066 | 2.033684 | 2.022645 | 1.654430 |
| 29 | 0.262610 | 0.572640 | 0.403972 | 2.478982 | 1.597067 | 1.915384 | 0.274336 |
| 30 | 1.931004 | 1.782137 | 3.534178 | 0.819247 | 0.041382 | 0.013555 | 0.516887 |
| AVERAGE | 1.326551 | 1.534081 | 0.860792 | 3.139432 | 0.527531 | 0.612541 | 0.836539 |

Notes: (1) Above declining balance rates (R) of each asset are calculated from the expected life-time assets (T) reported in N.W.S. (see [Table 4]) and estimated economic rate of depreciation ($\mu$) (see [Table 2]) in case(IV) of [Table 1] as follows,

$$R = \mu T \ .$$

(2) As concerns the item of assets, refer to Notes of [Table 2].

[Table 5] Expected Lifetime of Durable Assets

| Industry \ Assets | Corporate Sector | | | | | | | Non-corporate Sector | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1 | 0.0 | 31.6000 | 19.6000 | 10.1000 | 9.9000 | 4.8000 | 5.4000 | 0.0 | 14.4000 |
| 2 | 0.0 | 28.0000 | 34.7000 | 8.5000 | 8.8000 | 6.3000 | 6.5000 | 0.0 | 8.0000 |
| 3 | 0.0 | 35.3000 | 24.4000 | 6.5000 | 8.3000 | 4.8000 | 5.6000 | 0.0 | 12.1000 |
| 4 | 0.0 | 34.1000 | 25.0000 | 11.4000 | 10.4000 | 4.9000 | 5.8000 | 0.0 | 20.3000 |
| 5 | 0.0 | 32.4000 | 25.2000 | 10.7000 | 6.6000 | 5.1000 | 7.4000 | 0.0 | 18.9000 |
| 6 | 0.0 | 36.4000 | 16.4000 | 10.4000 | 8.0000 | 5.2000 | 8.7000 | 0.0 | 19.4000 |
| 7 | 0.0 | 25.4000 | 26.8000 | 11.2000 | 11.6000 | 4.7000 | 6.9000 | 0.0 | 14.3000 |
| 8 | 0.0 | 28.6000 | 19.0000 | 12.2000 | 11.6000 | 5.1000 | 5.9000 | 0.0 | 18.4000 |
| 9 | 0.0 | 33.6000 | 30.6000 | 12.7000 | 6.2000 | 5.1000 | 8.2000 | 0.0 | 18.2000 |
| 10 | 0.0 | 41.6000 | 20.9000 | 12.2000 | 8.0000 | 5.0000 | 7.1000 | 0.0 | 20.3000 |
| 11 | 0.0 | 37.7000 | 22.3000 | 8.6000 | 15.7000 | 7.2000 | 7.7000 | 0.0 | 16.0000 |
| 12 | 0.0 | 37.7000 | 22.3000 | 8.6000 | 15.7000 | 7.2000 | 7.7000 | 0.0 | 16.0000 |
| 13 | 0.0 | 32.5000 | 25.1000 | 10.6000 | 5.0000 | 5.1000 | 4.9000 | 0.0 | 17.5000 |
| 14 | 0.0 | 32.5000 | 25.1000 | 10.6000 | 5.0000 | 5.1000 | 4.9000 | 0.0 | 17.5000 |
| 15 | 0.0 | 27.7000 | 32.6000 | 10.9000 | 16.7000 | 5.6000 | 5.7000 | 0.0 | 18.2000 |
| 16 | 0.0 | 35.0000 | 31.2000 | 13.5000 | 10.8000 | 11.5000 | 6.9000 | 0.0 | 19.3000 |
| 17 | 0.0 | 35.0000 | 31.0000 | 11.1000 | 7.4000 | 6.1000 | 6.5000 | 0.0 | 18.6000 |
| 18 | 0.0 | 33.6000 | 21.9000 | 12.0000 | 11.1000 | 5.0000 | 4.5000 | 0.0 | 17.4000 |
| 19 | 0.0 | 32.2000 | 27.2000 | 11.8000 | 13.5000 | 5.1000 | 5.5000 | 0.0 | 17.8000 |
| 20 | 0.0 | 39.0000 | 23.9000 | 10.2000 | 4.1000 | 5.4000 | 5.2000 | 0.0 | 19.1000 |
| 21 | 0.0 | 34.0000 | 33.6000 | 10.6000 | 9.9000 | 4.9000 | 4.1000 | 0.0 | 18.6000 |
| 22 | 0.0 | 34.0000 | 33.6000 | 10.6000 | 9.9000 | 4.9000 | 4.1000 | 0.0 | 18.6000 |
| 23 | 0.0 | 39.0000 | 25.1000 | 10.6000 | 5.0000 | 5.1000 | 4.9000 | 0.0 | 19.1000 |
| 24 | 0.0 | 32.5000 | 25.1000 | 10.6000 | 5.0000 | 5.1000 | 4.9000 | 0.0 | 17.5000 |
| 25 | 0.0 | 35.5000 | 33.7000 | 11.0000 | 16.2000 | 5.9000 | 7.2000 | 0.0 | 10.6000 |
| 26 | 0.0 | 34.1000 | 41.2000 | 17.1000 | 7.7000 | 5.2000 | 9.5000 | 0.0 | 15.5000 |
| 27 | 0.0 | 35.3000 | 19.0000 | 10.9000 | 13.2000 | 4.8000 | 7.0000 | 0.0 | 19.1000 |
| 28 | 0.0 | 46.7000 | 30.0000 | 10.1000 | 9.1000 | 5.9000 | 7.3000 | 0.0 | 28.5000 |
| 29 | 41.6000 | 46.7000 | 30.0000 | 10.1000 | 9.1000 | 5.9000 | 7.3000 | 26.1000 | 28.5000 |
| 30 | 0.0 | 33.0000 | 24.3000 | 9.0000 | 10.1000 | 5.3000 | 5.7000 | 0.0 | 21.2000 |

Notes: (1) Above values are expected life time of each asset which was reported in National Wealth Survery in 1970.

(2) Categories of asset are divided as follows:

Corporate Sector: (1) Residential buildings, (2) Non-residential buildings, (3) Other structures, (4) Machinery, (5) Water transport vessels, (6) Land and air transport vessels and (7) Tool and fixtures.

Non-corporate sector: (8) Residential buildings, and (9) Producer's durables.

Appendix A The Government Enterprises Whose Investment must be included in Corporate Sector and their Number of Industry

| [Special Accounts of Central Government] | Industry No. |
|---|---|
| Mint Bureau Special Accounts | 18 |
| Printing Bureau Special Accounts | 10 |
| State Forests and Fields Activity Special Accounts | 1 |
| Alcohol Monopoly Enterprise Bureau Special Accounts | 11 |
| Post and Telecommunications Activity Special Accounts | 25 |
| Post-office Life Insurance and Post-office Annuity Special Accounts | 28 |
| [Central Government Enterprises] | |
| Japan Monopoly Corporation | 24 |
| Japanese National Railways | 25 |
| Nippon Telegraph and Telephone Public Corporation | 25 |
| [Business Accounts of Local Government] | |
| Business Accounts of Water Supply | 26 |
| Business Accounts of Water Supply for Industrial Uses | 26 |
| Business Accounts of Transportation | 25 |
| Business Accounts of Electricity Supply | 26 |
| Business Accounts of Gas Supply | 26 |
| Business Accounts of Sewage Disposal | 26 |
| Business Accounts of Construction and Repair of Harbour Facility | 25 |
| Business Accounts of Market Facility | 27 |
| Business Accounts of Facility for Slaughtering and Meat Preparation | 4 |
| Business Accounts of Sightseeing Facility | 30 |
| Business Accounts of Construction of Residential Site | 3 |
| Business Accounts of Toll Road | 25 |
| Business Accounts of Parking Place | 25 |
| Business Accounts of Others | 30 |
| [Enterprises invested by Central Government] | |
| Japan Development Bank | 28 |
| Export-Import Bank of Japan | 28 |
| Electric Power Development Co. | 26 |
| People's Finance Corporation | 28 |
| Housing Loan Corporation | 28 |
| Agriculture and Forestry Finance Corporation | 28 |
| Smaller Business Finance Corporation | 28 |
| Hokkaido and Tohoku Development Corporation | 28 |
| Finance Corporation of Local Public Enterprise | 28 |
| Smaller Business Credit Finance Corporation | 28 |
| Medical Care Facilities Finance Corporation | 28 |
| Environmental Sanitation Business Finance Corporation | 28 |
| Water Resources Development Public Corporation | 30 |
| Agricultural Land Development Machinery Public Corporation | 3 |
| Forest Development Corporation | 1 |
| Japan Petroleum Development Corporation | 28 |
| Maritime Credit Corporation | 25 |

| | |
|---|---|
| Japan Railway Construction Corporation | 3 |
| New Tokyo International Airport Corporation | 25 |
| Keihin Port Development Authority | 25 |
| Hanshin Port Development Authority | 25 |
| Japan Housing Corporation | 3 |
| Japan Highway Public Corporation | 25 |
| Tokyo Expressway Public Corporation | 25 |
| Hanshin Superhighway Corporation | 25 |
| Honshu-Shikoku Bridge Authority | 25 |
| Teito Rapit Transit Authority | 25 |

Appendix B Average Annual Growth Rate of Capital Stock (in percent per year)

| Industry | 1960-1965 | 1965-1970 | 1970-1973 | 1973-1979 | 1960-1973 | 1960-19 |
|---|---|---|---|---|---|---|
| 1. Agric. | 2.89 | 3.93 | 5.16 | 5.18 | 3.81 | 4.24 |
| 2. Mining | 4.10 | 7.91 | 4.64 | -1.54 | 5.69 | 3.41 |
| 3. Construct. | 16.09 | 15.66 | 13.47 | 6.23 | 15.32 | 12.45 |
| 4. Foods | 12.85 | 11.64 | 10.73 | 6.35 | 11.90 | 10.15 |
| 5. Textile | 4.43 | 6.67 | 8.32 | 2.74 | 6.19 | 5.10 |
| 6. Fab. Text. | 8.96 | 11.47 | 13.61 | 2.88 | 10.99 | 8.43 |
| 7. Lumber | 2.66 | 6.19 | 7.83 | 3.24 | 5.21 | 4.59 |
| 8. Furniture | 6.19 | 10.94 | 13.33 | 5.13 | 9.66 | 8.23 |
| 9. Paper | 12.68 | 10.67 | 12.28 | 7.06 | 11.81 | 10.31 |
| 10. Printing | 6.88 | 9.89 | 11.99 | 5.50 | 9.21 | 8.04 |
| 11. Chemicals | 13.57 | 10.83 | 10.23 | 5.37 | 11.75 | 9.73 |
| 12. Pet. Coal | 16.67 | 14.07 | 13.03 | 7.62 | 14.83 | 12.55 |
| 13. Rubber | 20.40 | 16.30 | 8.91 | 4.69 | 16.18 | 12.55 |
| 14. Leather | 15.61 | 9.48 | 6.50 | 1.52 | 11.15 | 8.10 |
| 15. Stone Clay | 14.80 | 13.04 | 12.33 | 6.48 | 13.56 | 11.32 |
| 16. Iron Steel | 17.17 | 12.51 | 12.14 | 4.75 | 14.22 | 11.23 |
| 17. Nonferrous | 10.34 | 10.39 | 10.22 | 9.90 | 10.33 | 10.20 |
| 18. Fab. Metal | 22.69 | 18.43 | 15.46 | 8.26 | 19.38 | 15.87 |
| 19. Machinery | 20.03 | 14.10 | 12.64 | 4.30 | 16.04 | 12.34 |
| 20. Elec. Mach. | 18.98 | 12.50 | 11.04 | 5.89 | 14.65 | 11.88 |
| 21. Mot. Veh. | 16.32 | 15.64 | 14.09 | 7.52 | 15.55 | 13.01 |
| 22. Trsp. Eqpt. | 14.62 | 12.28 | 13.68 | 4.02 | 13.50 | 10.51 |
| 23. Prec. Inst. | 21.28 | 10.46 | 16.10 | 5.88 | 15.92 | 12.75 |
| 24. Misc. Mfg. | 18.92 | 16.36 | 18.68 | 7.09 | 17.88 | 14.47 |
| 25. Trsp. Comm. | 3.07 | 7.82 | 7.95 | 4.22 | 6.03 | 5.45 |
| 26. Utilities | 5.12 | 5.22 | 10.22 | 6.15 | 6.33 | 6.28 |
| 27. Trade | 11.66 | 11.51 | 13.46 | 6.41 | 12.02 | 10.25 |
| 28. Finance | 14.16 | 9.23 | 6.58 | 2.42 | 10.52 | 7.96 |
| 29. Real Estate | 3.98 | 5.58 | 6.57 | 4.43 | 5.20 | 4.95 |
| 30. Services | 3.52 | 16.07 | 13.95 | 6.12 | 10.75 | 9.29 |
| 31. Gov. Services | | | | | | |