Alternative Estimates of Japanese Saving and Comparisons with the U.S.: Can the Capital Gains to Land be Included in "Saving?"

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1. Introduction

This paper presents several novel measures of Japanese saving and performs a U.S.-Japan comparison. We find that if "saving" includes the capital gains to land, the two country gap is much larger than what was conventionally believed.

U.S.-Japan comparisons of saving based on the National Accounts have recently been sharply criticized by Hayashi (1986,1990). Briefly, Hayashi has argued that before comparisons are made, the definition of income, consumption, and government spending in the two countries must be made consistent.[1] Hayashi carefully recalculates Japanese national saving according to the American Department of Commerce definition and finds that during the 1980s, Japanese national saving is nearly halved (Figure 1).

The measures of Japanese saving examined in this paper are largely free from the National Income accounting biases that Hayashi is referring to. In fact, as discussed in the next section, our measures of saving tend to bias Japanese saving downward. If Japanese saving according to our definitions is found to be higher than American saving, then the true gap is probably higher.

Our measures of saving are constructed from the balance sheets of the household sectors in the United States and Japan. If there are no capital gains to reproducible capital and land,

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[1]Relative to the United States, Japanese consumption and government spending are underestimated. In the Japanese accounts, depreciation is treated at historical cost, and in times of high inflation, the historical cost depreciation will tend to underestimate the true cost of capital consumption. In contrast to the U.S. accounts, government spending in the Japanese accounts does not include government investment. This difference in accounting convention will tend to raise American government spending relative to Japanese spending.

then our measures of saving will equal the National Accounts definition of income minus consumption. The U.S.-Japan saving gap becomes much wider according to our definition because of the large capital gains to land that Japan has experienced during the post-war period. Figure 2 shows that the capital gains to land has been especially pronounced since 1986. At the end of 1988, land comprised almost two-thirds of total Japanese national wealth.

This paper is organized as follows. The next section defines and constructs three alternative ways of looking at saving. Section 3 addresses the question of whether it is appropriate to include in "saving," the capital gains on land. If capital gains arise because of increases in lifetime income, then present and future consumption opportunities rise. Capital gains to land can also arise when the relative returns to land and capital change, with constant or declining lifetime income. In such instances, future consumption opportunities will not rise. It appears that a reasonable test of whether the capital gains on land can be included as saving is to examine whether consumption rises when there are capital gains. Section 4 performs such a test using both aggregate time series data from March 1955 to September 1989 and a panel data set on Japanese prefectures covering the period 1970 to 1987. We find that the rise in land prices appears to have affected Japanese consumption. The effect has been especially large between 1985 and 1987, a period when the yearly increase in aggregate land values were over 1.5 times National Income. The tests performed in Section 4 also shed light on whether Japanese households on

average raise their consumption when housing values increase. Households can be divided into homeowners and renters. When housing prices increase, there is a transfer of wealth from renters to homeowners. Previous research has shown that Japanese renters on average decrease their consumption in response to an increase in land prices. If homeowners increase their consumption, the economywide net-effect is analytically ambiguous. The empirical results in Section 4 show that in the aggregate, the increased consumption of the homeowners is larger than the decreased consumption of renters.

2. Alternative Measures of Japanese Saving.

2.1 The Harrod-Domar Condition.

Table 1 depicts the ratio of net wealth to net disposable income for U.S. and Japanese households.[2] Compared to American households, Japanese families hold a much larger percentage of their portfolios in land. In spite of the persistently high level of postwar saving, the ratio of non-land assets to DI in Japan still appears to be smaller in Japan than in the United States.

It is well-known that the aggregate balance sheets of the Japanese household sector are not reliable. Equity and land appear to be substantially biased downwards (Ando, 1985; Hayashi, 1986).[3] Table 2 shows the levels of Japanese household non-

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[2]Net wealth is the difference between gross wealth and household financial liabilities. Gross wealth includes inventories, non-reproducible assets such as land, the structure of the owner occupied home, and financial assets such as money, deposits, bonds, and equities. Disposable income is defined as household income minus the sum of direct taxes, interest payments on loans, social security payroll taxes, and various minor fines and fees. For Japan and the United States, the household sector includes private unincorporated non-financial enterprises and not-for-profit organizations.

[3]In 1984, corporate equity held by the household sector was reported in the national accounts to be 15 percent of the market value of assets held by the corporate sector. A painstaking analysis by Hoshi and Kayshap (1989) of 353 Japanese manufacturing firms listed on the Tokyo stock exchange has revealed that in 1984, Tobin's q was 1.10. The underestimate arises mainly because non-publicly traded stocks are valued in the national accounts at par, usually at 50 yen per share.

For example, the par value of Bank of Japan stock is 100 yen, and there are a million shares outstanding. On very rare instances, Bank of Japan equity is exchanged over-the-counter, and in January 1990, shares were traded at 680 thousand a share.

Most unlisted corporations in Japan are very small. A firm can adopt the corporate form with 7 employees and 100,000 yen in

land assets, Non-land*, when the equity of unlisted firms is valued at market prices. The calculation procedure, described in the appendix, assumes that Tobin's q for unlisted firms is on average equal to that of listed firms. Since in practice Japanese firms with fewer employees have smaller q ratios, and since unlisted firms on average are smaller than listed firms, the wealth-disposable income ratios in Table 2 are an upper bound (Hoshi and Kayshap, 1989). The market valuation of unlisted firms raises Japanese non-land/disposable income ratios by over 50 percent.

The only item in the Japanese household balance sheets that is subject to an upward bias is the value of the structure of the owner-occupied home. As Hayashi (1986) points out, depreciation in the Japanese National Accounts is measured in terms of historical costs, while that in the U.S. is measured in terms of replacement costs, and in times of high inflation, this difference in accounting convention will tend to overstate the

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capitalization, and take advantage of limited liability and generous physical capital depreciation tax allowances. To be listed on a stock exchange, a firm's equity must be above a given amount, be widely traded, and the firm must run a profit two years in succession. In Japan at the end of March 1990, there were 975,861 corporations, and 4872 were listed on the two sections in Tokyo and the seven regional stock exchanges. Unfortunately without information on the market values of unlisted firms, it is difficult to accurately adjust upwards, the equity reported in the national accounts. In the text, a crude attempt is made to estimate the market value of unlisted firms by assuming that the q ratio of unlisted firms is equal to that of listed firms.

The Economic Planning Agency imputes the value of land held by the household sector using the National Land Agency's "Posted Land Values" (Koji-Chika). It is estimated that in recent years, the Koji-Chika is about 70 percent of the market value of land. Since there are no official compilations of the actual transactions prices of real estate, it is not possible to develop a series for the market value of Japanese land.

value of Japanese depreciable assets. In 1987, depreciable assets were less than ten percent of household net assets. The footnote below shows that the historical cost depreciation of housing structures will at most upward bias the Japanese housing stock by about 3 percentage points of disposable income.[4] Relative to the 1987 household wealth-income ratio of almost 800 percent, the bias appears insignificant.

According to the Harrod-Domar identity, the steady-state saving rate, s, is equal to g*W/Y, where g is the growth rate of real income and W/Y is the wealth-income ratio.[5] Table 3 shows the equilibrium saving rates for the two countries for various combinations of g and W/Y. Since the Japanese economy was probably not in the steady-state in the 1950s and 1960s, s is also calculated for the period starting in the mid-1970s.

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[4]Let the annual rate of depreciation at replacement and at historical cost be denoted by d and d'. Assume that the gap between d and d' is constant over time. The two depreciation practices give two different values for the net capital stock at time t, K(t) and K'(t). As a fraction of disposable income, the difference in the two measures is,

$$(K(t)-K'(t))/DI(1987)= (t-1)(d'-d)K(0)/DI(1987) + (d'-d)I(t-2)/DI(1987) + \text{higher order terms}/DI(1987),$$

where 0 is the initial time period. When time 0 is 1955, time t-1 will be 21 (= 1987-1955-1). Since d and d' are small, we can neglect the higher order terms.

For residential housing, K(1955)/DI(1987) and I(1985)/DI(1987) are .025 and .03. Suppose there is a gap of 5 percent between d and d' for housing (approximately the average gap between 1970 and 1985 as reported in Hayashi, 1986, Table 2). Substituting these values in the above formula, we get 0.028. Depreciation by historical cost will upward bias the measurement of the 1987 net housing stock by about 3 percentage points of DI.

[5]In the steady-state, the wealth-income ratio is constant. If income grows at g, saving or the change in wealth must equal g*W. The saving rate that keeps the wealth-income ratio constant is g*W/Y.

When wealth is restricted to non-real estate, the derived saving rates appear similar. The U.S.-Japan gap in saving rates when Non-land* is used is higher, but the gap is less than four percent. When wealth includes land, the Japanese derived saving rates rise to over twice the American rates.

2.2 First Differences in Wealth

Table 4 depicts the ratio of the annual changes in wealth to disposable income.[6] Because the volatility in year-to-year asset prices makes international comparisons difficult, period averages are depicted at the bottom of the table.

For the entire 1956 to 1987 period, the changes in non-land wealth on average for the two countries appear roughly similar. Averages over sub-periods show that the Japanese first-differences have been rising since the mid-1960s, while that for the United States have been falling. The gap has especially widened in the 1980s.

If we assume that Tobin's q is equal to one, there is no government sector, and the economy is closed, then there is a straitforward relationship between the change in household non-land assets and the conventional definition of saving of income

[6] $(W(t+1)-W(t))/DI(t)$. The taking of first-differences may not eliminate the downward bias in measured Japanese household asset values if there is an upward trend in the gap between the Koji-Chika and the market value of land. For example, the gap between the Koji-Chika and the actual market values of land has apparently widened after the post-1986 surge in land prices. Since local governments use the Koji-Chika as the base for calculating property taxes, a rapid increase in the Koji-Chika may be politically infeasible, because the tax burden would automatically be raised.

minus consumption.

The change in household non-land assets is equal to,

$$k(t+1)*K(t+1)-k(t)*K(t)-d*k(t+1)*K(t+1) + p(t+1)L(c) - p(t)L(c) \quad (1),$$

where k(t) is the price of capital goods relative to consumption goods, K(t) is the capital stock, d is the annual rate of capital depreciation, p(t) is the price of land, and L(c) is the land held by the corporate sector.[7] Note that when k(t)= k(t+1) and p(t)= p(t+1), the change in wealth will equal income minus consumption. During the 1980s, revaluations or the capital gains in corporate land holdings have been on average much larger in Japan than in the United States, which may help explain part of the rising gap in the first-differences of household non-real estate wealth between the two countries.[8]

The introduction of the government sector complicates the comparison between the two measures of saving. In a closed neo-Ricardian economy, net national saving will equal the change in household non-land wealth without asset revaluations, but the world may not be neo-Ricardian.

The inclusion of land greatly increases the U.S.-Japan gap in the first-differences of wealth. The average Japanese changes in wealth over the period 1956 to 1987 and 1986 to 1987 are now over three times and nine times that in the United States.

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[7]At the end of 1987, the corporate sector held over 28 percent of the land in Japan.

[8]During the 1980s, there has been a fall in the relative price of capital goods in Japan.

2.3 The Absorbtion Approach

The current account surplus is the excess of saving over domestic investment. If both the current account surplus and domestic investment are high, then saving must be high. Saving here is the conventional National Accounts definition of income minus consumption.[9] The capital gains on land does not directly affect the current account.[10]

Figures 3 (a) and (b) depict the trends in the current account surpluses in the United States and Japan. The experience of the two countries are markedly different since the early 1980s, with Japan running high surpluses, and the United States, large deficits.

Tables 5 (a), (b), and (c) depict various investment-output measures.[11] All three definitions show the Japanese investment-output ratios higher than America's.[12] In both countries, the

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[9]In the National Accounts, national saving differs from the sum of the current account surplus and domestic investment by the statistical discrepancy. For example, in 1981, the statistical discrepancy was 0.513 trillion yen. National saving in that year was 46.012 trillion.

[10]Real estate capital gains may indirectly affect the current account through its effect on consumption. Section 3 discusses at length, the relationship between capital gains and consumption.

[11]The "nominal-nominal" ratios can differ from the "real-real" ratios when the deflator for investment goods changes at at a rate different from the GNP deflator. Through most of the 1970s and 1980s, there has been a fall in the relative price of investment goods, which would tend to raise the "real-real" ratios without any change in the "nominal-nominal" ratios.
In the OECD Accounts, asset specific depreciation rates do not exist, and only total investment rates are given.

[12]In the Japanese national accounts, government investment and consumption are separated. In the American accounts, government investment is treated as consumption, and this practice would tend to understate total U.S. investment.
Fortunately, the OECD National Accounts separate government

"real-real" investment ratios are higher than the "nominal-nominal" ratios, suggesting that there has been a decline in the price of capital goods relative to the general price level. The U.S.-Japan gap cannot be explained by differences in depreciation accounting. When Japanese depreciation is valued at replacement costs, the investment-output ratio in Japan drops, but the ratio is still on average three times that in the United States.[13]

2.4 Summary

It appears that during most of the post-war period, Japanese saving has been higher than U.S. saving. The result holds for when saving is restricted to the accumulation of non-land assets. A much larger gap, however, arises when land is included in the measure of wealth. The next section presents some conditions under which it may be appropriate to regard the capital gains on land as saving.

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consumption from investment for all countries. It appears that what is reported as government investment for the United States is the sum of non-military durable purchases by the Federal, State, and Local governments.

[13]For 1970 to 1984, the excess of depreciation at replacement costs over depreciation at historical costs was taken from Hayashi (1986) Table A2. From 1985, the authors' calculation, using the method of Hayashi.

3. Can Capital Gains on Land be Considered "Saving"?

In this section, we present simple examples of real estate capital gains. We show that whether capital gains can be treated as saving depends on whether the gains are positively correlated with increases in lifetime income.

In a world without uncertainty, households save either to raise their own future consumption or the consumption of their children. A rise in future consumption is therefore a type of saving. More formally, assume a two-period economy with perfect capital markets, and endowed with K_1 capital, T land, and an unit of first-period labor earning w. The rates of return on capital and land in the two periods are r_1, r_2, and R_1, and R_2.

The budget constraint for this economy is,

$$c_1 + c_2/r_2 = w + (1+r_1)K_1 + R_1T + (R_2/r_2)T \quad (2),$$

and the price of land at the end of the first period will be,

$$P=R_2/r_2.$$

Capital gains on land occurs when R_2 rises by more than r_2.

For simplicity, assume a logarithmic utility function,

$$\ln(c_1) + \ln(c_2)/(1+rho) \quad (3),$$ where rho is the pure rate of time preference.[14]

Maximizing (3) with respect to (2), we get,

$$c_1r_2 = \{1/(2+rho)\}\{r_2R_1T + r_2(1+r_1)K_1 + R_2T + r_2w_1\}, \quad 4(a)$$

and

$$c_2 = \{1/(2+rho)(1+rho)\}\{r_2TR_1 + r_2(1+r_1)K_1 + R_2T + r_2w_1\} \quad 4(b).$$

[14]Logarithmic utility is convenient because the marginal rate of substitution between first and second period consumption is independent of the real rate of interest.

Consumption in both periods are linear in lifetime income.

From 4(b), we see that c_2 can rise only when lifetime income rises. The objective of the following examples is to see when a rise in P is consistent with an increase in c_2. We define "saving" as an increase in period two consumption. There are cases in which c_2 rises, while saving according to the National Accounts definition, $Y_1 - c_1$, falls.

Example 1: Positive shock to the productivity of land.

Assume that second-period output in this economy is produced by a Constant Elasticity of Substitution CES production function,

$$Y_2 = K_2^{1-p}/(1-p) + (aT)^{1-p}/(1-p) \quad (5),$$

where p is the inverse of the elasticity of substitution between capital and land.

Cost-minimization entails a Rent-rental ratio of,

$$R_2/r_2 = a(K/aT)^p.$$

Suppose consumers during period one expect in period two, land-augmenting technical progress, increasing a.[15] An example of such technical progress in Tokyo would be a restructuring to produce higher value-added products. Factories producing goods that are in the mature phase of their product cycle would be converted to retail outlets or office buildings housing financial firms.

As long as the elasticity of substitution is greater than

[15]The literature on the endogenous bias of technical change suggests that firms will direct innovative activity to the most slowly growing factors (Phelps and Drandakis, 1966).

one, a rise in a will increase the rent-rental ratio. With a high elasticity of substitution, the quantity of capital does not have to be raised to increase output. The returns to capital can remain low, and most of the rise in output can be captured as land rents.

With an utility function as in (3), both first and second period consumption rise with an increase in lifetime income. With Y_1 remaining constant, first period income minus consumption will fall.

Example 2: Negative shock to the productivity of capital.

With an elastic CES production function, a negative shock to the productivity of capital will lower the rental rate relative to land rents. The price of land will rise, but there will be a decline in lifetime income. Second period consumption will fall.

It would be difficult to attribute the recent rise in land prices to an expectation of future negative productivity shocks to capital. From 1986 to 1988, the return on capital appears to have risen. Corporate profits increased at an annual average rate of 7.2 percent, compared to a 3.4 percent average for 1984 and 1985. The Nikkei price index of stocks increased by 41 percent between 1986 and 1987, and 16 percent between 1987 and 1988. Negative productivity shocks, however, may have played a role in the run-up of real estate prices after the oil shock of 1979.

Example 3: Changes in fiscal and monetary policies.

Fiscal and monetary policies may affect the second period production function, possibly resulting in changes in asset prices. For example, the imposition of a first-period consumption or labor income tax may reduce the likelihood of a second-period hike in the tax on the pure land rent. Although there may be no change in the lifetime income of households, land prices will rise.

As depicted in Figures 4(a) and 4(b), in Japan, growth in the supply of money has had a high degree of correlation with increases in land prices (Nishimura, 1990). A simple way to introduce money in the above model is to add government spending, G and subtract money, M from the right-hand side of (2). The government is assumed to raise revenue of M through seniorage and spend it lump sum as G.

Include M in the production function (5) in place of the productivity shock, a. A rise in M will have a similar effect as a positive productivity shock to land. The inclusion of money in the production function can be justified by appealing to the model of Kayshap, Sharfstein, and Weil (1990). A rise in land prices raises collateral, and the ability of firms to borrow. Money supply accomodates the demand for liquidity. Companies invest, increase their physical capital, future output and rents rise.

A different model would add an asset demand function,

$M_1 = L(R_2, r_2)$.

A rise in M_1 will change equilibrium R_2 and r_2, and it is possible for p to increase. Assume that lifetime income is held

constant. A fall in the price of second period consumption, r_2, will raise first period consumption and decrease the level of second period consumption. A rise in the supply of money may raise land prices, but the effect of a rise in money supply on second period consumption depends on the model.

The above examples show that whether capital gains can be treated as saving depends on the type of shock. Both positive and negative shocks can raise land prices, but lifetime income and future consumption opportunities rise only with the former.

During much of the post-war period, the Japanese economy was in a transition phase from a low capital-output ratio.[16] The two-period model may fail to capture the relationship between land prices and the level of consumption when the economy is off the steady-state. A simple application of the Ramsey saving model suggests that the relationship between land prices and consumption again depends on the mechanism causing land prices to be high. If land prices are high because the pure rate of time preference is low, then the level of consumption during the transition phase will tend to be high. If, however, land prices are high because the economy is endowed with little land, then consumption during the transition phase will tend to be low.

Assume a closed Ramsey-type infinite horizon economy with production in every period characterized by a CES function separable in capital and land as in (5) above. For simplicity,

[16]In 1955, the Japanese net reproducible capital-NNP ratio was 2.1. By 1988, the ratio was close to 3.0.

also assume that technical change, population growth, and the rate of capital depreciation are zero. In the steady-state,

$$rho = K^{*-p} \quad \text{and} \quad R^{*}=(aT)^{-p},$$

where rho is the pure rate of time preference of households. When households are "patient," rho will be low and steady-state capital, output, and land prices will be high. Given two economies with the same population, technology and intial endowments of capital and land, the economy with more "patient" households will have a faster accumulation of capital. In the steady-state, and during at least a portion of the transition path, the "low rho" economy will have a higher level of consumption and land prices.[17]

Now assume two economies that are identical except that one economy is endowed with less land. A fall in T raises steady-state rents. Steady-state capital remains constant, but output and steady-state consumption will fall. An economy with little land will have rapidly rising land prices during the transition phase, but consumption will not rise as fast as an economy with more land.

3.1 Summary.

This section has shown that whether increases in today's land prices can be treated as "saving" depends crucially on whether tomorrow's consumption will rise. If land prices are

[17]Since in the steady-state, the "low rho" economy will have a higher level of consumption than a "high rho" economy, with the same initial conditions, the "low rho" economy must have a higher level of consumption during at least a portion of the transition path in order for the "low rho" economy to overtake the "high rho" economy.

rising because of anticipated future productivity improvements, then future output and consumption will rise. Land prices can also increase without corresponding increases in future output. Monetary policies, for example, may in the short-run increase the returns to land relative to capital, raising land prices.

The next section examines the correlation between land prices and household consumption using both time-series data and panel data for Japanese prefectures. The results help shed light on whether Japanese households view rising land prices as increases in lifetime income.

4. The Correlation between Land Prices and Consumption.

According to the lifetime-permanent income hypothesis, the consumption of the household sector in each period t equals permanent income, the flow of rental income from total wealth, W(t), accruing at a risk-free, constant, interest rate of r,

$$c(t) = r*W(t) \qquad (6).$$

Household wealth is composed of land, the market value of equities, financial assets, and the present discounted value of the returns to human capital, human wealth,

W(t)= p(t)L(t) + Equities(t) + Fin. Assets (t) + Human Wealth(t).

We estimate (6) for Japan using both time-series National Accounts data and prefectural level panel data from the Economic Planning Agency's Annual Report on the Prefectural Accounts. Appendix 2 describes both data in detail.

4.1 Time-series Estimates.

Table 6 depicts the ordinary least squares estimates of the "first-differenced" version of equation (6).[18] As dependent variables, total household consumption and food consumption are used. Given the absence of a bi-annual series on household financial assets, the level of interest income is used as a proxy for financial assets. If interest rates are constant, the change

[18] Even when the errors in the levels version of (6) is distributed as i.i.d., first-differencing will result in MA(1) errors. Equation (6) was also estimated by maximum-likelihood, taking account of the MA(1) error structure, and the results were not affected.

in financial assets will equal the change in interest income. To account for the seasonal patterns in consumption and labor income, a dummy variable that adopts a value of one during the September to March period is included in all specifications.

In the aggregate economy, the changes in financial assets and equities are endogenous, and in columns (1) and (3), financial assets and equities are dropped.[19] From columns (1) and (3), we can observe that the change in land prices is significant at the 20 percent level. During the 36-year period between 1953 and 1989, land prices appear to be positively related to consumption.

The t-statistics fall when stock prices and interest income are included. As shown in Figure 4(a), the movement of equity prices closely parallels the movement in land prices, and it may be difficult to detect an independent effect of land prices on consumption.

Figures 4(a) and (b) suggest that the change in land prices is likely to be correlated with the change in the real money supply. A regression of the change in land prices on the change in real money supply results in significant coefficients (Table 7, 1).[20] If we assume that money is supplied exogenously, then the change in money supply can be used as an instrument for the change in land prices. Money appears to be significant (Table

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[19]The change in the sum of financial assets and equities is endogenous, equal to the difference between income and consumption.

[20]The change in real consumption is included to control for changes in permanent income. The correlation between money and land prices could be spurious if positive shocks to permanent income increase both land prices and money supply.

7, 2), although the possibility of endogenous money means that we should not place too much emphasis on the results.[21]

Table (8) depict estimates using a test in Hall (1978) which provides further evidence for the correlation between land prices and consumption. If consumption responds to lifetime income with a lag and if lagged land prices affect the change in consumption, then lagged land prices must include information about lifetime income. The results in the Table suggest that lagged land prices does include information about lifetime income.[22] The null hypothesis that all three coefficients of lagged land prices are jointly zero was rejected by the Likelihood-ratio test at the five percent level.

4.2 Panel Data Estimates.

As shown in Figure 2, there were three distinct episodes of above average annual increases in land prices between 1970 and 1987: 1971-1973, 1978-1981, and 1985-1987. The shocks producing these changes in land prices are likely to be different for each of the three episodes.[23] The inter-prefectural land price

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[21] If the Bank of Japan adjusts its monetary policy in response to economic fluctuations, the error term will be correlated with money and the estimates will be inconsistent.

[22] If lagged land prices were found to be insignificant, we still cannot reject the hypothesis that land prices affect consumption. Consumption may be responding to land prices without a lag. The significance of land prices allows us to reject the hypothesis that land prices do not affect consumption. The time path of consumption should not be affected by past land prices if land prices did not inform consumers about future trends in lifetime income.

[23] For a nice description of the possible shocks raising land prices during each of the three episodes, see Takagi (1989).

changes depict markedly different patterns. Figures 5(a) to (c) show that real land prices increased evenly throughout Japan between 1971 and 1973, but uniformly fell in 1973. In the second episode during and after the second oil crisis in 1979, real land prices increased across the country but did not fall (figures 5(d)-(f)). The third episode constrasts sharply with the first two. Land price increases were initially concentrated in the Kanto region and gradually spread to other areas (figures 5(g)-(h)). As of Fall 1990, statistics do not show a decline in the value of real estate.

It is likely that estimates such as those depicted in Table 6 give misleading results when they are based on a time period that has experienced several very different types of shocks. In this sub-section, we estimate equation 6 using prefectural level data for the above three sub-periods when land price volatility was abnormally high. We find that during the first and third episodes, the change in land prices appear to be significantly positively related to the change in consumption.

Table 9 shows the results of the "fixed-effects' estimation of equation (6) using a panel of 39 prefectures.[24] Since household financial wealth holdings by prefecture cannot be observed, we assume that financial wealth is constant over the sub-period and include it in the unobserved fixed-effect. To correct for heteroskedasticity, all observations were weighted by the prefectural population, but the results were not significantly affected, and are not depicted in the table.

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[24]A complete series spanning 1971-1987 could not be obtained for 8 prefectures, Hokkaido, Iwate, Fukushima, Nagano, Hiroshima, Tokushima, Kagoshima, Okinawa.

Land prices are found to affect consumption for the first and third sub-periods, but not for the second. As modelled in Section 3, if the rise in land prices during the second sub-period is because of a rise in the price of oil, which is a negative shock to the capital shock, consumption should not be affected, or should even fall; lifetime income has declined.

The "wealth-effect" of a change in land prices was especially high between 1985 and 1987. Between the end of 1985 and the end of 1987, the value of land in Japan held by households increased by 417 trillion yen. The predicted change in household consumption is 14.18 trillion (=417 trillion * 0.034), which is almost as large as the actual 14.50 trillion yen increase in household final consumption between 1985 and 1986. The value of the coefficient on the value of land, 0.034, appears close to the value of the real interest rate, which is what is predicted by the lifetime income hypothesis.[25]

[25]These results should be viewed with caution. The coefficient on labor income is also high at 1.31. There may be a missing variable correlated with both land prices and labor income.

5. Conclusion

An individual has only two reasons to save, to increase his own future consumption, and to increase the consumption of his children. If the capital gains to some asset results in an increase in an individual's future consumption opportunities, then "saving" has taken place.

This paper has argued that the gap in U.S-Japan saving rates is large if the capital gains to land can be included as saving. Including the gains to land, in the 1956-1987 period, Japanese households would have saved 38 percent of their disposable income, compared to 13 percent for American households.

A crucial test of whether it is appropriate to include the capital gains to land as saving is to see how household consumption responds to changes in land prices. If the lifetime wealth-permanent income hypothesis holds, then consumption responds to changes in lifetime wealth. If consumption responds to changes in land, then it is probable that households regard the change in land prices as changes in future consumption opportunities and saving.

This paper has shown that at least for the early 1970s and the 1985-1987 period, Japanese households appear to view a change in land prices as an increase in their lifetime income and future consumption opportunities. The response of consumption to land prices is especially large in the 1985-1987 period; estimates appear to show that the entire 14.18 trillion yen change in family consumption during the two year period can be explained by the rise in the price of real estate owned by households.

Appendix 1: The Construction of Table 2.

a) Column 1. Tobin's q for Listed Corporations.

The values for average q are from Hoshi and Kayshap (1989) Figure 3.5. The q values are for the median firm. For consistency with the definition of q in column (2), the value of q that is not adjusted for taxes is used. Included in the replacement cost of assets are depreciable assets, land, and inventories.

b) Column 2: Tobin's q from the National Accounts.

The figures are derived from dividing the value of equity held by the household sector by the net wealth (shomi-shisan) of the non-financial and financial sectors.

c) Column 3: The Ratio of the Market Value of Corporate Equity held by households as reported in the National Accounts.

Column (1) divided by column (2) equals the ratio of the market value of equity to the value of equity as reported in the National Accounts. The replacement costs of capital cancel out.

The above calculation assumes that q is the same for listed firms as that for the unlisted. If unlisted firms have smaller q values, then the calculated economy-wide q will be biased upwards. The bias will be higher the larger the discrepancy between the qs of the listed and the unlisted firms and the larger the capital stock of the unlisted firms.

The possibility of arbitrage by the buying and selling of unlisted firms suggest that the q of unlisted firms will on average not diverge far from the q of the listed firms.

d) The Ratio of Non-land Assets to Household disposable income when equity is adjusted upwards to reflect market values.

The value of equity as reported in the National Accounts is multiplied by column (3). To this figure, other household non-land assets are added.

Appendix 2: Description of the Data.

A.2.1: Data used in the Time-series estimates.

Since the mid-1950s, the Japan Real Estate Institute has published its index of land prices for all urban districts. The index is announced once every 6 months, at the end of March and at the end of September. The difference between two successive indexes would be the rise in land prices in the previous six months.

Household total consumption, food consumption, the consumption deflators, and labor and interest income are available quarterly from the Japanese national accounts. To make the frequency of these variables correspond to the frequency of the land prices, we added the fourth and first quarters (October-March) and the second and third quarters (April-September) to get two observations per year.

The Money Supply stock (M2+CD) and the Nikkei stock price index are available at monthly intervals from the Bank of Japan data files. We took the observations for the end of March and the end of September for both stock variables. It has been pointed out that we should have used the broader TOPIX index for stock prices, but the results were not affected by the choice of the stock market index.

With 33 years and one 6 month period, we have 67 observations.

A.2.2 Data Used in the Panel Estimates.

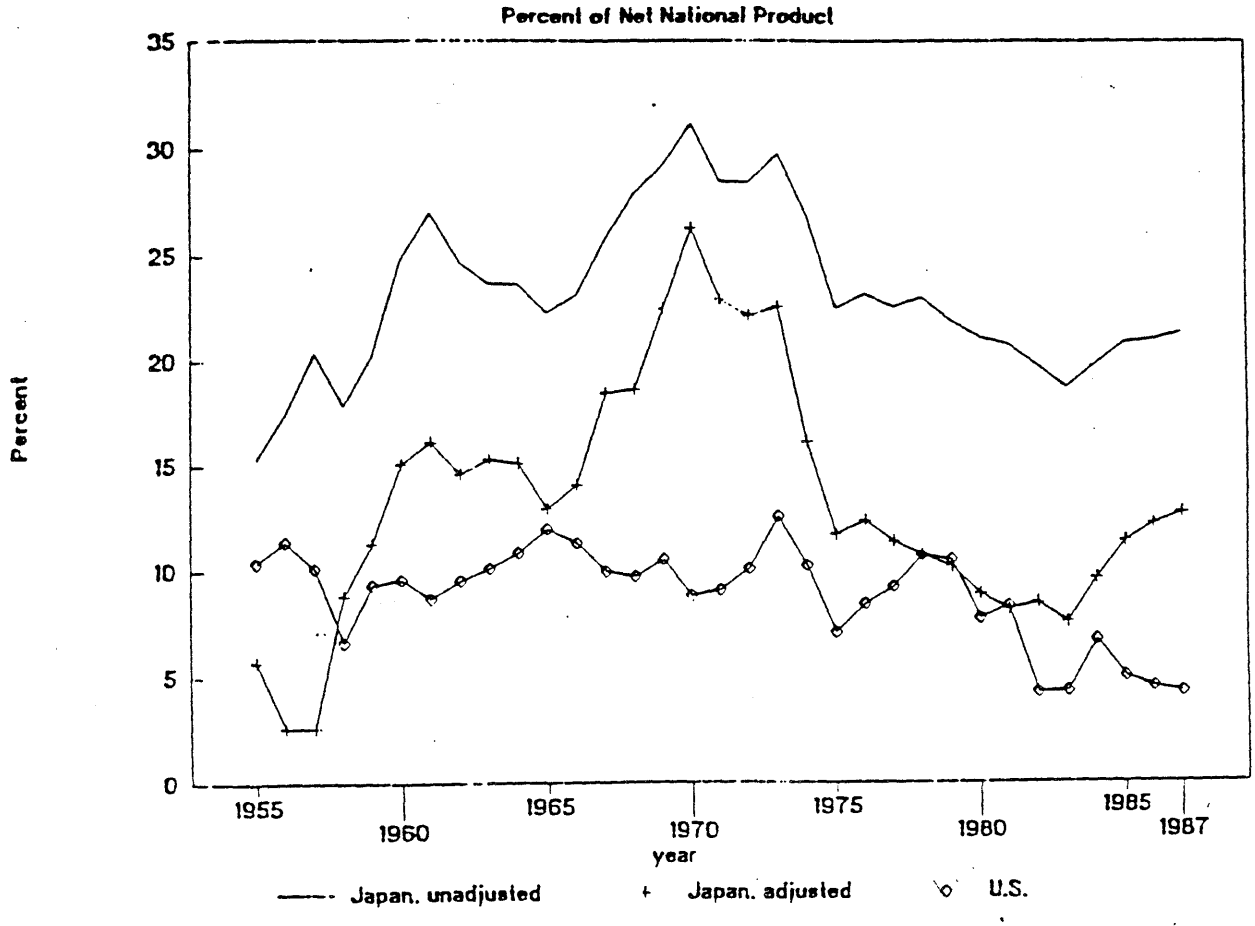
Prefectural consumption, the labor income of prefectural residents, prefectural population, the prefectural expenditure deflator, and the dividend receipts of prefectural residents are available by prefecture from the Annual Report on Prefectural Accounts. The 1970-1975 data are from the 1980 edition; the later years are from the 1990 edition. Unlike the 1976-1987 data, the 1970-1975 data are not based on the new SNA statistics. We assume that the yearly dummies will correct for the definitional differences.

The stock of equity wealth by prefecture is derived as follows. Aggregate equity wealth held by the household sector at the end of each year is available from the balance sheets section of the Japanese national accounts. We assume that the distribution of aggregate equity wealth among prefectures is proportional to the interprefectural distribution of dividends.

The value of prefectural land held by households is from the Japanese national accounts. For all stock (land and equity) variables, the end-of-the-year values are used.

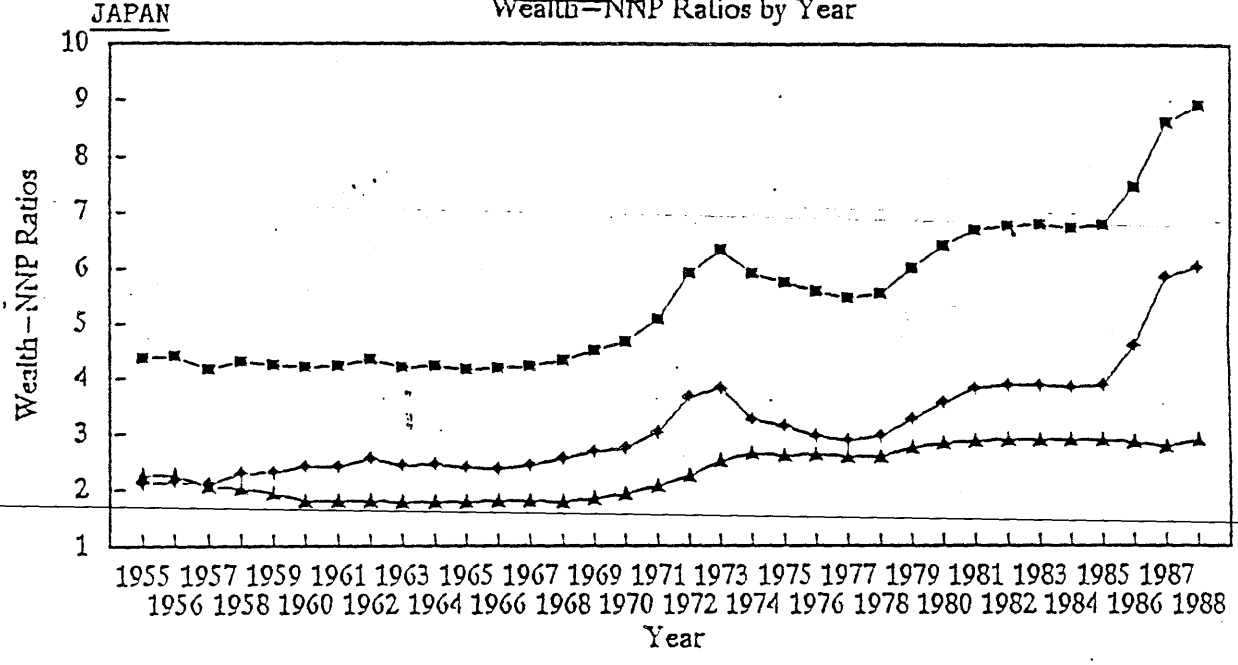
All variables are divided by the prefectural expenditure deflator for the given year to arrive at the real values.

Figure 1



Source: Hayahi (1990)

Figure 2
Wealth–NNP Ratios by Year



reproducible capital includes inventories
and net foreign assets

Table 1

Net Wealth-Net Disposable Income (DI) Ratios

for U.S. and Japanese Households

	U.S. Households			Japanese Households		
Year	Wealth/ DI	Land/ DI	Non-Land/ DI	Wealth/ DI	Land/ DI	Non-land/ DI
1955	4.83	0.17	4.66	3.13	1.85	1.28
1956	4.84	0.19	4.65	3.22	1.91	1.31
1957	4.63	0.19	4.44	3.27	1.97	1.30
1958	4.97	0.20	4.77	3.34	2.05	1.29
1959	4.93	0.20	4.73	3.32	2.04	1.28
1960	4.85	0.22	4.63	3.43	2.16	1.27
1961	5.08	0.22	4.86	3.45	2.15	1.30
1962	4.77	0.22	4.55	3.45	2.23	1.22
1963	4.87	0.21	4.66	3.50	1.99	1.51
1964	4.79	0.21	4.58	3.25	1.99	1.26
1965	4.78	0.23	4.55	3.19	1.92	1.27
1966	4.57	0.22	4.35	3.24	1.94	1.30
1967	4.76	0.23	4.53	3.32	2.00	1.32
1968	4.88	0.23	4.65	3.47	2.14	1.33
1969	4.62	0.23	4.37	3.64	2.31	1.33
1970	4.42	0.22	4.20	3.79	2.41	1.38
1971	4.49	0.22	4.27	4.32	2.66	1.66
1972	4.59	0.23	4.36	5.25	3.25	2.00
1973	4.23	0.24	3.99	5.34	3.33	2.01
1974	4.04	0.25	3.79	5.64	3.33	2.31
1975	4.15	0.25	3.90	4.22	2.44	1.78
1976	4.28	0.27	4.01	4.33	2.30	2.03
1977	4.29	0.30	3.99	4.18	2.26	1.92
1978	4.35	0.34	4.01	4.39	2.37	2.02
1979	4.49	0.36	4.13	4.86	2.67	2.19
1980	4.65	0.37	4.28	5.12	2.90	2.22
1981	4.54	0.39	4.15	5.11	3.13	2.28
1982	4.48	0.37	4.11	5.53	3.19	2.34
1983	4.55	0.38	4.17	5.57	3.16	2.41
1984	4.36	0.37	3.99	5.67	3.17	2.50
1985	4.47	0.37	4.10	5.83	3.24	2.62
1986	4.55	0.38	4.17	6.58	3.83	2.75
1987	4.58	0.40	4.18	7.91	4.81	3.10

Source: For the United States, National Balance Sheets, 1988 edition, Federal Reserve Board. For Japan, National Income Accounts.

Table 2

The Ratio of Japanese Household Non-land Wealth to Disposable Income When the Equity of Unlisted Corporations is Valued at Market Prices.

	Q for Listed Corporations (1)	Q from the National Accounts (2)	(1)/(2) (3)	Non-land*/DI (4)
1976	0.98	0.14	7.0	3.34
1977	1.02	0.12	8.5	3.52
1978	1.10	0.16	6.9	3.66
1979	0.98	0.15	6.5	3.78
1980	0.98	0.13	7.8	3.98
1981	0.92	0.13	7.4	3.92
1982	0.96	0.11	8.9	4.13
1983	1.05	0.13	8.1	4.26
1984	1.10	0.15	7.3	4.43

Note: See Appendix 1 for details in the construction of the four columns. Post-1984 data on Tobin's Q for listed firms is not available in Hoshi and Kayshap (1989). Column (3) is the ratio of the market value of corporate equity to the equity as reported in the national accounts. Non-land* is the value of household non-land assets when the equity of unlisted corporations is valued at market prices.

Table 3

U.S. and Japanese Saving Rates Derived from the Harrod-Domar Condition

$s = W/Y * g$

Saving Rates (in percent)

	(1)	(2)
Japan	W/Y= Non-land/DI	W/Y= Land + Non-land/DI
1955-1987 g= 7.8%	W/Y= 1.79 s= 13.14	W/Y= 4.35 s= 33.07
1978-1987 g= 4.2%	W/Y= 2.44 s= 12.67	W/Y= 5.66 s= 29.57
	W/Y= Non-land*/DI	
1976-1984 g= 4.44	W/Y= 3.87 s= 17.20	
U.S.	W/Y= Non-land/DI	W/Y= Land + Non-land/DI
1955-1987 g= 3.2	W/Y= 4.28 s= 13.69	W/Y= 4.59 s= 14.69
1978-1987 g= 3.0	W/Y= 4.50 s= 13.5	W/Y= 4.13 s= 12.39

Source: Tables 1 and 2. Non-land* corrects for the underestimate of corporate equity that is reported in the national accounts.

Table 4

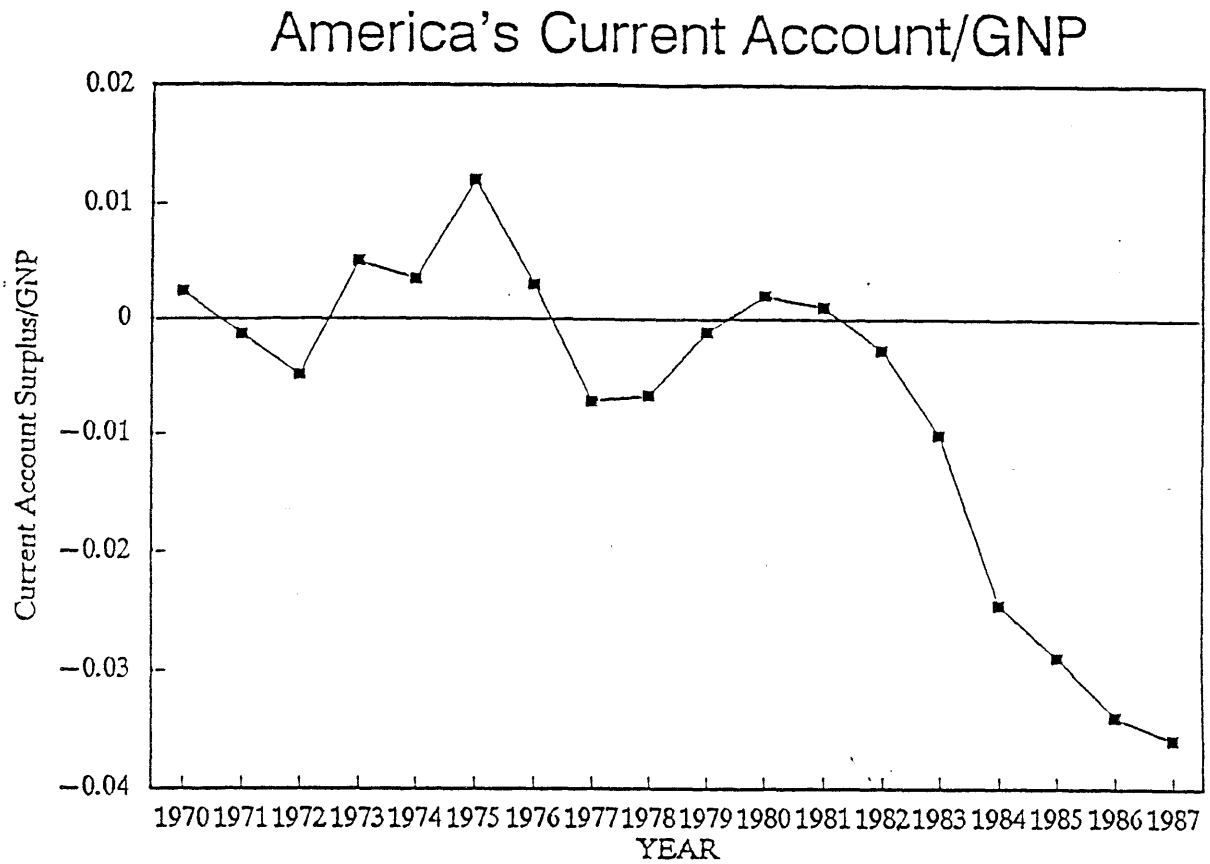
Annual Changes (First-Differences) in the Wealth-Disposable Income Ratios for U.S. and Japanese Households

	U.S. Households			Japanese Households		
Year	Change in Wealth/DI	Change in Land/DI	Change in Non-land/DI	Change in Wealth/DI	Change in Land/DI	Change in Non-land/DI
1956	0.24	0.028	0.21	0.26	0.16	0.11
1957	-0.11	0.0059	-0.11	0.18	0.10	0.08
1958	0.35	0.0056	0.34	0.35	0.25	0.10
1959	0.12	0.057	0.066	0.27	0.17	0.10
1960	0.025	0.024	0.0010	0.40	0.30	0.10
1961	0.30	0.0054	0.29	0.33	0.19	0.13
1962	-0.10	0.0062	-0.11	0.31	0.25	0.063
1963	0.28	0.0049	0.28	0.13	0.00038	0.13
1964	0.21	0.0088	0.20	0.27	0.16	0.11
1965	0.27	0.069	0.26	0.15	0.057	0.094
1966	0.077	0.0035	0.042	0.31	0.18	0.14
1967	0.37	0.0040	0.37	0.36	0.24	0.13
1968	0.33	0.014	0.32	0.43	0.31	0.12
1969	-0.04	0.012	-0.053	0.54	0.39	0.15
1970	-0.03	-0.00010	-0.029	0.47	0.30	0.17
1971	0.20	0.010	0.190	0.64	0.33	0.31
1972	0.20	0.012	0.190	1.33	0.83	0.50
1973	-0.056	0.026	-0.082	0.58	0.38	0.20
1974	-0.0087	0.020	-0.029	-0.81	-0.69	-0.12
1975	0.24	0.0014	0.23	0.027	-0.32	0.059
1976	0.15	0.026	0.13	0.35	-0.0072	0.35
1977	0.022	0.035	-0.013	-0.0016	0.043	-0.045
1978	0.29	0.051	0.25	0.38	0.19	0.18
1979	0.32	0.039	0.28	0.61	0.37	0.24
1980	0.31	0.019	0.29	0.46	0.35	0.11
1981	-0.017	0.028	-0.046	0.43	0.30	0.13
1982	-0.18	-0.031	-0.15	0.26	0.14	0.12
1983	-0.02	0.0047	-0.025	0.26	0.084	0.17
1984	-0.05	-0.0017	-0.049	0.29	0.12	0.17
1985	0.21	0.0044	0.21	0.33	0.17	0.15
1986	0.19	0.028	0.16	0.88	0.66	0.22
1987	0.14	0.027	0.11	1.51	1.087	0.42
AVERAGES						
1956-60	0.13	0.024	0.10	0.29	0.20	0.086
1961-65	0.19	0.0062	0.18	0.24	0.13	0.106
1966-70	0.14	0.013	0.13	0.42	0.28	0.14
1971-75	0.12	0.014	0.10	0.35	0.16	0.19
1976-80	0.22	0.034	0.19	0.36	0.19	0.17
1981-85	-0.012	0.0011	-0.0013	0.31	0.17	0.15
1986-87	0.17	0.028	0.14	1.19	0.88	0.32
1956-87	0.13	0.015	0.12	0.38	0.23	0.15

Source: for Japan, National Income Accounts. For the U.S., Federal Reserve Board, National Balance Sheets.

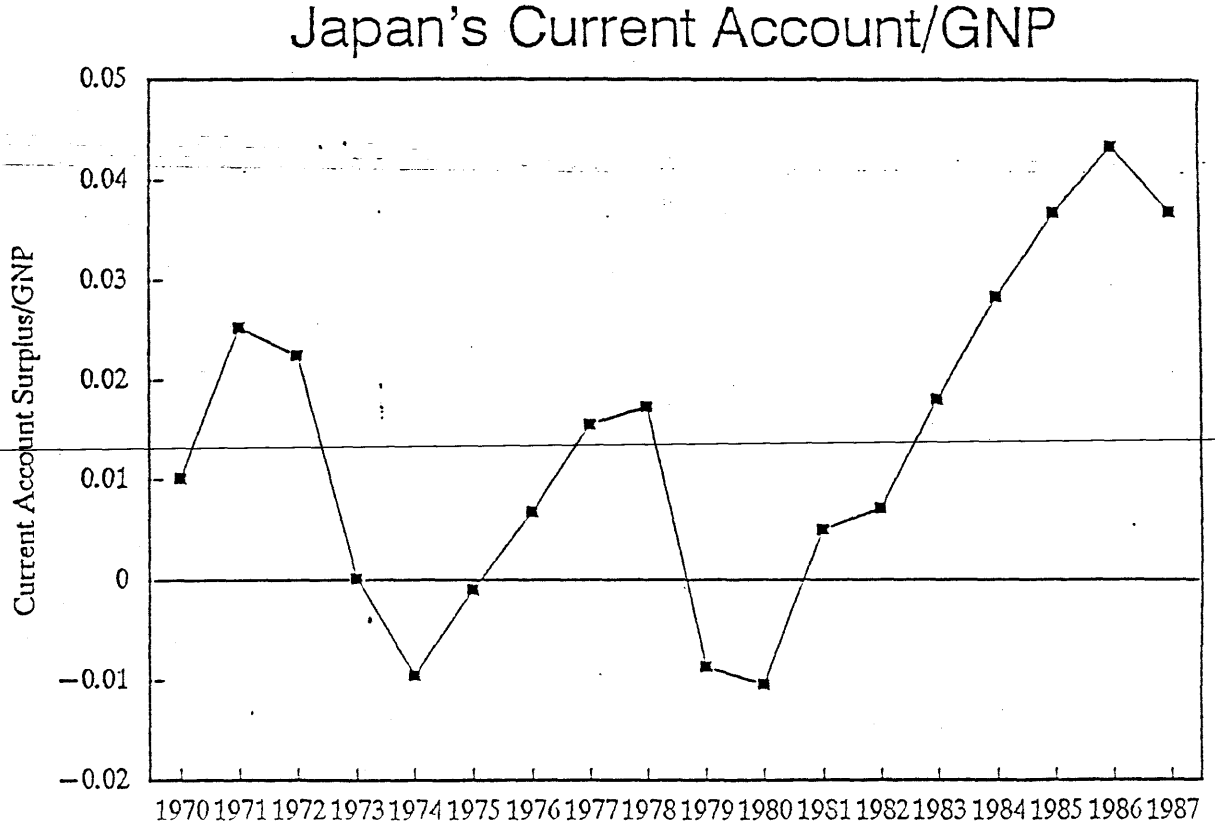
Numbers may not add up due to rounding.

Figure 3(a)



Source: OECD National Accounts: Detailed Tables

Figure 3(b)



Japanese and American Gross Investment Rates

A. Nominal Investment/Nominal GNP

	U.S.				Japanese		
Year	Total/ GNP	Resid./ GNP	Non-Resid./ GNP	Plant/ GNP	Total/ GNP	Resid./ GNP	Non-Resid./ GNP	Plant/ GNP
1970	0.176	0.038	0.066	0.072	0.355	0.069	0.120	0.166
1971	0.181	0.048	0.063	0.070	0.343	0.068	0.119	0.156
1972	0.187	0.048	0.061	0.078	0.342	0.075	0.119	0.148
1973	0.191	0.052	0.062	0.077	0.364	0.087	0.128	0.149
1974	0.184	0.040	0.066	0.078	0.348	0.079	0.129	0.140
1975	0.169	0.035	0.061	0.073	0.324	0.079	0.128	0.117
1976	0.171	0.041	0.055	0.074	0.313	0.078	0.121	0.114
1977	0.183	0.049	0.053	0.081	0.304	0.074	0.118	0.112
1978	0.195	0.051	0.057	0.087	0.308	0.074	0.121	0.113
1979	0.198	0.049	0.060	0.089	0.321	0.074	0.130	0.117
1980	0.185	0.039	0.062	0.084	0.319	0.069	0.136	0.114
1981	0.179	0.035	0.062	0.082	0.310	0.062	0.133	0.115
1982	0.165	0.029	0.062	0.074	0.299	0.060	0.128	0.111
1983	0.172	0.045	0.052	0.075	0.283	0.063	0.119	0.119
1984	0.180	0.048	0.053	0.079	0.279	0.064	0.114	0.102
1985	0.181	0.047	0.054	0.080	0.278	0.063	0.110	0.105
1986	0.177	0.051	0.049	0.077	0.276	0.013	0.111	0.152
1987	0.173	0.050	0.047	0.076	0.289	0.057	0.123	0.109

Note: Resid.: residential structures; Non-resid.: non-residential structures; Plant: plant and equipment investment. For Japan, plant and equipment investment includes land improvement and plantation and orchard development. For both countries, investment includes government capital formation except durables for National Defense.

Source: OECD National Accounts, Detailed Tables.

Japanese and American Gross Investment Rates

B. Real Investment/Real GNP

	U.S.				Japanese			
	Total/ GNP	Resid./ GNP	Non-Resid./ GNP	Plant/ GNP	Total/ GNP	Resid./ GNP	Non-Resid./ GNP	Plant/ GNP
Year								
1970	0.189	0.040	0.078	0.071	0.346	0.073	0.129	0.144
1971	0.194	0.051	0.074	0.069	0.345	0.074	0.130	0.141
1972	0.194	0.057	0.070	0.067	0.350	0.080	0.131	0.139
1973	0.200	0.041	0.070	0.089	0.366	0.084	0.134	0.148
1974	0.194	0.035	0.067	0.092	0.336	0.076	0.127	0.133
1975	0.170	0.040	0.061	0.069	0.325	0.076	0.128	0.121
1976	0.172	0.046	0.057	0.069	0.318	0.078	0.121	0.119
1977	0.181	0.045	0.054	0.082	0.316	0.075	0.120	0.121
1978	0.189	0.042	0.056	0.091	0.329	0.077	0.124	0.128
1979	0.190	0.032	0.057	0.101	0.333	0.071	0.125	0.137
1980	0.174	0.031	0.055	0.088	0.321	0.061	0.123	0.137
1981	0.181	0.035	0.058	0.088	0.319	0.058	0.116	0.145
1982	0.175	0.048	0.048	0.079	0.315	0.055	0.110	0.150
1983	0.183	0.051	0.062	0.700	0.298	0.056	0.115	0.127
1984	0.198	0.050	0.056	0.092	0.297	0.052	0.110	0.135
1985	0.204	0.054	0.058	0.092	0.300	0.051	0.105	0.144
1986	0.200	0.052	0.052	0.096	0.310	0.054	0.107	0.149
1987	0.199	0.053	0.050	0.096	0.328	0.062	0.109	0.157

Note: Resid.: residential structures; Non-resid.: non-residential structures; Plant: plant and equipment investment. For Japan, plant and equipment investment includes land improvement and plantation and orchard development.

Source: OECD National Accounts, Detailed Tables.

Japanese and American Net Investment Rates

(Net Nominal Investment/NNP)

	U.S.	Japan	
Year		Hist. Cost Dep.	Repl. Cost Dep.
1970	0.078	0.255	0.250
1971	0.082	0.238	0.232
1972	0.089	0.234	0.227
1973	0.095	0.262	0.250
1974	0.078	0.247	0.228
1975	0.053	0.223	0.208
1976	0.056	0.212	0.195
1977	0.071	0.200	0.184
1978	0.082	0.204	0.189
1979	0.081	0.218	0.199
1980	0.059	0.214	0.193
1981	0.054	0.200	0.181
1982	0.033	0.183	0.164
1983	0.042	0.169	0.150
1984	0.059	0.165	0.149
1985	0.062	0.162	0.147
1986	0.059	0.159	0.144
1987	0.056	0.171	0.157

Note: Net investment figures are obtained from subtracting from Gross Nominal Investment, Capital Consumption Allowances. Depreciation for Japan is in terms of historical costs. Using the method of Hayashi (1986), historical cost depreciation was converted to replacement cost depreciation.

Source: OECD National Accounts, Detailed Tables

Table 6

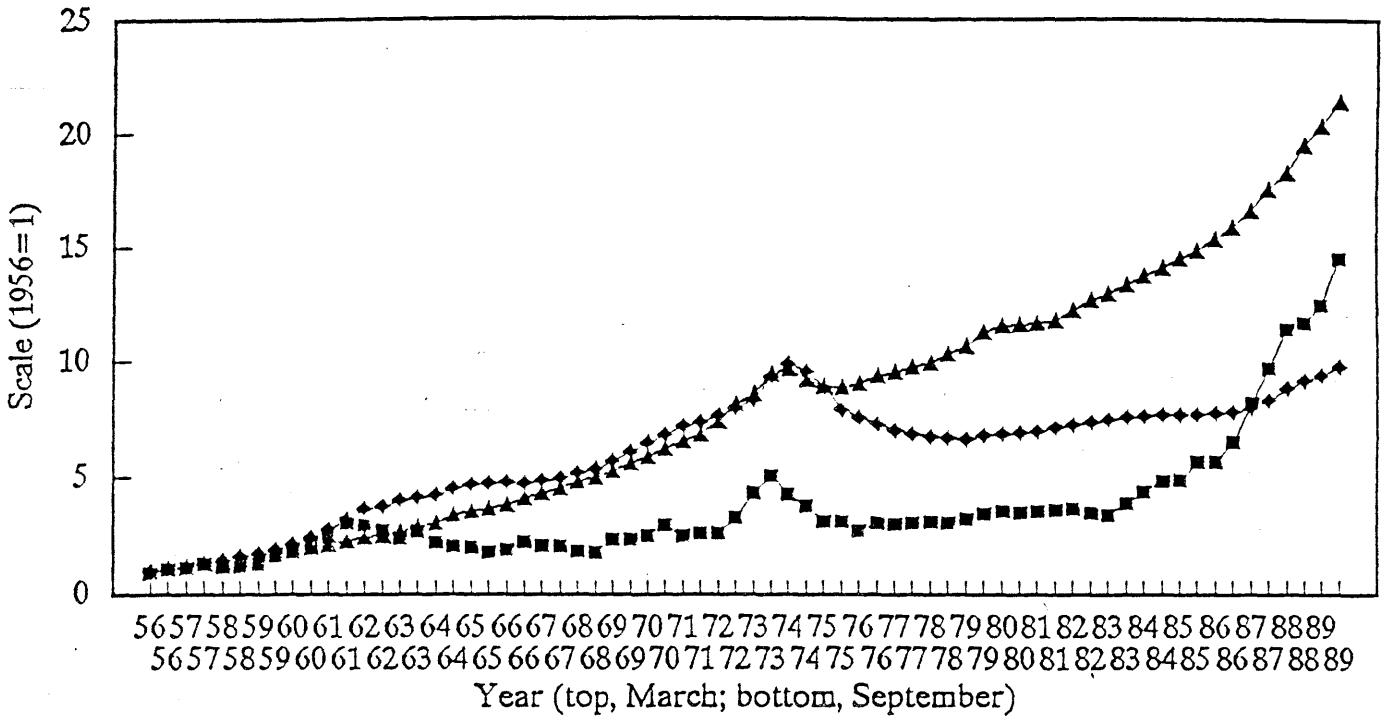
Effect of Land Prices on Aggregate Consumption

	Dependent Variable: Change in Aggregate Household Consumption.		Dependent Variable: Change in Household Food Consumption.	
	(1)	(2)	(3)	(4)
CONSTANT	-933.32 (-6.78)	-933.32 (-6.78)	-947.87 (6.42)	-946.86 (-6.83)
Change in Land Prices	35.97 (1.58)	16.46 (0.714)	21.82 (1.42)	12.59 (0.63)
Change in Labor Income	0.64 (7.39)	0.63 (7.53)	0.62 (7.42)	0.61 (7.38)
Change in Stock Prices	-----	0.24 (2.73)	-----	0.23 (2.92)
Change in Interest Income	-----	0.17 (0.80)	-----	0.051 (0.25)
Season (Sept.-March=1)	2437 (7.34)	2542 (7.92)	2518 (7.56)	2636.3 (7.76)
R-squared:	0.9323	0.9397	0.9015	0.9185
Observations:	67			

Note: T-statistics are in parentheses. Land prices are average urban prices from the Japan Real Estate Institute. The Nikkei average is used for stock prices. The season dummy variable adopts a value of one during the October to March period, zero between April and September. Household consumption, labor income, and interest income are from the Japanese National Accounts.

Figure 4(a)

Growth in Real Money Supply and Asset Prices (1956–1989)



Real Money Supply is M2 plus CD divided by the consumption deflator

Figure 4(b)

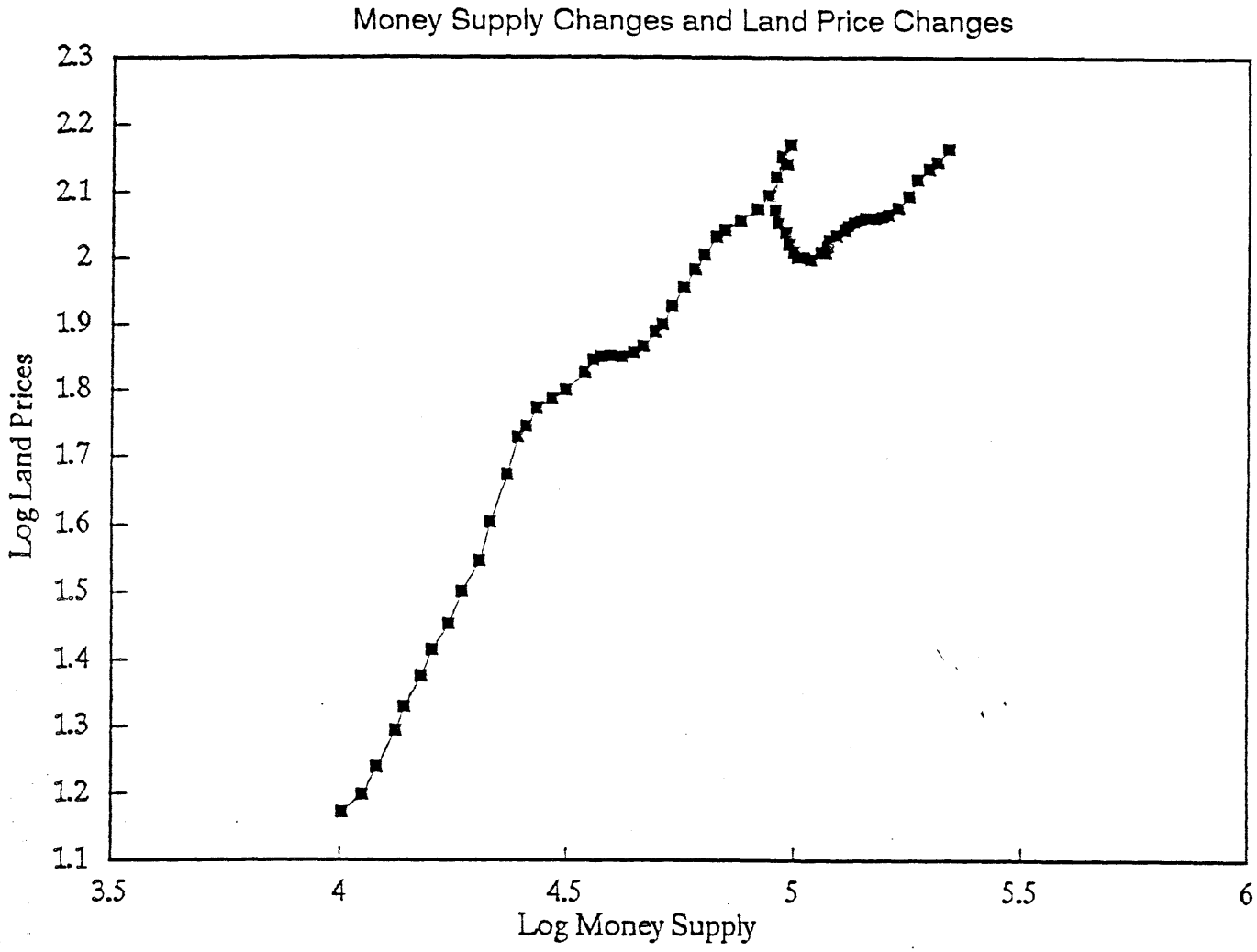

Money Supply Changes and Land Price Changes
Log Land Prices
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
3.5
4
4.5
5
5.5
6
Log Money Supply

Table 7

The Correlation of Real Money Supply with Land Prices and the Money Supply as an Instrument in the Consumption Function.
(Money Supply: M2+CD)

1) Change in Land Prices= Constant + Change in Real Consumption

1.92	0.0125
(1.65)	(2.38)

Change in Real Money Supply.

0.00366
(2.12)

R-squared: 0.9411

2) Change in Real Consumption= Constant + Change in Real Money

-1124.4	0.105
(-7.56)	(3.99)

Supply + Change in Labor Income.

0.234
(7.84)

R-squared: 0.9438

Note: T-statistics are in parentheses. Observations, 67, March 1953-September 1989.

Table 8

Do Lagged Land Prices Affect The Change in Consumption. A Hall (1978)-type Test.

	Dependent Variable: Change in Household Aggregate Consumption.	Dependent Variable: Change in Household Food Consumption.
	(1)	(2)
Constant	-1765.4. (-4.79)	-1766.4 (-4.85)
Land(-1)	107.91 (2.53)	103.49 (2.46)
Land(-2)	-170.67 (-2.20)	-163.55 (-2.13)
Land(-3)	70.25 (1.69)	67.21 (1.62)
Season (Sept.-March=1)	4671 (19.94)	4709 (19.56)
R-squared:	0.8661	0.8704

Observations: 65, March 1954 to September 1989. Bi-annual data.

Prefecture Number and Names of Prefectures in Figures 5(a)-(h).

2 Aomori
4 Miyagi
5 Akita
6 Yamagata
7 Fukushima
9 Ibaragi
10 Tochigi
11 Gunma
12 Saitama
13 Chiba
14 Tokyo
15 Kanagawa
16 Yamanashi
18 Shizuoka
19 Toyama
20 Ishikawa
21 Gifu
22 Aichi
23 Mie
24 Fukui
25 Shiga
26 Kyoto
27 Osaka
28 Hyogo
29 Nara
30 Wakayama
31 Tottori
32 Shimane
33 Okayama
35 Yamaguchi
37 Kagawa
38 Ehime
39 Kochi
40 Fukuoka
41 Saga
42 Nagasaki
43 Kumamoto
44 Oita
45 Miyazaki

Figure 5(a)

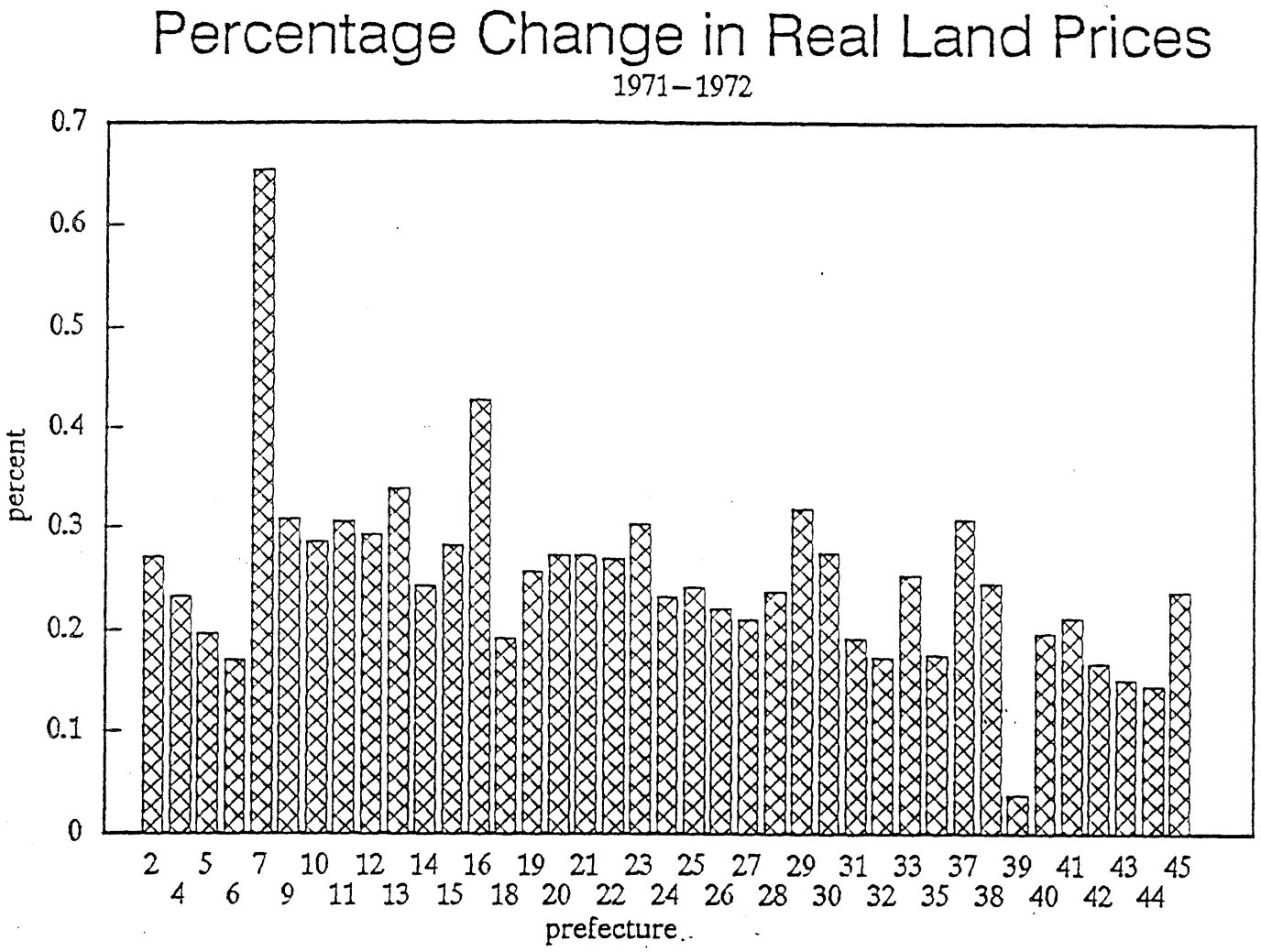

Percentage Change in Real Land Prices
1971–1972
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
percent
2 5 7 10 12 14 16 19 21 23 25 27 29 31 33 37 39 41 43 45
4 6 9 11 13 15 18 20 22 24 26 28 30 32 35 38 40 42 44
prefecture

Figure 5(b)

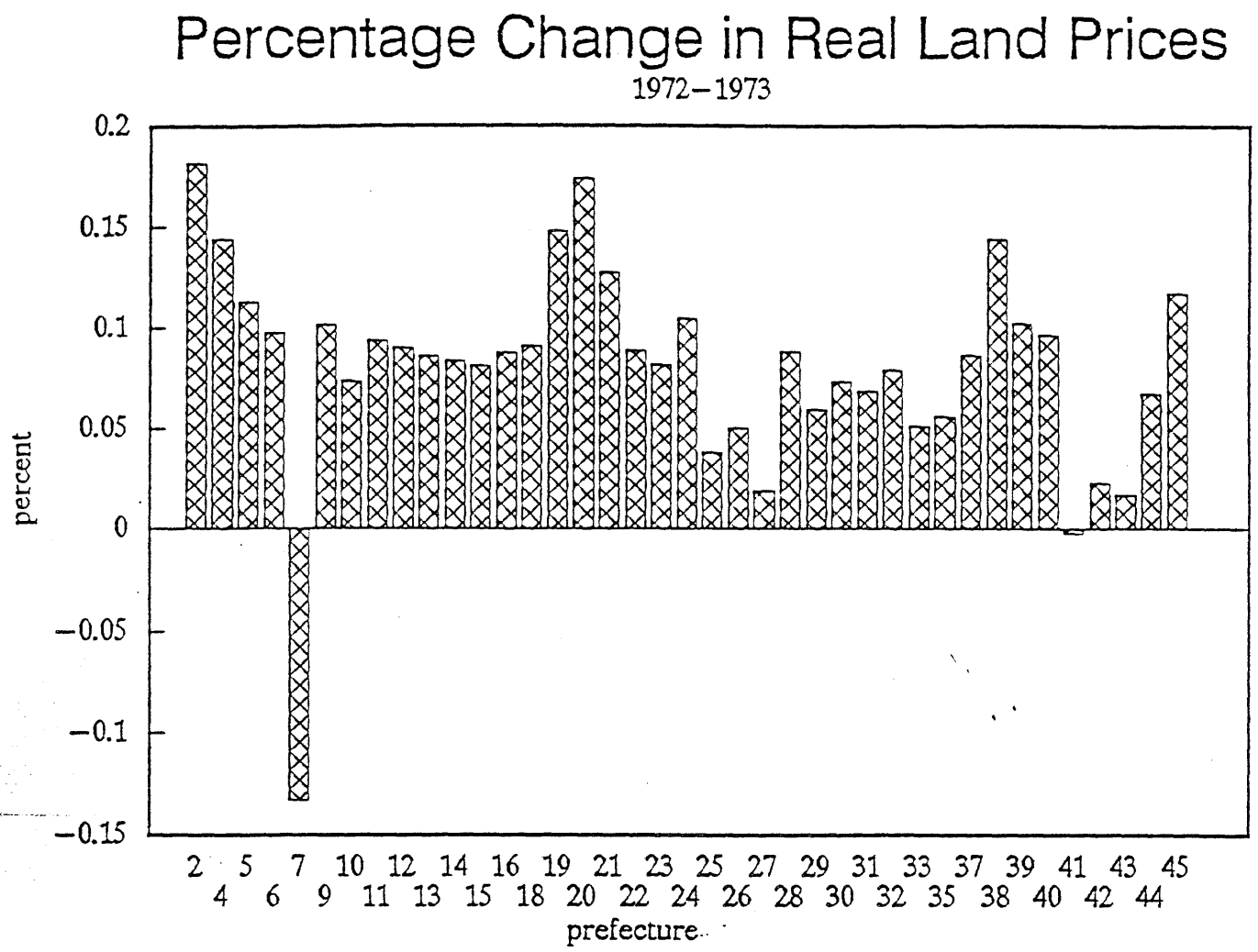

Percentage Change in Real Land Prices
1972–1973
0.2
0.15
0.1
0.05
0
−0.05
−0.1
−0.15
percent
2 5 7 10 12 14 16 19 21 23 25 27 29 31 33 37 39 41 43 45
4 6 9 11 13 15 18 20 22 24 26 28 30 32 35 38 40 42 44
prefecture

Figure 5(c)

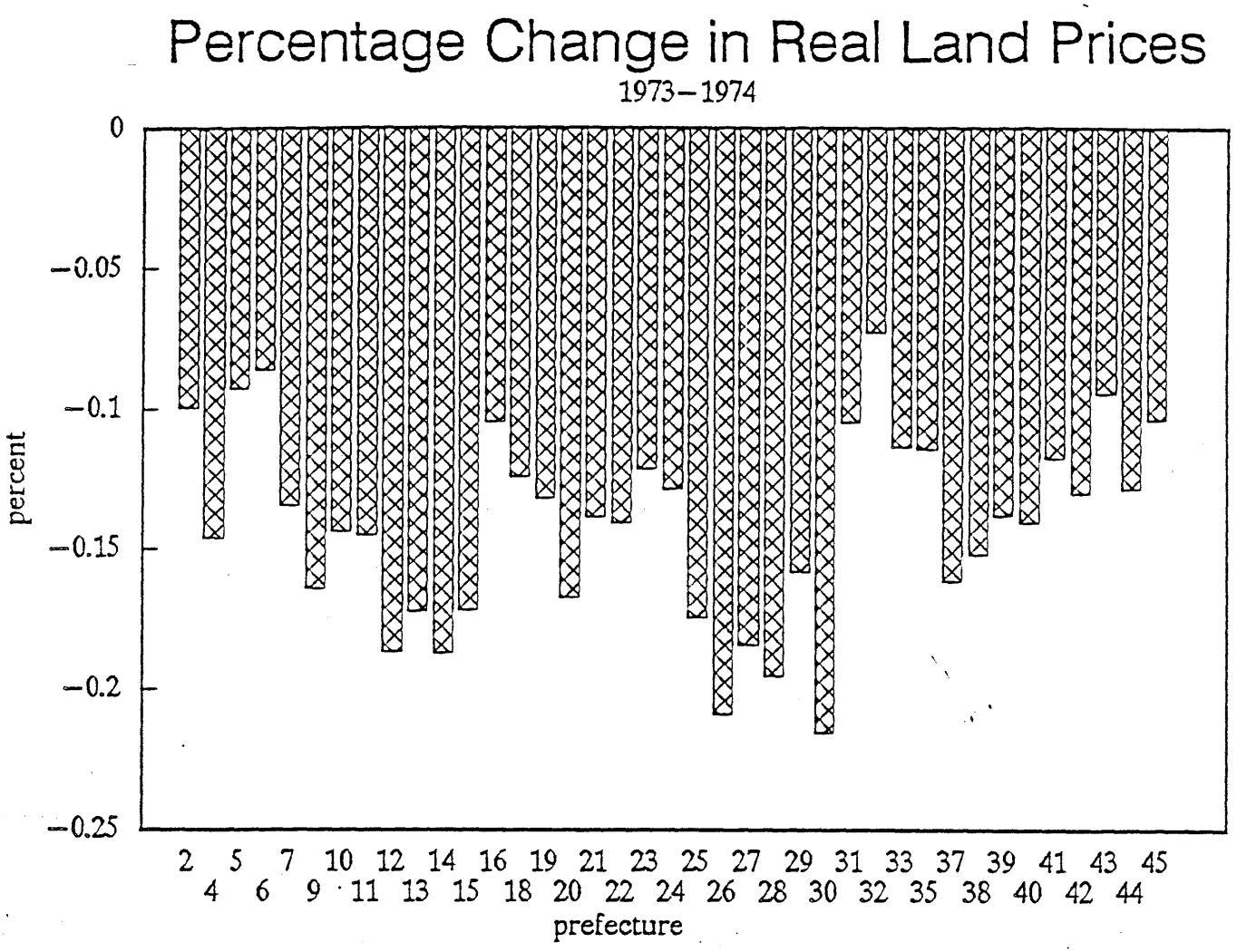

Percentage Change in Real Land Prices
1973–1974
0
−0.05
−0.1
−0.15
−0.2
−0.25
percent
2 5 7 10 12 14 16 19 21 23 25 27 29 31 33 37 39 41 43 45
4 6 9 11 13 15 18 20 22 24 26 28 30 32 35 38 40 42 44
prefecture

Figure 5(d)

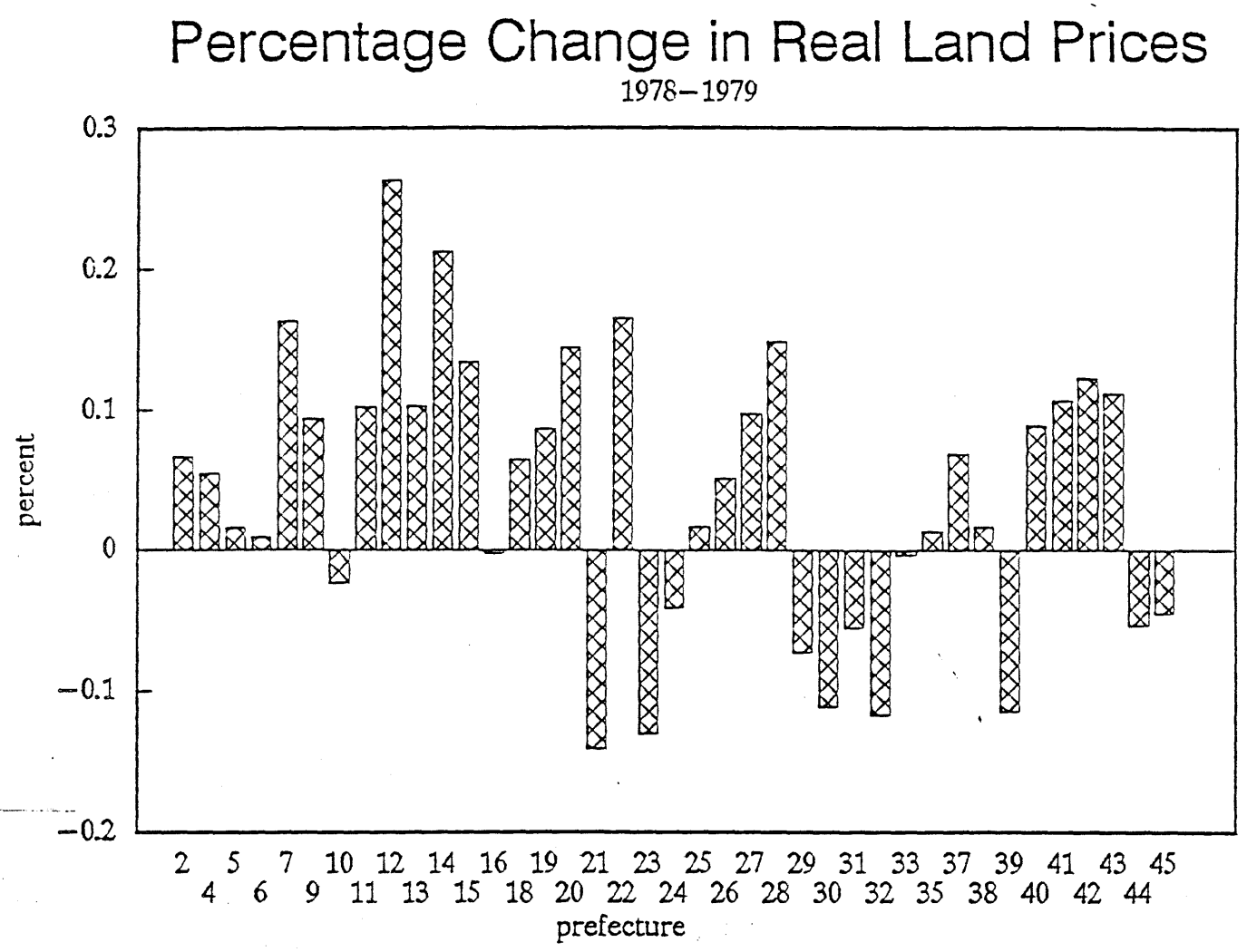

Percentage Change in Real Land Prices
1978–1979
0.3
0.2
0.1
0
−0.1
−0.2
percent
2 5 7 10 12 14 16 19 21 23 25 27 29 31 33 37 39 41 43 45
4 6 9 11 13 15 18 20 22 24 26 28 30 32 35 38 40 42 44
prefecture

Figure 5(e)

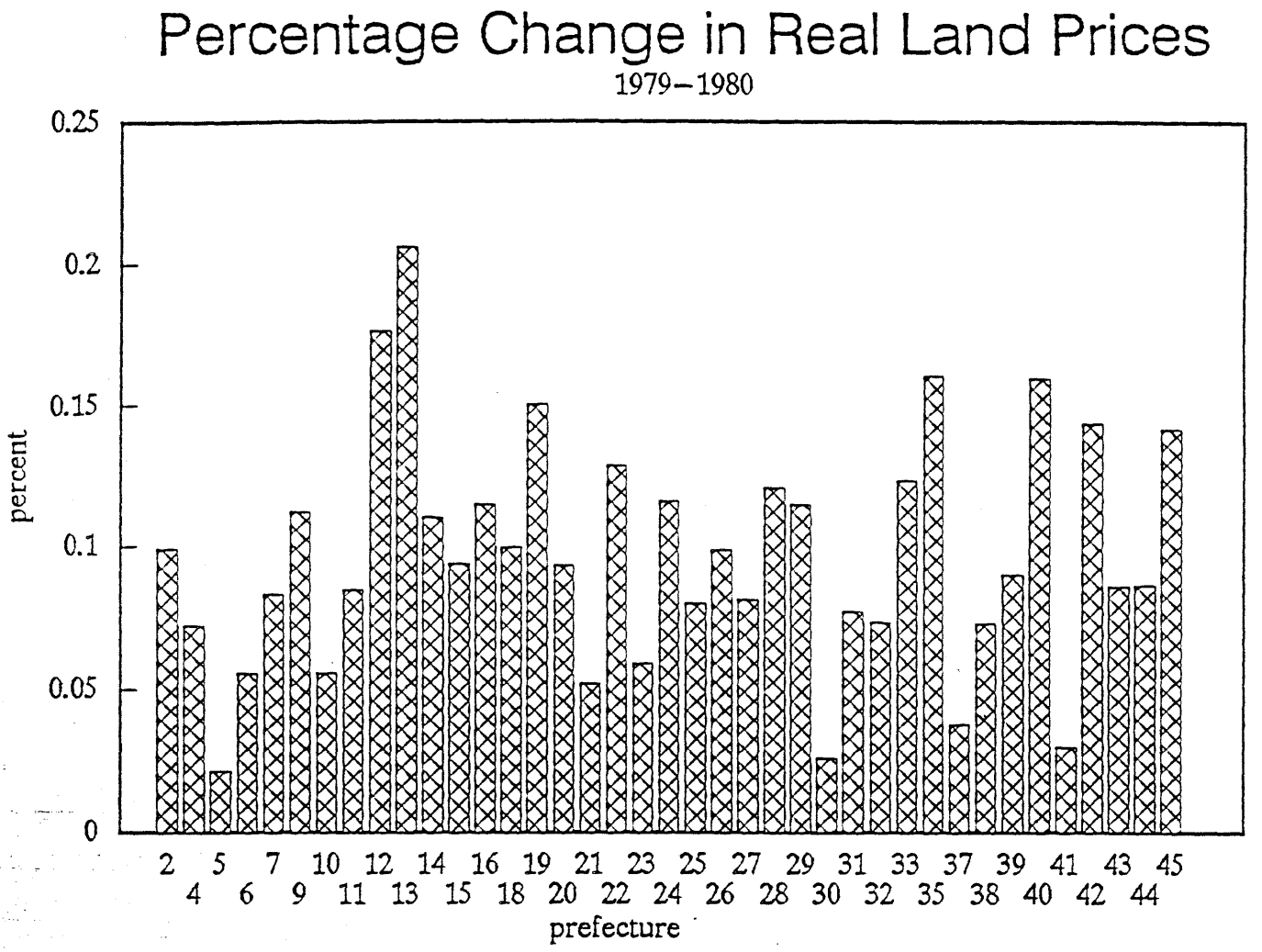
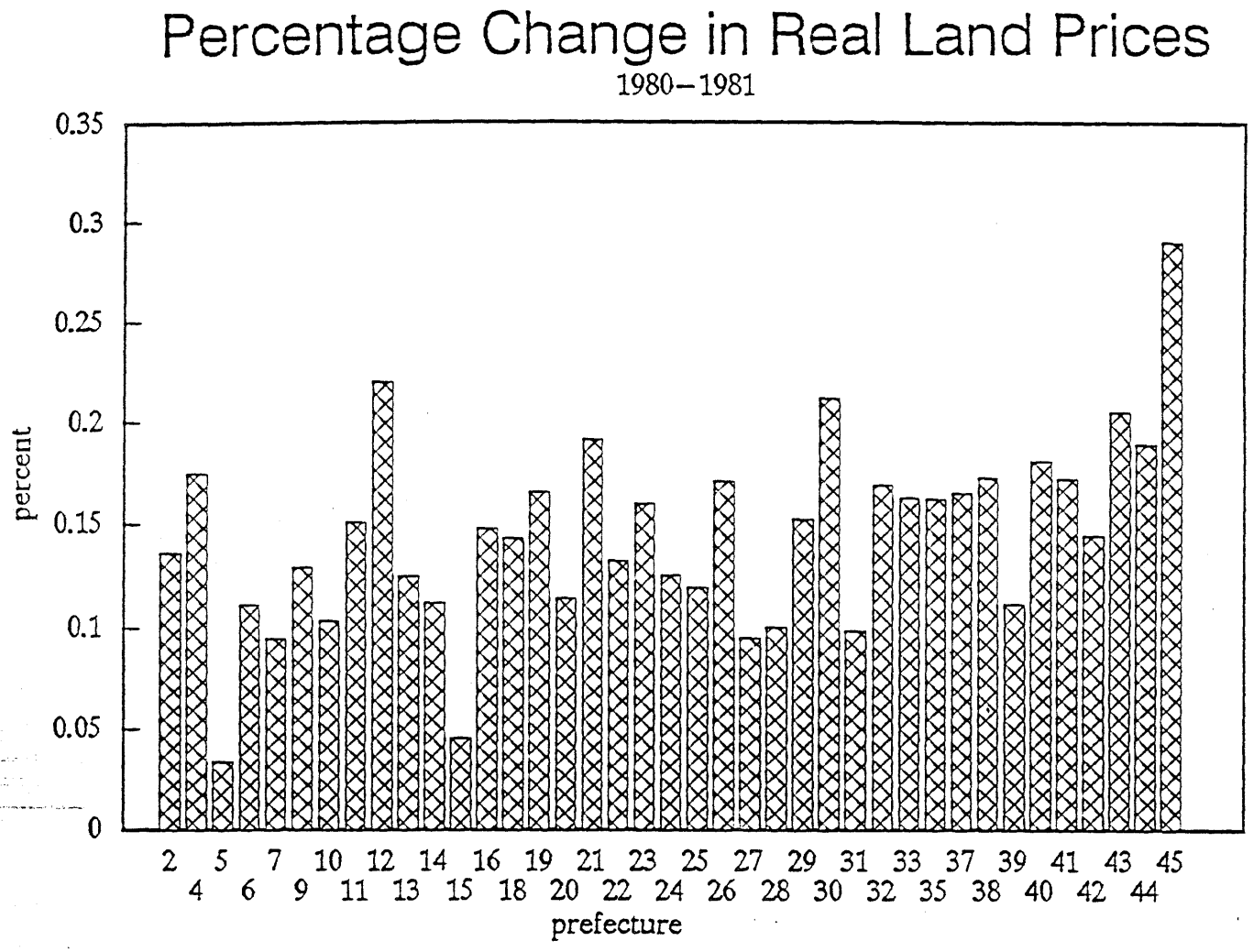

Percentage Change in Real Land Prices
1979–1980
0.25
0.2
0.15
0.1
0.05
0
percent
2 5 7 10 12 14 16 19 21 23 25 27 29 31 33 37 39 41 43 45
4 6 9 11 13 15 18 20 22 24 26 28 30 32 35 38 40 42 44
prefecture

Figure 5(f)


Percentage Change in Real Land Prices
1980–1981
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
percent
2 5 7 10 12 14 16 19 21 23 25 27 29 31 33 37 39 41 43 45
4 6 9 11 13 15 18 20 22 24 26 28 30 32 35 38 40 42 44
prefecture

Figiure 5(g)

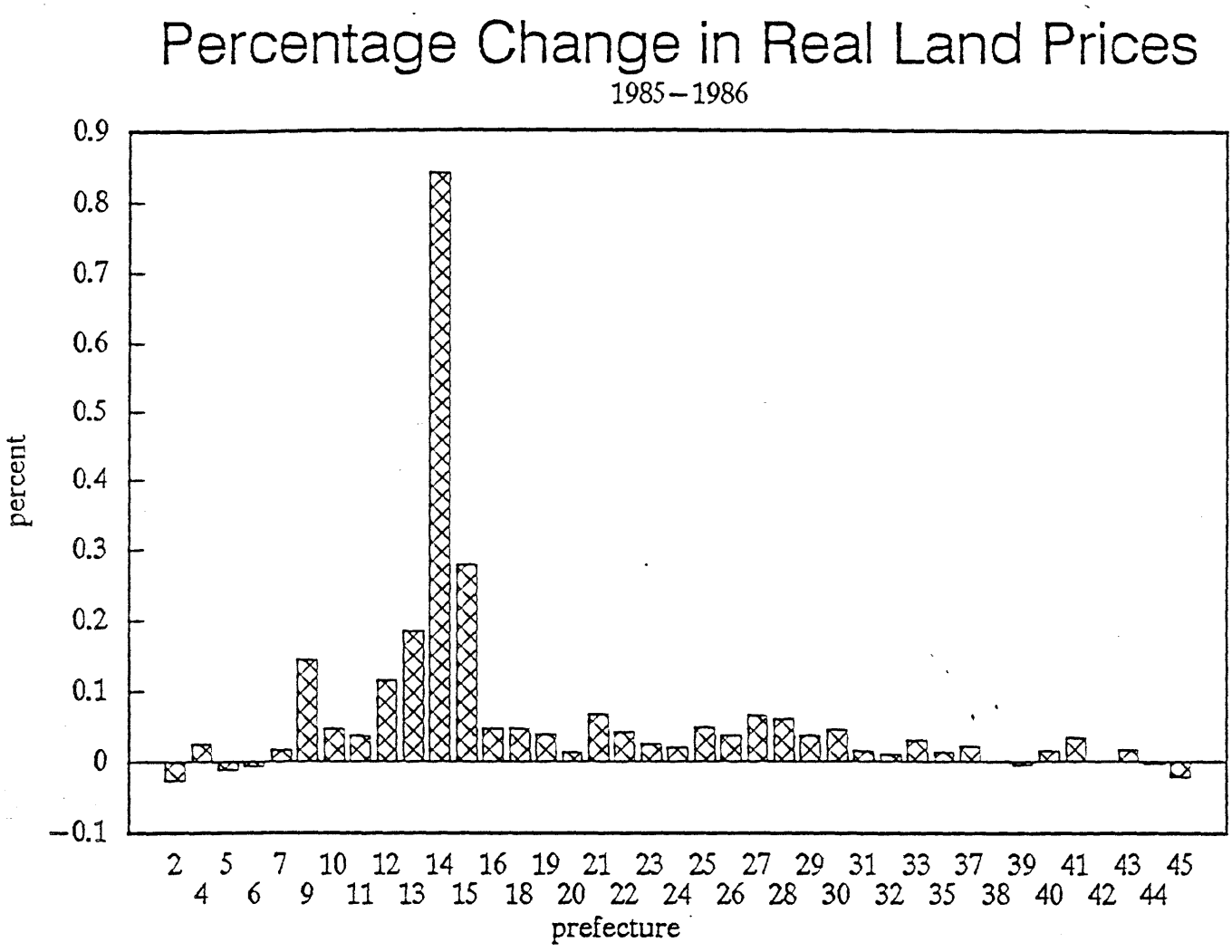

Percentage Change in Real Land Prices
1985–1986
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
−0.1
percent
2 5 7 10 12 14 16 19 21 23 25 27 29 31 33 37 39 41 43 45
4 6 9 11 13 15 18 20 22 24 26 28 30 32 35 38 40 42 44
prefecture

Figure 5(h)

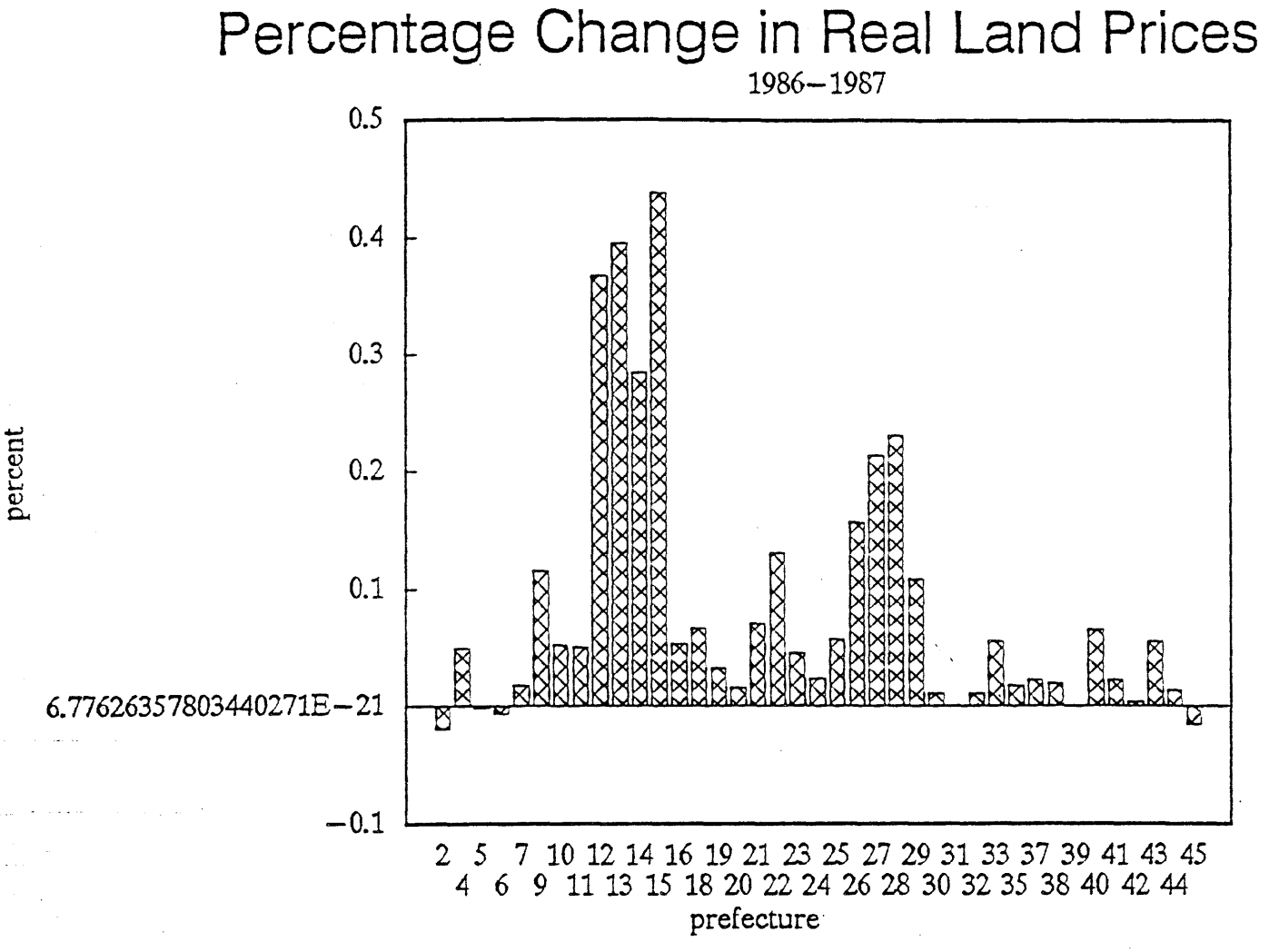

Percentage Change in Real Land Prices
1986–1987
0.5
0.4
0.3
0.2
0.1
6.77626357803440271E–21
–0.1
percent
2 5 7 10 12 14 16 19 21 23 25 27 29 31 33 37 39 41 43 45
4 6 9 11 13 15 18 20 22 24 26 28 30 32 35 38 40 42 44
prefecture

Table 9

Fixed-effects Estimates of the Effect of Prefectural Land Prices on Prefectural Aggregate Consumption

Dependent Variable: Prefectural Consumption (excluding rents)

	1971-1974	1978-1981	1985-1987
CONSTANT	0.014 (1.31)	0.031 (1.57)	0.043 (4.54)
Land Holdings by Prefectural Residents	0.0061 (1.89)	0.0043 (0.85)	0.034 (12.27)
Equity Holdings by Prefectural Residents	0.0254 (2.36)	-0.057 (-0.82)	- 0.00041 (-0.046)
Labor Income Received by Residents in a Prefecture	0.62 (38.25)	0.43 (4.26)	3.20 (17.66)
R-squared:	0.967	0.626	0.933
Observations:	156=4*39	156=4*39	117=3*39

Notes: "Fixed-effect" estimates. Yearly dummies were included, but suppressed above. The above results were not significantly affected by weighing each observation by the prefectural population.
39 prefectures. A complete series spanning 1971-1987 could not be obtained for 8 prefectures, Hokkaido, Iwate, Fukushima, Nagano, Hiroshima, Tokushima, Kagoshima, Okinawa.

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