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Inefficiency of Corporate Investment and Distortion of Savings Behavior in Japan

Albert Ando, Dimitrios Christelis, and
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6.1 Introduction

Malaise and stagnation notwithstanding, Japan is a rich country, and the Japanese have substantial individual wealth. However, the data suggest that somehow the accumulated net worth of the household sector (excluding land) is smaller than its savings should have achieved. In an earlier paper, Ando (2002) examined this capital loss and attributed some three-fourths of it to losses in the household-sector holdings of corporate equity. In this paper we examine in much further detail the components of this loss and the features of the operations of Japanese corporations[1] that possibly led to it.

The Japanese National Accounts are the starting point for a quantitative analysis, but the nature of some key measures complicates this. Other measures simply are not provided. Still, we believe that the available data and compelling circumstantial evidence support our propositions.

The most important problem we encountered during our investigation

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1. Please note that our discussion of corporations is in the framework of the National Accounts, so we are looking at a much larger universe than just those firms that have equity publicly traded on stock exchanges.

was the extremely high depreciation recorded in the Japanese National Accounts. Thus, we have constructed a series of capital stock and depreciation that conforms more closely to international practice.

After our data adjustments, we find that the rate of return on assets in the corporate sector (whether or not land is included) is very low. Another way of expressing this is that there has been excessively large investment by the corporate sector in physical assets that seem to have low productivity or earning capacity. This idea of "excessive" investment is also borne out by the fact that the market value of the equity of the corporate sector is lower than the liquidation (or replacement) value (i.e., the market sees that the investment is of low quality). Another way to see the same point is to look at average Tobin's *q* (which is below 1).

This low market valuation (and low quality investment) seems to arise because of the corporate governance structure that permits low dividend payments. Since the level of dividends is so small and the historical pattern of dividends does not give any basis to expect them to increase, even when operating surplus and corporate profits after tax increase over time, there is no reason for the market to increase its valuation of corporate equities. Thus, households find themselves with very little value in their ownership of corporations: They are not rewarded for their savings, and this results in the small value of their net worth excluding the value of their land. Faced with this situation, households continue to save a large fraction of their income in an attempt to increase their net worth to a satisfactory level.

In addition, these low dividend payments leave cash in the hands of firms, which are then able to continue to make more low-productivity investments. In other market systems we would expect this to have been corrected by takeovers, which are very rare in Japan, as is well known.

The paper is organized as follows: Section 6.2.1 discusses the accumulation of net worth of the household sector, while section 6.2.2 examines land as a determinant of consumption behavior. Section 6.3.1 discusses corporate saving and dividend payments, and the balance sheet and the capital loss of the corporate sector are discussed in Section 3.2, Corporate investment behavior and financing decisions are addressed in section 6.3.3. Section 6.4 concludes.

6.2 Accumulation of Net Worth by the Household Sector

6.2.1 Household Net Worth and Saving

This section will present the capital loss incurred by the households in more detail than shown in Ando (2002).[2] Table 6.1 summarizes the accu-

2. Our results here are slightly different than the ones reported in that paper due to small revisions in our calculations.

Table 6.1 **Household Sector Saving and Net Worth in 1990 Prices, 1971–1998 (¥ trillions)**

		1971–1979	1980–1990	1991–1998	Accumulated
A.1	Reproducible tangible assets[a]	129.0	66.0	23.2	218.2
	A.2 Flow	131.3	94.1	46.0	271.4
	A.3 Reconciliation[b]	–2.3	–28.1	–22.8	–53.3
B.1	Nonreproducible tangible assets[a]	227.5	982.3	–538.5	671.3
	B.2 Flow	–50.8	–84.3	–24.1	–159.1
	B.3 Reconciliation[b]	278.3	1,066.6	–514.4	830.4
C.1	Net financial assets (excluding equity shares)	112.9	259.1	235.3	607.3
	C.2 Flow	216.6	339.2	273.9	829.6
	C.3 Reconciliation excluding inflation loss[c]	–1.5	–5.9	1.7	–5.7
	C.4 Inflation gain (loss)	–102.2	–74.2	–40.2	–216.6
D.1	Equity	21.5	109.8	–93.1	38.2
	D.2 Flow	5.7	2.1	–9.1	–1.4
	D.3 Reconciliation	15.9	107.7	–84.0	39.6
E.1	**Net worth = A.1 + B.1 + C.1 + D.1**	**490.9**	**1,417.2**	**–373.2**	**1,534.9**
	E.2 Flow = A.2 + B.2 + C.2 + D.2 = F.1 + F.2 + F.3	302.8	351.0	286.7	940.5
	E.3 Reconciliation excluding inflation loss on net financial assets = A.3 + B.3 + C.3 + D.3	290.2	1,140.3	–619.6	811.0
	E.4 Inflation gain (loss) = C.4	–104.2	–74.2	–40.2	–216.6
	F.1 Savings	322.9	360.6	301.6	985.1
	F.2 Net capital transfers	–6.4	–15.9	–20.4	–42.7
	F.3 Statistical discrepancy	–13.7	6.4	5.5	–1.9

(*continued*)

Table 6.1 (continued)

	1971–1979	1980–1990	1991–1998	Accumulated
Excluding Land				
E.1a Net worth = A.1 + C.1 + D.1	**263.4**	**434.9**	**165.4**	**863.7**
E.2a Flow = A.2 + C.2 + D.2 = F.1A + F.2 + F.3	353.6	435.3	310.8	1,099.7
E.3a Reconciliation excluding inflation loss on net financial assets = A.3 + C.3 + D.3	12.0	73.7	–105.2	–19.4
E.4a Inflation gain (loss) = C.4	–102.2	–74.2	–40.2	–216.6
F.1a Savings = F.1 – B.2	373.7	444.9	325.7	1,144.2

Source: EPA (2000a), 86–89, 326–31.

Notes: The household sector includes nonprofit institutions. The SNA68 and our estimate of reproducible tangible assets were used. Constant prices were obtained using the deflator for total private consumption expenditure. Also see box 6.1 for additional information on the data.

[a]Gross fixed capital formation has been reduced by the amount of investment in land improvement using data provided by Mr. Mitsuo Hosen of the Economic and Social Research Institute, Cabinet Office, the Japanese Government. Corresponding adjustments were made to the investment in land and the reconciliation accounts of reproducible fixed assets and land.

[b]Including inflation loss

[c]For net financial assets, losses to creditors are gains to debtors, so the effects of general inflation are reported explicitly rather than as part of reconciliation. (See discussion in the text.)

mulation of net worth by the Japanese household sector from 1971 to 1998. Details on the data are in box 6.1 and the table 6.1 notes.

The E sections bring together information for the flows and changes in stocks. For 1971–1998, the sector's net worth increased some ¥1,535 trillion in 1990 prices (row E.1), whereas savings adjusted for net capital transfers and statistical discrepancy was about ¥940 trillion (row E.2 = F.1 + F.2 + F.3). Thus, the household sector had a net capital gain of ¥595 trillion (row E.1 minus E.2, which also is E.3 + E.4).

Box 6.1 Savings and Net Worth Data in Tables 6.1 and 6.7

In each table, A through D relate changes in the value of stocks to flows for four broad components of net worth. Changes in net worth components are not computed directly. Instead, they are related to the flow-of-funds data through a reconciliation calculation. One element of the reconciliation is changes resulting from general inflation. For three categories—reproducible tangible assets (A), nonreproducible tangible assets (B), and equities (D)—this inflation loss is not shown separately because one sector's loss is not another sector's gain. Thus, the reconciliation is the result of the difference between the price index for the asset and the deflator for total consumption expenditures.

For financial assets (C), losses to creditors are gains to debtors, so the effects of general inflation are reported explicitly (line C.4) rather than as part of the reconciliation entry (line C.3). Specifically, we multiplied the initial stock by the rate of change of the consumption expenditure deflator and recorded the resulting amount as inflation gain (loss). What is left is recorded as reconciliation.

Flow is positive when assets increase more than liabilities, and is negative when liabilities increase more than assets. For nonreproducible tangible assets (B), the flow is primarily net purchase (sale) of land by that sector. These assets are mostly land, but also include timber, fisheries, and subsoil assets. The National Accounts Division assures us that these are at market value. We do not know exactly how the information is obtained, but we have no choice but to accept it.

The structure of the National Accounts requires that the sum of the net acquisition of all items on the balance sheet equals savings recorded in the flow portion of the accounts *plus* net capital transfers received *plus* statistical discrepancy.

The overall gain is due entirely to land. Excluding land, overall capital losses were some ¥236 trillion (row E.1a minus E.2a, which also is E.3a + E.4a). Most of this is the inflation loss suffered on net financial assets (row E.4a). (Savings excluding land is F.1 minus B.2.)

Throughout most of 1971–1998, the net financial liability of the government sector was very small. Most of the net financial asset position of the household sector was matched by the net financial liability position of nonfinancial and financial corporations. The inflation loss of the household sector, therefore, was largely matched by the inflation gain of the corporate sector.

Why did this inflation gain of corporations not appear as an increase in the value of corporate equity owned by the household sector? During most of this period, corporations retained substantial earnings, yet the household sector gained less than ¥40 trillion in the value of corporate equity, far smaller than the accumulated retained earnings and capital gains of corporations combined. We believe this is one of the most unusual features of the Japanese economy. It may provide a clue to one of the causes for the low level of consumption by the household sector. We will therefore look carefully at the corporate sector and how its savings and accumulation of assets are related to the value of corporate equity outstanding.

6.2.2 Land

The household balance sheet is shown in table 6.2, column (5) for 1998 (tables for years 1970, 1980, and 1990 are available online at http://www.nber.org/data-appendix/ando_et_al). It is immediately apparent how large a share the value of land is in household net worth. The way the extraordinarily high price of land affects the savings behavior of the household sector and why one might want to exclude it from the net worth of that sector is the topic of this section. We believe that it is more insightful to exclude the land component of net worth. This is based in part on the fact that the household sector has been a small net seller of land throughout the period studied, 1971–1998, and that the proceeds were used to acquire other assets.

Another reason is the way Japanese households view land. For a typical family, the land on which its residence stands is both a major asset and, by definition, makes the imputed consumption of housing services very high. Thus, it is probable that a family views a rise in the price of land as representing both an increase in its assets and a rise in the cost of living, with each offsetting the other. If families can routinely borrow using land as collateral, a higher price of land may facilitate additional consumption. However, consumer borrowing, including mortgages, appears to be very low in Japan, suggesting either that the market is not well developed or that consumers do not wish to borrow. We therefore believe that most families view net worth excluding land as what is available to them over time.

Table 6.2 **Sectoral Balance Sheet, 1998 Year-End, SNA93 Data (¥ trillions)**

	Nonfinancial (1)	Financial (2)	Total ([1] + [2]) (3)	Government (4)	Households (5)	Rest of the World (6)
a. Reproducible physical assets	721.0	23.0	744.0	325.9	344.8	n.a.
b. Nonreproducible physical assets	433.2	22.1	455.3	162.1	1,083.4	n.a.
c. Total physical assets (a) + (b)	1,154.3	45.0	1,199.3	487.9	1,428.1	n.a.
d. Gross financial assets excluding equity	576.0	2,854.9	3,430.9	300.8	1,284.0	191.6
e. Gross liabilities excluding equity	–977.9	–2,902.1	–3,879.9	–549.6	–415.1	–362.8
f. Net financial position (d) + (e)	–401.9	–47.2	–449.1	–248.8	868.9	–171.1
g. Balance excluding equity (c) + (f) (Accounting net worth [net] for corporate sector)	752.4	–2.2	750.2	239.1	2,297.0	n.a.
h. Gross equity outstanding (market value)	–329.9	–69.0	–399.0	–10.2	n.a.	n.a.
i. Gross equity owned (market value)	89.3	138.6	227.9	62.8	80.7	n.a.
j. Net equity position (i) + (h)	–240.6	69.6	–171.0	52.6	80.7	37.9
k. Market valuation discrepancy –[(g) + (j)]	–511.8	–67.4	–579.2	n.a.	n.a.	n.a.
l. Household and government accounting net worth including equity (g) + (i)	n.a.	n.a.	n.a.	291.7	2,377.7 (6.59)[a]	n.a.
ll. Net worth excluding value of land (households only)	n.a.	n.a.	n.a.	n.a.	1,294.3 (3.59)[a]	n.a.
m. Tobin's Average q [–(j) – (f)]/(c)	0.557	n.a.	0.517	n.a.	n.a.	n.a.
n. Disposable income (households only)	n.a.	n.a.	n.a.	n.a.	360.7	n.a.

(*continued*)

Table 6.2 (continued)

	Nonfinancial (1)	Financial (2)	Total ([1] + [2]) (3)	Government (4)	Households (5)	Rest of the World (6)
	Hypothetical Equilibrium Pattern[b]					
h′. Gross Equity outstanding (market value)	–1,176.6	–658.4	–1,895.1	–10.2	n.a.	n.a.
i′. Gross equity owned (market value)	424.2	658.5	1,082.7	62.8	474.8	n.a.
j′. Net equity position (=g)	–752.4	2.2	–750.2	52.6	474.8	222.8
l′. Household net worth (g) + (i′)	n.a.	n.a.	n.a.	n.a.	2,771.8 (7.68)[b]	n.a.
ll′. Net worth excluding value of land (households only)	n.a.	n.a.	n.a.	n.a.	(1,688.4) (4.68)[b]	n.a.

Note: Stocks of reproducible physical assets are our own estimates and include stocks of computer software. Other figures are taken from ESRI (2001). n.a. = not applicable.

[a]Figures in parentheses are ratios to disposable income.

[b]Assumptions used for the hypothetical equilibrium pattern (see also appendix C):

$i' = i$, $h' = h$, and $j' = j$ for the government (column [4])

$j' = g$ for corporations (columns [1], [2], and [3]).

$i' = j \cdot (i/j)$ in column (3), thus $h' = j' - i'$ in column (3).

In column (1), $i'(1) = i'(3) \cdot \{i(1)/[i(1) + i(2)]\}$. In column (2), $i'(2) = i'(3) \cdot \{i(2)/[i(1) + i(2)]\}$. In addition, $h'(1) = j'(1) - i'(1)$ and $h'(2) = j'(2) - i'(2)$.

$j'(5) + j'(6) = j'(3) - j'(4)$. In column (5), $j'(5) = [j'(3) - j'(4)] \cdot \{j(5)/[j(5) + j(6)]\}$. In column (6), $j'(6) = [j'(3) - j'(4)] \cdot \{j(6)/[j(5) + j(6)]\}$.

That said, there are families who own more land than they need for their residences or farms. For them, excess land is like any other asset that can be sold to finance consumption as the need arises. Thus, the value of land is part of their life-cycle net worth, and an increase in the price of land must be viewed as an addition to their resources. At the other extreme, for families who do not own any land and aspire to acquire it, an increase in the price of land is a significant increase in the cost of living without a compensating increase in their income. Although there are significant allocative consequences within the household sector, for the sector as a whole, the responses of these two extreme groups to a change in price of land should largely offset each other.

We will now look at the literature on the effect of land on consumption. There are two studies we are aware of that offer evidence on the effect of an increase in the price of land on consumption. Ogawa et al. (1996) introduce into a consumption function three components of wealth held by households: liquid financial assets, net illiquid financial assets, and tangible wealth (an estimate of the value of land and residential structures). They find that the coefficient of tangible wealth is very close to zero and its standard error is larger than the estimated value of the coefficient. They conclude that consumption is not affected by tangible wealth held by households. Because they define tangible wealth as the sum of the value of land and an *imputed* value of residential structures, their result does not bear directly on the effect of the price of land on consumption. However, because more than two-thirds of the fluctuation of the variable is due to changes in the value of land, which is itself due almost entirely to price variations, we may view his result as generally indicating that consumption does not respond to land price variation.

More direct evidence is provided by Murata (1999). She estimates a time series consumption function in the error correction formulation. The log of the consumption-income ratio is a function of the ratio of wealth to income and the ratio of land price to consumption prices, among other things. She obtains a small but significant negative coefficient for the ratio of land price to consumption prices. This again suggests that an increase in the relative price of land is unlikely to increase the consumption-income ratio.

There are two other studies we have looked at that are not helpful for our purposes. Dekle (1994) is hard to interpret because he regresses the level of consumption on the price of land and the rate of growth of output by prefecture without controlling for the level of income or wealth. Thus, the price of land can easily be a proxy for a basic resource variable in his estimation.

Takayama (1992) runs a regression of consumption on different measures of wealth and finds that the coefficient of net real assets (which consist essentially of real estate holdings) has a small positive value but is also

highly significant. However, this variable is nonzero only for homeowners. Thus, because he does not control for home ownership in his regression, its coefficient can represent the effect of home ownership rather than the effect of the value of real wealth.

Regarded alone, none of the considerations reviewed above definitely justify focusing attention on net worth excluding land as a critical factor in determining the saving-income ratio, but together with the reasons given in the text, they provide reasonable support to doing so.

6.3 Savings and Net Worth Accumulation by the Corporate Sector

6.3.1 Income Flows

This section examines the savings and dividend payments of Japanese firms. It shows that they are not only exceptionally small, but that they have also decreased over time, thus providing an explanation of the low valuation of the firms. We must begin however by examining a variety of data problems that are present in the Japanese National Accounts and that can seriously bias any analysis of the corporate sector behavior.

First, both the "nonfinancial corporate enterprises" and "financial institutions" components include not just private businesses, but also public enterprises. It is impossible to separate them completely for years before 1990. This is also true of the total business sector, which includes unincorporated enterprises. With the new National Accounts based on the *System of National Accounts* (SNA93; United Nations et al. 1993), this is not an ongoing problem, but it will remain for prior periods. Thus, it is impossible to study long-term patterns in the behavior of the private business sector.

Second, even using SNA93, the National Accounts report neither the compensation of employees nor the value added of output by sector. Thus, it is very difficult to assess how productively labor and capital inputs are utilized. Because the way total value added is distributed to the factors contributing to production is important to our analysis, we use the whole economy excluding agriculture, housing, and government.

The method of computing depreciation in the National Accounts is a third source of difficulties. Depreciation is the change in value of a productive asset "as a result of physical deterioration, normal obsolescence, or normal accidental damage" (SNA 1993, 147, chap. 6.179). This can be calculated in several ways. For example, U.S. firms typically use different methods to compute depreciation for tax purposes and for financial reporting purposes. In the U.S. national accounts, depreciation, or the capital consumption allowance, uses uniform service lives and empirically based depreciation patterns (compared to a wide range of methodologies allowed by GAAP [Generally Accepted Accounting Principles] and the tax code), as well as current cost rather than historic cost, which is used for fi-

nancial and tax reporting. The difference between this number and depreciation reported for tax purposes is called the capital consumption adjustment (hereafter CCAdj).[3]

Unfortunately, Japanese national income data historically do not include such a CCAdj. Rather, under the 1968 *System of National Accounts* (SNA68; United Nations 1968), depreciation using the tax code's provisions for service lives and historic cost was reported. Under SNA93, beginning with 1990 data, an adjustment that reflects the difference between historic and current cost is computed, but tax-code lives are still used. Depreciation using the tax code is (intentionally) faster than actual values. Using historical cost leads to under-statement in periods of high inflation. Adjustments to a current-cost basis were included with other items in the revaluation account under SNA68, but cannot be separated out to adjust the reported depreciation series (see Economic Planning Agency [EPA] 1978). Thus, we have to adjust the reported depreciation with our own estimate of the CCAdj using a method similar to Hayashi (1986).

We can see the effect of depreciation in table 6.3, which shows the way value added is distributed to the factors contributing to production. Table 6.3 presents data for the United States and for Japan using both National Accounts and our capital stock and depreciation estimates. The estimates that are used make a substantial difference in the evaluation of the sector's performance.

As we have just observed, the Japanese National Accounts do not provide information on either a measure of output or the compensation of employees for the corporate sector. We will therefore work with the whole economy less agriculture, housing, and government.[4]

First, let us compare the United States (part A) to Japan using National Accounts estimates (part B). The figures for 1970 are radically dissimilar, presumably because the Japanese economy was still in the process of a rapid transformation. It may also be because the data for this period are of lower quality, as the National Accounts only begin with 1970.

Over the entire period, there are a number of differences. The ratio of employee compensation to gross domestic product (GDP; column [7]) declined steadily in the United States, whereas it was increasing steadily in Japan. The ratio of operating surplus to GDP (column [8]) was declining sharply and steadily in Japan, whereas there is no particular pattern for the United States.

3. See http://www.bea.gov, click on Methodologies, and under "National Programs" see "A Guide to the NIPAs," M10–12.

4. Information on estimates of output and its composition for the housing sector were kindly supplied to us by the National Account Division, Economic and Social Research Institute, Cabinet Office. The GDP for Japan reported here reflects our estimates of the distribution of the imputed banking services among sectors. The U.S. figures incorporate the distribution estimated by the Bureau of Economic Analysis (BEA).

Table 6.3 **Distribution of GDP in the Nonarm Private Business Sector, Excluding Housing, 1970–1998**

	Absolute Amounts					Percentage of GDP				
Year	GDP[a] (1)	Depreciation[b] (2)	Compensation of Employees (3)	Operating Surplus (4)	Capital Stock[c] (5)	Depreciation (6)	Compensation of Employees (7)	Operating Surplus (8)	Capital Stock (9)	Depreciation As % of Capital Stock (10)
					A. United States ($ billions)					
1970	687.7	65.0	460.1	162.6	1,013.2	9.5	66.9	23.6	147.3	6.4
1980	1,926.7	226.1	1,257.8	442.8	3,202.6	11.7	65.3	23.0	166.2	7.1
1991	3,995.7	512.5	2,536.9	946.3	6,622.7	12.8	63.5	23.7	165.7	7.7
1995	5,019.2	630.2	3,117.1	1,271.9	7,731.5	12.6	62.1	25.3	154.0	8.2
1998	6,093.0	759.6	3,757.1	1,576.3	9,006.8	12.5	61.7	25.9	147.8	8.4
					B. Japan, with National Account Estimates[d] (¥ trillions)					
1971	60.4	7.6	31.2	21.6	50.2	12.6	51.6	35.8	83.1	15.1
1980	176.7	26.7	105.1	44.9	213.1	15.1	59.5	25.4	120.6	12.5
1990	314.7	52.0	190.1	72.6	419.9	16.5	60.4	23.1	133.4	12.4
1995	343.7	64.1	226.1	53.5	548.0	18.6	65.8	15.6	159.4	11.7
1998	341.9	69.4	231.2	41.3	596.4	20.3	67.6	12.1	174.4	11.6
					C. Japan, with Our Estimates[e] (¥ trillions)					
1971	60.4	4.9	31.2	24.3	61.7	8.1	51.6	40.3	102.1	7.9
1980	176.7	21.6	105.1	50.0	276.2	12.2	59.5	28.3	156.3	7.8
1990	314.7	43.1	190.1	81.4	523.3	13.7	60.4	25.9	166.3	8.2
1995	343.7	54.9	226.1	62.7	678.3	16.0	65.8	18.3	197.4	8.1
1998	341.9	58.2	231.2	52.6	703.8	17.0	67.6	15.4	205.8	8.3

Source: Statistics for the United States from BEA web site http://www.bea.doc.gov. Statistics for Japan, from EPA (2000a), 168–79, 390).

Note: The GDP for Japan reflects our estimates of the distribution of imputed banking services among sectors. Imputed banking services were calculated based on interest flows and operating surplus. The U.S. figures incorporate the distribution estimated by the BEA.

[a]GDP less indirect business taxes.

[b]For the United States, depreciation is with a CCAdj. For B, we calculated an adjustment to make the National Accounts series current cost, following a methodology similar to the work of Hayashi (1986). For C, our estimates of capital stock and depreciation are used. Data for the Japanese housing sector was provided by Mr. Mitsuo Hosen of the ESRI.

[c]Capital stock is as of the beginning of the year.

[d]National Accounts estimates of reproducible fixed assets are used.

[e]Our estimates of reproducible fixed assets used.

Although the share of depreciation (column [6]) was increasing during the 1970s and 1980s for both, it is much larger for Japan and continued to increase in the 1990s, whereas for the United States it stabilized. As for the capital-output ratio (column [9]), there was a steady increase for Japan, and no particular pattern for the United States. The ratio of depreciation to capital stock (column [10]) was increasing in the United States but falling in Japan.

It is hard to see how the difference in the depreciation rate (12 percent in Japan versus 8 percent in the United States, as shown in column [10]) can persist when the technologies available in both countries are approximately the same. It is possible that when the Japanese economy was still going through its rapid transformation—that is, until the early 1970s—depreciation did indeed proceed more rapidly in Japan than in the United States. It is furthermore conceivable that this higher depreciation rate became incorporated into Japan's accounting practices and tax code and thus has persisted even after the economy matured and "true" depreciation became roughly comparable to that for the United States. In such a case, rational managers presumably would not abandon capital stock before it was economical to do so. That would create a situation in which data for capital stock and depreciation are seriously biased relative to their true quantities.

To remedy this situation, we constructed a series for net capital stock and depreciation that uses current costs and empirically based depreciation patterns. Our series is based on depreciation rates suggested by Hulten and Wykoff (1981), as adapted to the Japanese case by Hayashi and Inoue (1991). We leave the National Accounts estimates for residential houses untouched. The details of our reconstruction are reported in appendix A (available online at http://www.nber.org/data-appendix/ando_et_al), and results are recorded in part C of table 6.3.

Our estimate of the net stock of capital stock in 1998 is 18 percent larger than the National Accounts estimate. Our depreciation estimate is 16 percent smaller than the National Accounts estimate, adjusted by us to reflect current costs. As a result, our overall depreciation rate for Japan during the 1990s is around 8 percent, which is about two-thirds of the (approximately) 12 percent implied by the adjusted national accounts data. A simple theoretical example of the consequences of assuming a depreciation rate much higher than the one that actually prevailed in the economy is in appendix B (available online at http://www.nber.org/data-appendix/ando_et_al).

If this accounting bias took place in the United States, where the financial markets are well developed and investors are constantly seeking arbitrage opportunities, sooner or later the market value of equities would adjust to correct it. If the market value persisted in reflecting the biased accounting records, in the United States, an attempt at a takeover of a firm would be likely to occur. In Japan, however, since corporations are seldom

subjected to a takeover or merger challenge, such biased data may well be accepted in the equity market and persist for a long time. We believe that these accounting biases are some of the factors contributing to the creation of a large market valuation discrepancy in the Japanese corporate equity market that is to be discussed later.

Having adjusted depreciation, let us now proceed to a review of the dividends and retained earnings of Japanese nonfinancial corporations and financial institutions. Be reminded that these sectors include both private corporations and public enterprises and that we are looking at this mixture. Our impression is that the size of public enterprises is especially large in the case of the financial institutions sector.

In table 6.4, parts A and B, we present data for 1990 to 1998 using the revised National Accounts on the basis of the SNA93. We cannot use data based on the SNA68 since the definition of dividends paid by financial institutions contained a number of items, including a part of imputed property income due to holders of life insurance policies, that swamped dividends paid to equity holders (see EPA 2000b). The data based on the SNA93 give figures for dividends paid to equity holders separated from other payments, and the difference is very large. For 1998, gross dividends paid by financial institutions in the old accounts were ¥4.4 trillion, whereas they are only ¥0.7 trillion in the new accounts. For this reason, in this subsection in which the income of equity holders is one of the central issues, we have no choice but to confine our discussion to the period 1990–1998 because the data on an SNA93 basis are available beginning only in 1990.

Table 6.4 **Corporate Sector, Savings, and Net Dividends Paid, SNA93 Data (¥ trillions)**

	1990	1991	1992	1993	1994	1995	1996	1997	1998
				A. Nonfinancial Corporations					
1. Savings A[a]	7.41	4.42	2.15	3.18	3.25	5.53	10.27	14.69	10.15
2. Savings B[b]	n.a.	–4.40	–7.90	–7.95	–7.60	–9.11	2.19	5.39	0.72
3. Savings C[c]	10.33	6.15	2.88	2.61	2.96	6.25	14.63	18.11	12.39
4. Net dividends paid	2.78	2.74	2.61	2.62	2.39	2.88	2.50	2.56	2.25
				B. Financial Institutions					
5. Savings A[a]	6.17	6.89	6.05	5.67	4.69	6.58	8.63	9.64	10.32
6. Savings B[b]	n.a.	7.67	7.43	7.14	6.61	8.52	10.39	11.34	11.78
7. Savings C[c]	6.96	7.29	6.90	6.51	5.96	8.06	9.84	10.80	11.16
8. Net dividends paid	–0.33	–0.36	–0.34	–0.32	–0.26	–0.34	–0.41	–0.45	–0.41

Source: ESRI (2001, 94–97, 500–09).

Note: n.a. = not available

[a]Using National Accounts depreciation (thus, at historical cost).

[b]Using National Accounts depreciation and CCAdj.

[c]Using our estimates of depreciation (based on Hulten-Wykoff service lives and current cost).

Later in the paper, where it is essential to cover a longer period, we attempt to avoid dealing with dividends paid by financial institutions.

In addition, there are dramatic differences in the size of retained earnings of these two sectors between the old accounts and new accounts. These differences appear to be mostly due to changes in current transfers. We have not yet found specific references to this issue in the National Accounts Division's explanation of changes. We would, however, venture a guess that the Division changed the procedure for handling the write-off of bad debts and that this is the main reason why there has been such a large change in current transfers and, hence, retained earnings.

Under these circumstances, it is extremely difficult to make coherent sense of these partial income statements for corporations. The best we can do is to offer a few observations that may be useful for future investigation.

1. The net dividend payment by the nonfinancial corporate sector is steady at about ¥2.5 trillion per year (table 6.4, line 4). The payment of net dividends by financial institutions (line 8) is negative and around ¥–0.3 trillion. Thus, these two sectors together paid other sectors of the economy, primarily the household sector and the rest of the world sector, a total of 2.2 trillion yen in dividends per year during the period 1990 to 1998. This contrasts with dividend payments by American corporations (financial and nonfinancial combined) during the same period, starting at $144 billion in 1990 and steadily increasing to $309.2 billion in 1998.[5] At an exchange rate of ¥120 to a dollar, American corporations paid roughly ten times the amount of dividends that were paid by Japanese corporations.

2. If we accept the figures reported in the National Accounts for the nonfinancial and financial corporate sectors combined, corporate retained earnings, after tax (savings) adjusted for CCAdj, were close to zero for the period 1990 through 1995 as shown in table 6.4. For the years 1996, 1997, and 1998, the corporate retained earnings were over ¥10 trillion. For the entire period 1990–1998, their average was about ¥5 trillion per year. If we replace the national accounts estimate of depreciation with our own estimate, the retained earnings (savings with CCAdj) would be roughly ¥10 trillion greater per year, or around ¥15 trillion on average. This difference reflects the difference between depreciation with CCAdj given by the national accounts and our own estimates, shown in table 6.3, column (2). We can see the importance of making sure that the estimate of depreciation is reasonable and realistic. The retained earnings after tax with CCAdj and IVA (Inventory Valuation Adjustments) for U.S. corporations (nonfinancial and financial combined) fluctuate over time, but on average they are approximately $125 billion per year. The Japanese figure is roughly one-

5. As shown in Table 1.16 of the U.S. National Income and Product Accounts; available at http://www.bea.gov/bea/dn/nipaweb/TableViewFixed.asp?selectedTable=26&FirstYear=2001&last year=2002&Freq=Qtr.

third of the U.S. amount if we take the national accounts estimate of depreciation, whereas it is about equal to the U.S. amount if we take our own estimate of depreciation.

3. Even though we believe that Japanese corporations have retained more earnings and that their capital stock is probably larger than recorded, we suspect that the retained earnings of Japanese corporations have not contributed to the value of equities at all. One reason for our suspicion is shown in table 6.5, where the historical record of the amount of dividends paid by nonfinancial corporations is shown. We have to rely on the data on the SNA68 basis here, since we wish to have a long time series. Therefore, we cannot work with the dividend payments of financial institutions. Since we do not have information on the output of corporations, we report

Table 6.5 **Dividends of Nonfinancial Incorporated Enterprises, SNA68 Data (¥ trillions)**

Year	Dividends Paid	Dividends Received	Net Dividends Paid	Sector GDP[a]
1970	1.521	0.501	1.020	58.2
1971	1.622	0.529	1.092	63.7
1972	1.782	0.585	1.197	72.8
1973	2.233	0.770	1.463	89.2
1974	2.579	0.925	1.655	104.9
1975	2.424	0.858	1.566	113.3
1976	2.477	0.871	1.606	127.9
1977	2.334	0.871	1.464	141.5
1978	2.729	0.975	1.754	156.1
1979	2.914	1.027	1.887	170.2
1980	3.190	1.174	2.016	185.6
1981	3.502	1.289	2.213	199.8
1982	3.291	1.210	2.081	210.1
1983	3.378	1.216	2.161	218.4
1984	3.453	1.250	2.203	233.3
1985	3.698	1.604	2.095	249.2
1986	3.845	1.842	2.003	258.5
1987	4.177	2.991	1.186	270.6
1988	4.420	3.666	0.754	289.5
1989	6.465	5.412	1.054	311.6
1990	5.597	5.451	0.146	337.2
1991	5.744	5.647	0.097	361.7
1992	5.599	5.394	0.205	370.2
1993	5.668	5.117	0.550	369.1
1994	5.265	4.468	0.798	367.1
1995	5.709	4.325	1.384	370.7
1996	5.899	2.918	2.981	382.4
1997	5.855	3.240	2.615	386.7
1998	5.691	3.231	2.460	374.1

Sources: EPA (2000a, 72–73). See notes for table 6.3 for calculation of GDP.

[a]Private business GDP, excluding the agriculture, housing, and financial sectors.

private, nonfarm, nonfinancial business GDP as the scale indicator. The most amazing fact is that nominal net dividend payments have hardly increased since 1970. In addition, there is a strange rise of dividends received from 1987 through 1995, making net dividends paid during this period extremely erratic and close to zero.

Retained earnings increase the value of equity, because they presumably contribute to increased profits and, hence, to future increases in dividends. In the case of Japanese corporations, however, the retention of substantial amounts of earnings by corporations, have not contributed to an increase in dividends at all. Thus, from the point of view of equity holders, retained earnings are of little value. Given the historical pattern of dividend payments, the market value of equity even at the end of the 1990s may be considered remarkably high. The average dividend-price ratio for those corporations listed at the Tokyo Stock Exchange, first division, and paying dividends for 1998, 1999, and 2000 is reported to be 1.3 percent, 0.9 percent, and 1.1 percent respectively (Bank of Japan 2002).

We have noted that there are substantial differences in the pattern of dividend payments and retained earnings of nonfinancial corporations between national accounts data on the SNA68 basis and data on the SNA93 basis. In table 6.6, we report dividends paid and received according to the data on the SNA93 basis. The pattern is indeed different, especially in the period 1987–1995 when the data on the SNA68 basis showed strange increases in dividends received. The pattern shown by the data on the SNA93 basis is perfectly smooth throughout the 1990s. The basic feature of the time pattern of dividend payments is common in both versions of data: Dividend payments show no sign of growth to reflect the increasing scale of the economy over time.

Table 6.6 **Dividends Paid and Received by Corporations, SNA 93 Data (¥ trillions)**

	Nonfinancial		Financial		
Year	Paid	Received	Paid	Received	Total[a]
1990	4.971	2.193	0.918	1.251	2.445
1991	5.090	2.347	0.837	1.195	2.385
1992	4.918	2.311	0.794	1.139	2.262
1993	4.960	2.336	0.857	1.172	2.309
1994	4.536	2.149	0.768	1.031	2.123
1995	4.942	2.057	0.717	1.061	2.540
1996	5.040	2.539	0.700	1.115	2.087
1997	5.100	2.544	0.718	1.167	2.108
1998	4.958	2.706	0.666	1.081	1.837

Source: ESRI (2001, 94–97).

Note: Includes nonfinancial and financial corporations. Excludes withdrawals of income from quasi corporations.

[a]Net payments.

We now turn our attention to the balance sheet of corporations and the relationship between the pattern of income and the structure of the balance sheet.

6.3.2 Capital Accumulation by Corporations and the Valuation of Corporate Equity

The consolidated balance sheet of the corporate sector is shown in table 6.2, column (3). For those of us who normally operate outside Japan, there are some striking features. First, the value of land (see line [b]) is enormous, a substantial part of tangible assets. At the height of the asset bubble in 1987–1991, its value even exceeded that of reproducibles. If it is added to the denominator of the ratio of operating surplus to fixed capital, the rate of return becomes minuscule. From the point of view of valuing a firm, there is no justification for omitting the value of land. In practice, however, a firm that has held land for a long time may not be using its true economic cost. Indeed, regardless of when the land was acquired and what was paid for it, there is no reason to account for its cost properly if management does not feel the need to compensate the firm's equity holders properly.

Second, the net equity outstanding is a small fraction of the accounting net worth of corporations (defined in table 6.2, line [g]). When financial markets are functioning efficiently and expectations on the contribution of reproducible physical assets to earnings are realized, accounting net worth and the market value of net equity should be close, if not necessarily equal, to each other. However, in Japan they are not. Rather, there is a gap, which we term the market valuation discrepancy. This is calculated in table 6.2, line (k). When the market valuation discrepancy is zero, the reproduction cost of reproducible fixed assets and the market value of land are fully reflected in the "value of the firm" (defined as the value of net equity outstanding plus net financial liabilities). Another way of saying this is that Tobin's average q is 1. When the value of land is very large, however, the interpretation of this concept becomes somewhat ambiguous, but we believe that the only tenable generalization of the concept is the inclusion of the value of land in the denominator. The value of q so computed is reported in table 6.2, line (m). For the consolidated corporate sector, it ranges from a low of 0.32 in 1980 to a high of 0.52 in 1998.

When the average q is properly calculated, it is well known that its value can be reduced from unity, even in equilibrium, when the pattern of the depreciation allowance under the corporate profit tax system is accelerated relative to the pattern of economic depreciation (see, e.g., Gordon and Malkiel 1981). However, it can be shown that the quantitative effect of this mechanism is quite minor, less than 5 percent of the reproduction cost of capital. Therefore, this consideration alone cannot account for the deviation of q from unity reported in table 6.2.

The possible reasons why the estimated value of q deviates so substan-

tially from unity must be the same as those listed above for the very large value of market valuation discrepancy.[6] When the market valuation discrepancy is negative and large, we are inclined to think of four possible reasons: (a) For whatever reason, the price paid for the reproducible fixed assets is no longer justified in terms of the anticipated income stream it will generate; (b) There is a dramatic change in the value of land; (c) There may be serious imperfections in the capital market; (d) There is a deliberate policy by management to maintain the pattern of a very small and stagnant payment pattern of dividends. We consider the fourth reason as the most likely.

Let us recall the observation with which we ended the preceding section, namely, that dividend payments by these corporations are not only very small, but also that they have not increased much at all. Here we face a serious data problem, because dividend payment information in the national accounts based on the SNA68 is not reliable, while the data based on the SNA93 is available only starting in 1990. We have no choice but to gain some sense of the pattern from these inconsistent data. Let us first look at the longer time series using the data based on the SNA68. Since net dividend payments by financial institutions are negligible, we can match net dividend payments of nonfinancial corporations reported in table 6.5 and the market value of their net equity outstanding in table 6.2. This dividend-price ratio averages approximately 2.6 percent for the period 1970–1998, declining during the period. Thus, in the 1970s it was 4.8 percent, in the 1980s it was 1.8 percent, and in the 1990s it was only 0.7 percent. This ratio is remarkably low, given that dividend payments did not grow at all, whereas the scale variable increased by seven times during the same period. For the 1990s, we can partially check this finding using the data based on the SNA93. Dividend payments on this basis are given in table 6.4, lines (4) and (8). The dividend-price ratio for 1999 is 1.9 percent (1.4 percent for 1991), confirming the pattern given by the data based on the SNA68. Therefore, we conclude that at least a partial reason why the market value of equity is so low is that dividend payments have been extremely small and did not grow over time. This is a puzzling pattern. If the accounting net worth is correctly estimated in the National Income Accounts (NIA) and the market value of equity is so depressed, in a well-functioning market, we would expect that someone would purchase the firm and liquidate its assets, realizing a major capital gain.

Table 6.7 traces development of the balance sheet for corporate capital

6. Others have estimated the Tobin's average q, and Hoshi and Kashyap (1990) summarize them conveniently. Basically, estimates of q using data from individual companies listed on the Tokyo Stock Exchange are close to unity, while those estimated using aggregate data are significantly less than unity. Both aggregate data and microdata require many adjustments and imputations for the purpose of estimating q, and a satisfactory resolution of this paradox will require a large-scale data analysis. It may be noted that the estimate of q using all firms appears to be considerably smaller than the one using only manufacturing firms.

Table 6.7 Corporate Sector Saving and Net Worth in 1990 Prices, 1971–1998, SNA68 (¥ trillions)

		1971–1979	1980–1990	1991–1998	Accumulated
A.1	Reproducible tangible assets[a]	167.3	193.9	91.7	452.9
A.2	Flow	212.6	278.2	211.7	702.6
A.3	Revaluation	–45.3	–84.3	–120.1	–249.7
B.1	Nonreproducible tangible assets[a]	86.2	519.4	–284.3	321.3
B.2	Flow	51.3	68.9	–1.4	118.8
B.3	Revaluation	34.9	450.5	–283.0	202.4
C.1	Net Financial Assets (excl. equity shares)	–52.6	–209.3	–40.5	–302.4
C.2	Flow	–158.1	–307.1	–75.6	–540.8
C.3	Reconciliation excl. inflation loss[b]	4.9	46.5	4.3	55.7
C.4	Inflation gain	100.6	51.3	30.8	182.6
D.1	Equity (accounting) = A.1 + B.1 + C.1[c]	200.8	504.0	–233.1	471.7
D.2	Flow = A.2 + B.2 + C.2 = E.1 + E.2 + E.3 + E.4	105.7	40.1	134.8	280.6
D.3	Reconciliation excl. inflation gain on net financial assets = A.3 + B.3 + C.3	–5.5	412.7	–398.7	8.4
D.4	Inflation gain = C.4	100.6	51.3	30.8	182.6
D.5	Equity (market)[c]	21.7	120.7	–72.7	69.7
D.6	Market valuation discrepancy[c]	179.1	383.3	–160.4	402.0
E.1	Savings	81.2	105.0	85.6	271.9
E.2	Net capital transfers	13.5	17.7	49.3	80.4
E.3	Statistical discrepancy	11.5	–13.2	–14.3	–16.0
E.4	Net equity transactions[d]	–0.4	–69.4	14.1	–55.6

Source: EPA (2000a, 80–83, 322–25).

Notes: The corporate sector can be decomposed into nonfinancial corporate enterprises and financial institutions. It includes public enterprises as well as private corporations, and these are an especially large part of the financial institutions sector. Our estimate of reproducible tangible assets is used. Constant prices were obtained using the deflator for total private consumption expenditure. Also see box 6.1 for additional information on the data.

[a]Gross fixed capital formation has been reduced by the amount of investment in land improvement using data provided by Mr. Mitsuo Hosen of the ESRI. Corresponding adjustments were made to the investment in land and the reconciliation accounts of reproducible fixed assets and land. Because our estimates are used, the accumulation of stock is considerably larger than the estimate presented by the National Accounts.

[b]For financial assets, losses to creditors are gains to debtors, so the effects of general inflation are reported explicitly rather than as part of reconciliation. (See box 6.1.)

[c]Accounting equity (D.1) differs from the market value of equity (D.5) by the market valuation discrepancy (D.6).

[d]This is new issues of equity minus acquisitions of equity. A minus sign indicates corporations were net purchasers of equity. During the most of the period, nonfinancial corporations were net sellers of equity but financial corporations were major purchasers.

stock in the same way table 6.1 does for the household sector (details on the data are also in box 6.1).

By definition, the sum flow of funds by use in table 6.7 (line D2) equals the total by source (line E). Unfortunately, the statistical discrepancy entry (E.3) is fairly large, but the most surprising item is net capital transfers received (E.2). For 1991–1998, these include the government bailout of firms in this sector, and it is nearly five times as large as accumulated retained earnings. It is also a sizable amount in the two earlier periods; we are not quite sure why.

Accounting equity (D.1) is divided between the market value of equity (D.5) and the market valuation discrepancy (D.6). In the Japanese National Accounts (and in SNA93) the discrepancy is designated as net worth. We believe that this designation is not only misleading but also gives users a wrong impression of the performance by corporations.

We find it surprising that the market value of these corporations increased by only ¥70 trillion between 1971 and 1998, whereas their accounting equity increased by ¥472 trillion, thereby increasing the market valuation discrepancy by ¥402 trillion. (Box 6.2 analyzes this gap.)

How does one explain the market valuation discrepancy? Part of the answer is that, in the corporate governance structure in Japan, management does not seem to feel any need to compensate equity owners. Thus, only token dividends are paid and scant attention is given to the market value of equity.

Management may have convinced itself that the token dividend payments define very low costs of internally generated funds, and thus investment in capital projects can be justified even when the expected rate of return is quite low. This is especially true if managers are encouraged to make their firms as large as possible, which is often said to be a goal of Japanese firms.

Beyond that, we believe that decision rules based on management's perception of the cost of internally generated funds contribute to other unusual features of the Japanese economy. These include a very high capital-labor ratio, a very low rate of return on capital for the corporate sector as a whole, and a dramatically small ratio of the market value of equity to the accounting value of firms. The puzzle is why new firms do not enter Japanese markets, follow the policy of efficient use of resources, and force older firms to reform. In any case, the apparent existing decision rules are an impediment to growth of the economy and the efficient allocation of resources.

This behavior may have historical roots. During the period immediately after World War II, most capital facilities were destroyed, obsolete, or both, so businesses needed to accumulate capital as quickly as possible to build plants and acquire new technologies. Thus, retaining as much of their revenue as possible for investment was a sensible policy, consistent with the

Box 6.2 Decomposing the Market Valuation Discrepancy Increase

Our starting point is the total of funds transferred from other sectors of the economy to the corporate sector during 1971–1998. This can be approximated using the data in table 6.7, column (4).

+	280.6	Accounting equity flow (D.2)
−	–16.0	Statistical discrepancy (E.3)
+	182.6	Inflation gain (C.4) (This is largely the counterpart of the ¥217 trillion inflation loss recorded in the household sector account, table 6.1, C.4.)
=	479.2	Total funds transferred to corporate sector.

If the sector is operating efficiently at all and the financial market is functioning reasonably well, then the market value of the shares of corporations in the sector should have increased at least by this amount. It did not. The actual market value increased by only ¥69.7 trillion, creating a ¥409.5 trillion equity loss to owners.

The loss increases the market valuation discrepancy to the extent individual items on the balance sheet of corporations did not incur real capital gains and losses (data are from table 6.7).

+	409.5	Equity owners' loss	
+	8.4	Total capital gain of corporations, composed of:	
		–249.7	Loss on reproducible tangible assets (A.3)
		202.4	Gain on land (B.3)
		55.7	Gain on net financial assets (C.3)
+	–16.0	Statistical discrepancy (E.3)	
=	402.0	Increase in market valuation discrepancy (D.6)	

needs of very rapid economic development. We suspect that the pattern of building as large a depreciation reserve as possible dates from this period. If corporations do not have to pay dividends to shareholders, the cost of internally generated funds is essentially zero.

Such behavior can be maintained only if the demand for output is growing rapidly and if additional labor to match the rapid increases in capital is available. This was the case in the high-growth era, as Japan could shift a well-educated labor force from the agricultural sector to manufacturing and high-technology industries on a large scale and its labor cost was lower

compared to the United States and Germany. It was therefore able to price its products sufficiently low to expand its share of the market.

As demand and labor-supply growth slacken, the gross rate of return on capital gradually declines, and presumably it becomes near the level of depreciation. At that point, firms must begin to reduce the level of investment and distribute excess funds to holders of equity.

Such a point was reached quite some time ago in Japan, but firms continued to operate as they had previously. In part this is because equity owners are in an exceptionally weak position to influence the policies of management. There are two related reasons for this. First, Japanese law encourages corporations to enforce strict majority rule in the election of board members, rather than permitting cumulative voting. This means minority shareholders have very little leverage with management. Second, the tradition of cross-shareholding arrangements among corporations makes it extremely difficult for outsiders to form a majority. Managers who detect the prospect of a hostile majority group forming can quickly arrange for friendly corporations to increase their ownership.[7]

6.3.3 Investment and Financing Decisions and the Rate of Return for Firms

We have singled out the dividend payment pattern as a noticeably unusual behavior of Japanese firms. We can also observe from table 6.3 that the operating surplus of the business sector in Japan appears to be a considerably smaller fraction of the value added less indirect taxes of the sector compared with the United States (15 percent versus 26 percent in 1998). Let us now consider if there is some connection between these two observations. In table 6.8, columns (1) and (2), we present the ratio of operating surplus to the value of reproducible and nonreproducible capital. The former is computed using our own estimate of depreciation, described in appendix A and adjusted for imputed banking services, while in the latter the value of reproducible capital is our own estimate. We are not sure that our estimates for the years 1971 through 1973 are reliable. There may be something unsatisfactory about the estimates of the capital stock reported in the *National Wealth Survey* (EPA 1970). Even starting from 1974, the rate of return on capital is quite low, and it declines steadily until it reaches a level of around 4 percent for nonfinancial corporations and 5 percent for the total business sector in the 1990s. Given that this rate is before the corporate profit tax, the rate of return is amazingly low.

This rate must be viewed as the measure of the marginal product of capital given the way it is computed. We are also interested in the rate of return

7. In chapter nine of this volume, Yafeh notes that minority shareholders have fairly good legal protection in Japan. This is true, and applies to different issues. His concern is with the way insider usually majority, shareholders treat other shareholders. Our concern is with the way management insiders treat *all* shareholders.

Table 6.8 **Rate of Return on Corporations (Annual Percentage Rates)**

Period Average[a]	Return on Capital[b]		Market Rate of Return		
	Nonfinancial Corporations (1)	Business Sector[c] (2)	Ordinary Income[d] (3)	Capital Gains[e] (4)	Total Return[f] (5)
1971–1980	7.36	11.69	8.05	–6.50	1.58
1981–1990	5.55	7.30	4.94	3.54	8.56
1991–1998	3.67	5.04	1.82	–2.87	–1.06
1971–1998	5.18	7.54	4.71	–1.88	2.91

Source: EPA (2000), 79–89, 248–249, 322–337, 390–391 and appendix 1.

[a]Geometric average.

[b]Operating surplus adjusted for rent, depreciation, and imputed banking services divided by the sum of the reproducible assets and land.

[c]Includes households, unincorporated enterprises, and corporations.

[d]Net interest and net dividends paid divided by the sum of net equity outstanding and net financial liabilities. That is, payments to owners and creditors as a percentage of the capital they provide to the firm.

[e]Nominal capital gains minus inflation loss divided by the sum of net equity outstanding and net financial liabilities.

[f]Geometric average. Due to the particular averaging procedure adopted, the sum of columns (3) and (4) is slightly different from column (5)

accruing to the investor in the firm. We consider the investor who owns the equity and debt of the firm in the same proportion as the outstanding quantities. In table 6.8, columns (3) through (5), we present the rate of return for such an investor. Column (3) is the ratio of dividends plus net interest payments to the sum of the value of equity and net financial liabilities. Column (4) records real capital gains and losses for the same base, and column (5) presents the total. This computation can be done only for the total corporate sector. The total rate of return is the amazingly low value of 2.91 percent. The rate reported in table 6.8, column (5) is for all corporations and is not strictly comparable with the one for nonfinancial corporations shown in column (1). Nevertheless, we should expect the one in column (5) to be smaller than the one on column (1), because the latter is the rate before corporate profit taxes, while the former is after corporate profit taxes.

In table 6.3, we have noted that the capital-output ratio for the total business sector of Japan is much larger than the corresponding ratio for the United States, certainly in the 1990s. For 1998, the Japanese ratio is 2.06, whereas it is 1.48 for the United States. We are not including land in these calculations, so that the price of land is not involved. This is consistent with the fact that the rate of return for Japan is very low, much lower than the typical rate obtained by using the U.S. data (see Ando, Hancock, and Sawchuck 1997).

When a business firm's perception of the cost of one factor is unrelated to the price charged in the market for that factor, as it appears to be the case for equity capital for Japanese firms, we should expect that many decisions of the firm deviate substantially from those expected in the standard optimizing firms. Let us speculate on the investment and financing decisions perceived by Japanese corporate managers in the simplest possible case in which the firm cannot borrow, it does not need land, and there is no corporate profit tax. Managers wish to finance their entire investment from internal funds every period and view their objective as increasing the size of their firms by a specific rate, g, indefinitely. This may not be a rational target, but any other arbitrary targets produce similar results. The managers also know that they have complete control of the internal funds (i.e., no dividends must be paid). They then must satisfy the accounting identity:

$$\Delta K = \rho K, \tag{1}$$

where ρ is the net rate of return on capital and thus ρK is the net income from the production process accruing to capital. Dividing both sides of equation (1) by K, we have

$$g = \frac{\Delta K}{K} = \rho. \tag{1a}$$

In equation (1a), we are assuming that the production function is homogeneous of first degree and that the productivity increase is labor augmenting. The rate of growth of output is then equal to the rate of growth of capital on the steady state growth path, and they are both equal to g. Let us suppose that the managers also believe that they must satisfy the efficiency condition in the use of labor and capital:

$$\frac{\rho + d}{w} = f\left(\frac{E}{K}\right), \tag{2}$$

where d is the depreciation rate, and w is the wage rate, and E is the number of hours worked. The managers view the net return on capital, ρK, as available for their firms without cost, since their firms do not have to compensate equity owners. To satisfy equation (1a), then, they choose K/E so that the value of ρ on the left-hand side of equation (2) becomes g:

The important point illustrated by this simple example is that the required rate of return on K is not at all related to anything in the market. If g is very small, the required net return on capital would also be quite small, and the capital-labor ratio would be correspondingly very large. The manager attempts to achieve an efficient combination of labor and capital from his point of view, but since the cost of capital is not related to the price of funds demanded in the market, his decision cannot be genuinely optimal.

Let us now consider a slightly generalized problem in which the firm is allowed to borrow, but still has to satisfy the modified version of equation (1):

$$\Delta K = \rho K + \Delta L - rL \tag{3}$$

or

$$g = \frac{\Delta K}{K} = \rho + l(g - r), \tag{3a}$$

where L is the loan taken out by the firm, r is the rate of interest charged on L, and l is the ratio L/K. Since the firm is not optimizing, there is no natural way to determine l, and we take its value as given. Then the value of ρ is again determined by the identity in equation (3a), and the capital-labor ratio is determined to achieve this value of ρ through equation (2). This time, there is an additional complication that, if r is greater than g, there seems to be no sensible motivation to take out the loan. If a specific value of l is viewed as required, however, a solution corresponding to it is feasible with ρ being larger than g.

As we have noted earlier, this is not an interesting or believable model of the behavior of a business firm. It does illustrate, however, the point that once the perceived price of a factor is not related to its market price, it is difficult to write an optimizing model and a number of strange consequences can follow. For a firm whose behavior is characterized by equations (2) and (3a), it is perfectly conceivable that its target rate of return, ρ, is extremely low, and that the capital-labor ratio turns out to be very large. Its behavior is not efficient in the normal sense, and the true cost of its production must be higher than that of genuinely efficient firms. Nevertheless, so long as owners of equity capital do not have to be compensated, the firm can go on indefinitely without being forced to liquidate. To prevent the market value of equity becoming zero, the firm may pay very small, constant dividends, without changing the basic feature of the model discussed above. It may be possible to construct a much more realistic and plausible model of a Japanese firm in which competing interests of participants are described carefully. As long as the price attributed to the contribution of one or more factors by the management is significantly different from their market price, however, the distortion considered previously must be present, and the allocation of resources in the whole economy cannot be efficient.

6.4 Conclusion

In this chapter we have explored reasons why the market value of equity of corporations in Japan has not increased to reflect their accumulation of capital. One consequence of this situation is that the Japanese economy

has been facing a condition of insufficient demand because households incur considerable capital losses in their corporate equity holdings and thus reduce their consumption. This condition does not seem to have any prospect of resolving itself unless a way can be found to transfer a substantial amount of resources from corporations to households via substantially increased dividend payments.

In the standard model of corporate finance, the present value of future dividend payments, allowing for the risk involved, determines the market value of equity. In equilibrium, that value is roughly equal to the value of accumulated capital, allowing for a variety of special conditions. This may be viewed as a consequence of nearly rational behavior on the part of management and the reasonably efficient functioning of markets for factors and output. Although real market conditions may never be in equilibrium, we expect that there will be general tendencies to move toward the equilibrium. Data covering a large number of corporations and a long period of time should point to where the equilibrium position is likely to be.

The data for Japan do not resemble such a picture. The historical pattern of net dividend payments is nearly constant in nominal terms over time and has nothing to do with the accumulation of capital by corporations. Typical market participants therefore can only assume that this pattern is likely to continue. Such an expectation can support only a very low level of the value of equity, and this distorts savings behavior.

During the high-growth era, Japanese firms had some justification for retaining and reinvesting earnings. By the early 1990s, however, readily available technologies enabling increased productivity had become limited, and Japan's labor cost had reached approximately the same level as, or perhaps even above, that of the United States. To maintain balance between aggregate demand and aggregate supply, therefore, the savings rate must become lower, and consumption demand must be expanded.

What can be done achieve this and thus remove a serious impediment to growth? Changes in corporate governance to give equity holders the capacity to deal with management on more equal terms must be considered. A complete reform of the accounting system also would be helpful. The government should consider changing the corporate profit tax system. The reformed tax system would encourage corporations to pay out funds when sufficiently profitable internal investment opportunities are not available.

We have estimated the "lost" wealth and the financial cost to Japan of the market valuation discrepancy. The household sector's lost wealth is presented in the bottom panel of table 6.2. Essentially, the calculation turns on estimating what the value of equity would be if Tobin's q were equal to 1 (a more detailed explanation is given in appendix C, also available at http://www.nber.org/data-appendix/ando_et_al).

At the end of 1998, the total value of net equity outstanding for all corporations (table 6.2, column [3]) would have been ¥750 trillion (instead of the actual ¥171 trillion), of which the household sector would have owned ¥475 trillion (rather than its actual ¥81 trillion). This is 395 trillion yen in lost wealth.

If the marginal propensity to consume out of net worth is 0.04, a reasonable value in terms of available estimates, consumption could have been larger by almost ¥16 trillion without any multiplier effect. With a very small multiplier of 1.5, additional consumption could have been more than ¥23 trillion. That would have been enough to put the Japanese economy back into full employment.

Appendix A

Determining Capital Stock in the Business Sector in Japan

There are several types of reproducible fixed assets reported by the Economic and Social Research Institute (ESRI) of the Japanese government in the National Accounts. However, as several authors have pointed out, Japan's depreciation rate is very much higher than the U.S. rate (for example Hayashi 1986).

Depreciation rates in the Japanese National Accounts are the same as those in the tax code, so it is possible that depreciation is overestimated. Thus, we decided to construct estimates of reproducible fixed assets, excluding housing, for the business sector (i.e., excluding general government but including public enterprises) by item and sector. In this appendix we describe the procedures followed. We decided to use National Accounts estimates of dwellings and their depreciation, given that housing in Japan has some characteristics (such as a substantial portion built with wood) that make unusually high depreciation rates not implausible.

We have constructed the stock of each type of reproducible fixed asset by first determining the benchmark stock, updating the stock each period using the perpetual inventory method, and then computing the stock and depreciation by sector.

Calculation of Benchmark Stock

The National Accounts do not report gross investment data by business sector and asset type, so we are not able to construct the capital stock of the business sector directly. Instead, we begin by constructing the aggregate capital stock. First, we calculate the benchmark stock using the National Wealth Survey of 1970 (EPA 1970), from which we get the net stock

value for the business sector, defined as the sum of the whole private sector, public corporate sector, and nonprofit institutions.

We include all assets with the exception of the residential stock and the stock corresponding to investment in land improvement and divide it into five types: (a) buildings, (b) structures, (c) machines and tools, (d) transportation equipment, and (e) plants and animals. The *National Wealth Survey* (EPA 1970) is at 1970 prices. We convert it to 1990 prices using the stock deflator reported in National Accounts, table 6.4.1 ("Closing Stocks of Net Fixed Assets" EPA 2000a).

Accumulation of Capital Stock

To accumulate capital stock using the perpetual inventory method, we need the investment series and depreciation rate by asset. Investment data by asset in the National Accounts covers all sectors, including the general government sector. Using the ratio of government to aggregate investment, we can impute government investment by item, exclude it from the aggregate, and thus obtain investment by item for the business sector as a whole.

We adopt depreciation rates for fixed capital using those reported by Hayashi and Inoue (1991). Their data for machinery and transportation equipment includes information on early retirement of capital, whereas the National Accounts do not. Thus, following their suggestion, we augment their depreciation rates (based on Hulten and Wykoff 1981) by 40 percent to take account of this omission.

For buildings, we use the rate reported by Dean, Darrough, and Neef (1990). For remaining structures, we augment Dean, Darrough, and Neef's rates by 20 percent, as Hayashi and Inoue (1991) suggest. For plants and animals we apply the rate used in the United States by the Bureau of Economic Analysis, as reported in Fraumeni (1997).

Depreciation rates by asset type are as follows:

0.047 Buildings
0.056 Structures
0.157 Machinery, tools, and furnishings
0.245 Transportation equipment (including ships)
0.023 Plants and animals

Using these rates and the perpetual inventory method, we calculate the capital stock from 1970 to 1998. An adjustment is made for the 1995 Hanshin-Awaji (Kobe) earthquake by subtracting the estimated losses (provided by Mr. Mitsuo Hosen of the ESRI) from the capital stock at the end of 1995.

Assets lost in the 1995 Hanshin-Awaji earthquake (in ¥ billions) are as follows:

3,088 Buildings
1,895 Structures
22 Machinery, tools, and furnishings
88 Transportation equipment (including ships)

Calculation of Capital Stock by Sector

The *National Wealth Survey* of 1970 (EPA 1970) can be used to construct capital stock by type and sector. Gross investment by sector can be obtained from the National Accounts.

Because housing is excluded from our stock calculation, we have to subtract housing investment, which is recorded in the National Accounts only for the combined corporate sector and for the combined household and nonprofit institutions sector. We assume that only households and nonfinancial corporations invest in residential structures. This seems innocuous, as we combine households and nonprofit institutions in any event and financial institutions hold a negligible amount of residential structures (0.49 percent), as reported in the *National Wealth Survey* (EPA 1970).

We need the depreciation rate by sector to accumulate the stock. To obtain it, we calculate aggregate depreciation by item, the sum across items, and then divide by total stock. This provides an implied depreciation rate, which is used for each individual sector. This implied rate is, on average, a little above 8 percent, which is a considerably less than the rate obtained from the National Accounts (table 6.3).

Having obtained gross investment and depreciation, we can use the perpetual inventory method to obtain capital stock by sector. We allocate the total loss of assets due to the Hanshin-Awaji earthquake reported above to each sector according to the stock held at the end of 1994.

The results of our calculations are shown in tables 6A.1 and 6A.2. Table 6A.1 shows our calculation of capital stock and depreciation by item and compares the totals to the corresponding National Account magnitudes. Our estimate of aggregate stock shown (column [11]) is roughly 20 percent higher than the National Account's (column [13]).

The difference in depreciation is considerable, especially in the early years. This is to be expected, as in those years our estimate of the stock is not very different from theirs, whereas our depreciation rates are considerably smaller. In later years, the difference in stock becomes bigger, and thus the difference in depreciation becomes smaller, although still sizeable. Note that column (14) reports National Accounts depreciation at original cost (i.e., at 1990 prices) and thus has to be augmented by an estimate of the capital consumption adjustment (column [15]) to be comparable to our estimate of depreciation in column (12).

Table 6A.2 reports stocks and depreciation for nonfinancial corporations and financial institutions.

Table 6A.1 **Capital Stock and Depreciation by Asset Type, 1970–1998: Our Estimates Compared to National Accounts (1990 ¥ billions)**

	Buildings		Structures		Machines and tools (including plants and animals)		Transportation and machines[a]		Business sector				
									Our totals		National accounts totals		
Year	Stock (1)	Depreciation (2)	Stock (3)	Depreciation (4)	Stock (5)	Depreciation (6)	Stock (7)	Depreciation (8)	Stock[b] (11)	Depreciation (12)	Stock (13)	Depreciation (14)	CCA[d] (15)
1970	50,961	n.a.	50,768	n.a.	31,640	n.a.	6,586	n.a.	139,956	n.a.	126,268	n.a.	n.a.
1971	57,527	2,395	59,680	2,863	36,383	4,824	8,100	1,614	161,691	11,696	145,760	24,124	–4,281
1972	64,382	2,704	68,863	3,366	40,296	5,600	9,547	1,985	183,088	13,654	165,265	24,134	–5,251
1973	71,782	3,026	78,650	3,884	45,876	6,276	10,842	2,339	207,151	15,525	186,975	26,911	–3,580
1974	77,927	3,374	87,709	4,436	50,054	7,146	11,048	2,656	226,738	17,612	204,093	29,564	417
1975	83,292	3,663	96,624	4,947	52,229	7,776	11,100	2,707	243,244	19,092	218,705	26,519	1,477
1976	88,313	3,915	104,902	5,450	54,794	8,154	11,092	2,719	259,102	20,237	232,141	23,264	2,682
1977	92,848	4,151	112,860	5,916	57,097	8,526	11,284	2,718	274,088	21,311	244,367	24,257	3,041
1978	97,529	4,364	121,048	6,365	59,700	8,825	11,843	2,765	290,120	22,319	257,429	25,022	3,294
1979	103,029	4,584	129,567	6,827	63,758	9,135	12,805	2,901	309,158	23,447	273,542	26,139	3,082
1980	109,718	4,842	137,275	7,308	68,439	9,623	13,742	3,137	329,174	24,910	290,400	28,417	3,722
1981	116,285	5,157	144,738	7,742	73,715	10,177	14,558	3,367	349,296	26,443	307,256	29,681	3,071
1982	122,295	5,465	151,491	8,163	79,392	10,822	14,883	3,567	368,062	28,017	322,451	31,119	3,545
1983	127,849	5,748	157,527	8,544	84,941	11,530	15,345	3,646	385,663	29,468	336,063	32,417	3,665
1984	133,663	6,009	163,671	8,885	93,213	12,222	15,787	3,760	406,334	30,875	351,952	33,857	4,203
1985	140,360	6,282	169,484	9,231	102,705	13,330	16,737	3,868	429,286	32,711	369,796	36,057	4,197
1986	147,540	6,597	175,495	9,559	111,212	14,612	17,740	4,101	451,988	34,868	387,562	38,304	3,743
1987	154,378	6,934	182,304	9,898	119,969	15,765	19,236	4,346	475,887	36,944	406,081	40,523	3,634
1988	162,359	7,256	190,437	10,282	132,201	16,948	20,798	4,713	505,796	39,199	429,843	43,050	3,759
1989	172,662	7,631	199,637	10,741	146,818	18,664	22,842	5,096	541,959	42,131	459,333	46,183	2,653
1990	184,509	8,115	210,208	11,260	163,228	20,744	24,999	5,596	582,944	45,715	493,368	51,413	3,511
1991	198,854	8,672	220,997	11,856	178,674	23,093	26,790	6,125	625,315	49,746	528,323	54,329	4,252
1992	212,736	9,346	230,645	12,464	189,166	25,308	27,490	6,563	660,037	53,681	555,609	57,621	5,238

(*continued*)

Table 6A.1 (continued)

Year	Buildings		Structures		Machines and tools (including plants and animals)		Transportation and machines[a]		Business sector				
									Our totals		National accounts totals		
	Stock (1)	Depreciation (2)	Stock (3)	Depreciation (4)	Stock (5)	Depreciation (6)	Stock (7)	Depreciation (8)	Stock[b] (11)	Depreciation (12)	Stock (13)	Depreciation (14)	CCA[d] (15)
1993	224,542	9,999	238,749	13,008	193,826	26,769	27,092	6,735	684,208	56,511	572,052	59,391	7,148
1994	234,409	10,553	245,905	13,465	196,356	27,349	26,457	6,638	703,127	58,005	582,980	58,795	7,328
1995	240,783	11,017	250,515	13,869	202,505	27,598	26,452	6,482	720,255	58,967	592,181	58,905	6,226
1996	248,763	11,317	257,171	14,129	217,158	28,401	26,707	6,481	749,798	60,328	608,917	60,240	7,179
1997	258,638	11,692	263,877	14,504	234,772	30,522	26,612	6,543	783,899	63,261	629,753	63,284	8,366
1998	266,726	12,156	268,879	14,883	246,108	33,063	25,473	6,520	807,186	66,621	641,504	65,776	9,285

Source: EPA (2000a, 79–89, 248–49, 322–37, 390–91; see appendix A).

Notes: Includes nonprofit institutions. Capital stock is reported on a year-end basis. n.a. = not available.

[a]Includes ships.

[b]Sum of stock of the four specific categories (columns [1], [3], [5], [7]).

[c]Sum of depreciation of the four specific categories (columns [2], [4], [6], [8]).

[d]Imputed capital consumption adjustment (CCA), excluding housing, from National Accounts. Calculated using data on real capital stock and flows. Note this CCA is not the same as the capital consumption adjustment (CCAdj) used by the United States—see discussion in the text under Depreciation.

Table 6A.2 **Estimates of Capital Stock and Depreciation of Nonfinancial and Financial Corporations**

Year	Reproducible Fixed Assets of Nonfinancial Corporations (excluding housing)	Depreciation of Reproducible Fixed Assets of Nonfinancial Corporations (excluding housing)	Reproducible Fixed Assets of Financial Institutions (excluding housing)	Depreciation of Reproducible Fixed Assets of Financial Institutions (excluding housing)
1970	107,433.5	n.a.	3,471.2	n.a.
1971	126,086.7	8,978.4	3,815.4	290.1
1972	144,164.8	10,647.5	4,117.7	322.2
1973	163,919.0	12,224.6	4,614.4	349.2
1974	179,876.5	13,936.3	5,006.4	392.3
1975	192,334.2	15,146.5	5,344.1	421.6
1976	203,661.9	16,001.7	5,601.3	444.6
1977	214,825.1	16,751.1	5,881.3	460.7
1978	226,630.4	17,493.2	6,123.0	478.9
1979	241,265.9	18,315.9	6,452.8	494.8
1980	257,061.1	19,440.0	6,852.4	519.9
1981	273,501.5	20,650.2	7,251.0	550.5
1982	289,390.9	21,937.7	7,562.7	581.6
1983	303,833.8	23,169.4	7,911.3	605.5
1984	321,308.6	24,324.4	8,349.6	633.4
1985	340,895.5	25,866.4	8,743.7	672.2
1986	360,335.0	27,688.6	9,227.0	710.2
1987	380,552.0	29,452.7	9,962.1	754.2
1988	405,534.9	31,346.0	11,156.9	820.6
1989	436,000.6	33,779.7	12,792.5	929.3
1990	471,103.9	36,777.2	14,760.0	1,079.1
1991	507,740.1	40,201.9	16,438.4	1,259.6
1992	537,485.5	43,587.9	17,679.9	1,411.2
1993	559,048.6	46,018.1	18,460.6	1,513.7
1994	576,722.5	47,394.7	19,105.6	1,565.0
1995	593,505.1	48,365.8	19,262.8	1,602.3
1996	621,008.5	49,711.4	20,180.7	1,613.4
1997	653,546.3	52,395.0	21,423.6	1,702.7
1998	676,024.1	55,542.8	22,568.1	1,820.7

Source: See appendix A.
Note: n.a. = not available.

Appendix B

Adjusting Depreciation and Capital Stock

In order to interpret the differences between parts B and C of table 6.3, let us consider the consequence of constructing the data for depreciation and the net capital stock assuming a depreciation rate much higher than the one that actually prevailed in the economy. We have the identity:

(A1) $$\mathrm{IG}_t - D_t = K_t - K_{t-1},$$

where IG_t is gross investment, D_t is depreciation, and K_t is the stock of capital at the end of period t. Dividing equation (A1) by K_{t-1}, we have

$$\frac{IG_t}{Q_t} \times \frac{Q_t}{K_{t-1}} - \frac{D_t}{K_{t-1}} = \frac{K_t - K_{t-1}}{K_{t-1}},$$

where Q is the value added measure of output. On a steady growth path, the rate of growth of Q_t should be equal to the rate of growth of K_t. Denoting this growth rate by g and defining d_t as D_t/K_{t-1} and ig_t as IG_t/Q_t, we have, on the steady state growth path,

(A2) $$ig \times \frac{Q_t}{K_{t-1}} - d = g$$

$$\frac{K_{t-1}}{Q_t} = \frac{\mathrm{ig}}{d+g}.$$

The Japanese economy has not been on a steady state growth path. Therefore, we cannot apply equation (A2) to the Japanese data directly. However, we can rely on the reasoning leading up to equation (A2) to formulate a hypothesis concerning the potential biases that are likely to be present in the Japanese data. For this purpose, let us note that the quantity ig is known, and there is no reason to suppose that information on this quantity is biased one way or another; the same is true of Q. The variable D is generated by multiplying K_{t-1} by an assumed value of d, and K_t is generated by the formula of equation (A1). Therefore, for a given g, if the assumed value of d is much larger than the true value of d, the recorded values of K and K/Q must be smaller than the true values of K and K/Q. For example, if ig is 0.2 and g is 0.02, and the true value of d is 0.08, then the true value of K/Q would be 2.0. If the value of d is incorrectly assumed to be 0.12, and the time series of K is generated by the perpetual inventory procedure, however, the resulting recorded value of K/Q approaches 1.5. That is, the estimate of capital stock under the assumption that d is 0.12 is roughly 75 percent of the correct value. Similarly, the estimate of depreciation, D, with the incorrectly large depreciation rate of 12 percent will be roughly 112.5 percent of the correct value.

Returning to table 6.3 and comparing the last values of columns (2) and (5) between parts B and C, we see that the estimates of the depreciation and capital stock with 12 percent depreciation rate are roughly 85 percent and 119 percent, respectively, of estimates with 8 percent depreciation rate. Given that the Japanese economy was by no means in a steady state equilibrium condition during the period leading up to 1998, we believe that our empirical results are within the reasonable range of our analytical predictions.

Appendix C

Computing Lost Household Wealth

To compute lost wealth we assume that there is no market value discrepancy for corporations—that is, the market value of net equity is equal to accounting equity, which is the same as saying that Tobin's average q is 1. We then made four additional assumptions, listed below, to create a hypothetical distribution of equities among sectors. This is used to calculate the household sector's adjusted net worth.

Assumptions Regarding Distribution

1. Government entries do not change, because virtually all its equity is in public corporations that are not traded and whose objectives are typically quite different from those of profit-seeking ones.
2. The ratio of equity owned to net equity for the corporate sector as a whole (table 6.2, column [3]) remains the same. That is, line $(i') = j' \cdot (i/j)$.
3. The ratio of nonfinancial equity owned to total corporate equity owned remains the same. That is, for line (i'), the ratio of column (1) to column (3) is the same as for line (i). The same is true for the ratio of column (2) to column (3).
4. The relative distribution of equities between households and the rest of the world remains the same. That is, for line (j'), the ratio of column (5) to (column [3] minus column [4]) is the same as for line (j).

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