

# AGRICULTURAL SURPLUS FLOW IN JAPAN, 1888-1937

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## I. INTRODUCTION

THE mobilizing of surplus resources from agriculture, which became an issue of violent controversy in the Soviet industrialization debate,<sup>1</sup> has come to be recognized once again as a mechanism of central importance for the development of newly independent countries in the post-World War II period. The dominant trend in contemporary theories of economic development argues that along with the mobilization of surplus labor and marketable surpluses of food a substantial investment fund must also be mobilized from the traditional agricultural sector for financing the development of a modern industrial sector—at least in the absence of large-scale funding from abroad [10] [11] [5]. On the other hand, there are notable exceptions to this thinking, such as for instance Ishikawa [8], who argues that in the contemporary Asian context the development of many of these economies would actually require a reverse transfer of resources into agriculture.

A minimum, though clearly not sufficient, requirement for establishing either point of view is to verify empirically the actual development experience of the presently developed countries. In this context, the lack of any firm estimates of intersectoral resource flow for Meiji Japan has been somewhat frustrating since Japan's experience has often been cited as a classic case of resource mobilization from agriculture [31] [25]. On the basis of an attempt to assemble the data then available, Ishikawa himself tentatively concluded that while there was probably a net resource outflow during the Meiji era, the magnitude of this net flow was too small to have served as a major source of Japan's early industrialization [8, pp. 318-21]. The persisting uncertainty about the actual resource flow ex-

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<sup>1</sup> For an authoritative exposition of the "left opposition" position which argued in favor of such surplus mobilization see Preobrazhensky [30]. For different interpretations of the debate see Dobb [2], Ehrlich [3] [4], and Carr [1].

perience of Meiji Japan was unavoidable given the non-availability of necessary data for constructing reasonably comprehensive estimates of resource flow during the relevant period. Fortunately, this constraint has now been at least partly removed following completion of a comprehensive series of long-term economic statistics of Japan since 1868 (LTES) in a major project at the Institute of Economic Research at Hitotsubashi University [24] [23].

Using data from the LTES series and other materials related to that compilation, Ohkawa, Shimizu, and Takamatsu [22] (henceforth OST) had earlier presented a tentative estimate of surplus flow from the farm sector since 1888. It is evident that quantification in economic history is inevitably tentative. There can seldom be anything like a final estimate for as our data base improves our estimates will also improve. The present paper is an attempt to carry this process a step further in the estimation of agricultural surplus flow. The plan of the paper is as follows. Section II discusses some conceptual issues which still need clarification in the literature on intersectoral surplus flow. Section III discusses the separation of consumption and investment of the *agricultural* sector proper from that of the *farm household* sector as a whole, a problem which proved to be the most difficult statistical hurdle we have had to surmount in arriving at our present estimates. Section IV presents the estimates of agricultural surplus flow and Section V attempts to compare this flow with the internal rates of savings and investment in agriculture and nonagriculture and the long swings in Japan's modern economic growth up to the period preceding World War II. The main conclusions are summarized in Section VI.

## II. TWO CONCEPTUAL PROBLEMS

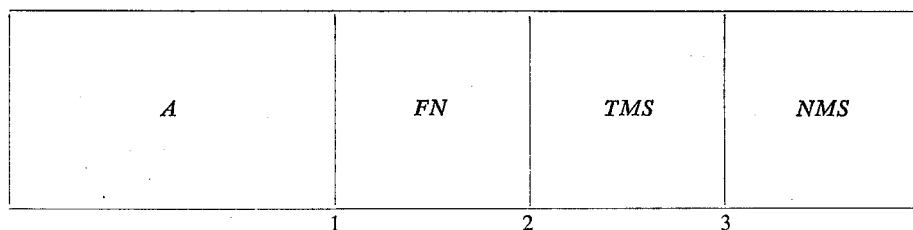
### A. Sectoring

It is evident that any national economy can be partitioned in a number of different ways for analyzing intersectoral relationships in a two-sector framework. Development theory has some times glossed over the analytical implications of choosing one or another sectoral demarcation. However, in an empirical study, it is necessary to make an explicit choice on this question and make very clear exactly what it is that we are measuring. For instance, while estimating intersectoral resource flows, we could be measuring this flow at the boundary between purely agricultural activities (*A*) and the rest of the economy (boundary 1 in Figure 1); or between the farm household sector, which includes agriculture as well as some nonagricultural activities of the farm households (*FN*)<sup>2</sup> and the rest of the economy (boundary 2 in Figure 1); or between the traditional sector, which includes the whole farm household sector as well as small-scale, unincorporated, manufacturing and services (*TMS*) on the one hand and the modern manufacturing and services (*MMS*) sector (boundary 3 in Figure 1).

Clearly, the profile of resource flow at one boundary may be quite different from that at another. Estimates based on one demarcation cannot therefore be

<sup>2</sup> For an interesting analysis of the role of these activities see Hymer and Resnick [7].

Fig. 1.



readily applied to verify propositions based on another demarcation. It is for this reason that we must clarify at the outset which two-sector demarcation is to be used and follow that demarcation consistently. Ideally, the choice of one or another form of sectoring should be determined by analytical suitability. However, in the case of measuring intersectoral resource flows these analytical considerations often have to be compromised in the face of insurmountable statistical problems while using a data set which was itself originally designed for other purposes. Thus in the case of Japan, the traditional sector: modern sector scheme (boundary 3 in Figure 1) has usually been used to analyze its experience of dualistic growth [32] [20] [28] [12]. Surplus transfers on the other hand have usually been measured between the farm household sector and the nonfarm sector (boundary 2 in Figure 1) [8] [22]. In the present paper, we have attempted to measure surplus outflow from the agricultural sector (boundary 1 in Figure 1). However, we would like to emphasize that we have chosen this boundary *not* because we find it more appropriate than the others analytically but only because the data presently available enables us to construct a relatively comprehensive estimate at this boundary. Subsequently, we hope to construct similar estimates at other boundaries once we are able to compile the necessary data set.

**B. Accounting**

A second important issue which needs clarification is the appropriate concept of "agricultural surplus" in the sense of a net resource outflow from that sector.<sup>3</sup> For this purpose, it is useful to begin by spelling out the account of payments between agriculture and the nonagricultural sector which is analogous to the balance of payments between a country and the rest of the world.

Receipts	Payments
(1) <i>From exports to nonagriculture</i>	(2) <i>For imports from nonagriculture</i>
of which	of which
(a) Export of consumer goods	(a) Import of consumer goods
(b) Export of intermediate goods	(b) Import of intermediate goods
(c) Export of capital goods	(c) Import of investment goods

<sup>3</sup> For earlier discussions of this issue see Ishikawa [8], Lee [9], Mundle [15] [16], and Ohkawa, Shimizu, and Takamatsu [22]. The concept used here should be clearly distinguished from surplus labor in agriculture and, less obviously, the marketable surplus of agriculture.

- |   |   |
|---|---|
| (d) Tax payment in kind<br>(nominal receipt)                              | (d) Government investment (nominal<br>payment for import component)       |
| (3) <i>Payments for factor services by<br/>agriculture</i> of which       | (4) <i>Payments for factor services by<br/>nonagriculture</i> of which    |
| (a) rent, interest, and profits   | (a) rent, interest, and profits   |
| (b) wages and salaries for subsidiary<br>occupation outside agriculture   | (b) wages and salaries for labor services<br>of nonagriculture households |
| (5) <i>Current transfers from nonagriculture</i><br>of which              | (6) <i>Of current transfers to nonagriculture</i><br>of which             |
| (a) Private transfers, e.g., gifts, money<br>orders                       | (a) Private transfers, e.g., gifts, money<br>orders                       |
| (b) Government transfers, e.g.,<br>subsidiaries                           | (b) To government, e.g., taxes in cash                                    |
| (7) <i>Capital transfers from nonagriculture</i><br>of which              | (8) <i>Of capital transfers to nonagriculture</i><br>of which             |
| (a) Purchase of assets and investment<br>in agriculture by nonagriculture | (a) Purchase of assets and investment<br>in nonagriculture by agriculture |
| (b) Government investment in<br>agriculture (cash value)                  |   |
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In terms of the above system of accounts, we may now describe the following concepts:

(a) Balance of trade or *trade surplus* ( $AS^*$ ) of agriculture [= (1) - (2)]. This was described as Account 1 in OST and essentially measures the *net surplus* in the value of goods and services delivered by agriculture over and above the value of goods and services received by it from nonagriculture.

(b) Balance of factor income payments ( $F_{NA}$ ) or *net receipt* of factor payments by agriculture [= (3) - (4)]. This is in effect the excess of factor income receipts by agriculture over and above what it has paid to nonagriculture.

(c) Balance of other current transfers ( $O_{NA}$ ) or *net receipt* of other current transfers by agriculture over and above what it has paid to nonagriculture [(5) - (6a)]. It will be noticed that in a strict accounting sense payment of money taxes to government should be included as a negative component here under item (6). However, since these taxes are in effect forced *savings* regularly extracted from agricultural incomes we have treated this item as a savings outflow, i.e., item (6b) has been included, in our subsequent analysis, in capital transfers other than in current transfers.

(d) Balance of capital transfers or *savings surplus* ( $AS$ ). This is the *net outflow* of capital investments from agriculture over and above inflow of such investments from nonagriculture. In keeping with the treatment of tax payments mentioned in (c) above it is included here as an item of capital outflow, i.e.,  $AS = [(8) + (6b) - (7)]$ . This was described as Account II in OST.

(e) Finally since the receipts and payments must balance in an ex post accounting sense we have the identity

$$(1) + (3) + (5) + (7) = (2) + (4) + (6a) + (6b) + (8), \quad (1)$$

from which we get,

$$[(1) - (2)] + [(3) - (4)] + [(5) - (6a)] = [(8) + (6b) - (7)]. \quad (2)$$

Or, using the notations of (a) to (d) above,

$$AS^* + F_{NA} + O_{NA} = AS. \quad (3)$$

From this balancing identity, we see the relationship between the different components of intersectoral transactions.<sup>4</sup> More specifically, we note that the difference between the savings surplus ( $AS$ ) and trade surplus ( $AS^*$ ) is equivalent to the net flow of factor incomes ( $F_{NA}$ ) plus other current transfers ( $O_{NA}$ ), i.e.,

$$AS - AS^* = F_{NA} + O_{NA}. \quad (4)$$

Since both  $AS$  and  $AS^*$  have been used at different times as measures of agricultural surplus it is useful to be aware of exactly what each variable measures and the precise implications of the difference between the two. In Section IV, we have attempted to construct a time series for both  $AS$  as well as  $AS^*$  and thus also derived a series for the difference variable ( $F_{NA} + O_{NA}$ ).

### III. CONSUMPTION AND INVESTMENT IN AGRICULTURE

In order to compute the magnitude of agricultural surplus, it is necessary as a preliminary step to first compute the magnitude of consumption and investment in the agricultural sector. As we have mentioned earlier the separation of investment and consumption of the agricultural sector proper from that of the farm household sector as a whole proved to be the most difficult statistical problem that we have had to face in the present exercise. Actually, in the case of investment, it is possible to get estimates for the agricultural sector for items other than residential building construction and for the farm sector in the case of residential building construction [24, Vol. 1, Table 4]. Adjustments are required to arrive at final estimates for the agricultural sector proper, but in any case the magnitudes involved here are so small that the difference between agricultural sector investment and farm sector investment would only affect our estimates of agricultural surplus marginally. The real problem arises when we come to consumption, by far the largest item of expenditure, and especially the decomposition of consumption into self-supplied and purchased components which is necessary to compute the magnitude of exports and imports in the case of  $AS^*$ .

For the present exercise, we have based ourselves on the earlier OST estimates for the farm sector.<sup>5</sup> These estimates give totals as well as self-supplied and

<sup>4</sup> These balances need not hold in an open economy where internal surpluses or deficits may be offset by the external account. In the present case where the accounts are set up for agriculture vis-à-vis nonagriculture the rest of the world may be seen as being implicitly lined up behind nonagriculture. Also since our estimates are at current prices we have ignored the "invisible" component of real transfers arising out of the shift in intersectoral terms of trade. For further discussion of this issue see Mundle [15].

<sup>5</sup> See Ohkawa, Shimizu, and Takamatsu [22]. These estimates have been slightly revised recently by N. Takamatsu. We have used these unpublished revised estimates.

TABLE I  
PRIVATE CONSUMPTION AND INVESTMENT IN AGRICULTURE  
(Millions of yen, current prices)

	(1) $Y_A/Y_F$ (%)	(2) $C_A$	(3) $C_S$	(4) $C_P$	(5) $I_{FA}$	(6) $I_{FS}$	(7) $I_{FP}$
1888-1892	71.8	314	210	104	47	24	23
1893-1897	74.0	423	276	147	67	33	34
1898-1902	75.5	622	373	249	89	41	48
1903-1907	75.9	794	498	296	108	49	59
1908-1912	75.7	967	551	416	124	53	71
1913-1917	70.8	1,087	770	317	135	55	80
1918-1922	73.4	2,849	1,193	1,656	297	111	186
1923-1927	75.8	2,903	1,007	1,901	347	133	214
1928-1932	74.7	2,100	665	1,435	282	105	177
1933-1937	79.2	2,284	782	1,502	263	86	177

Source: Ohkawa, Shimizu, and Takamatsu [22].

- Notes: 1.  $Y_A/Y_F$  is the ratio of pure agricultural income to total farm income.  $C_A$ ,  $C_S$ , and  $C_P$  denotes consumption by agricultural population and its self-supplied and purchased components.  $I_{FA}$ ,  $I_{FS}$ , and  $I_{FP}$  denote fixed investment and its self-supplied and purchased components.
2. Total consumption and investment in agriculture, along with their self-supplied and purchased components, are estimated from corresponding unpublished estimates for the farm sector by N. Takamatsu using procedures described in main text. The Takamatsu farm sector estimates, which also include estimates of  $Y_A$  and  $Y_F$ , are revisions of an earlier estimate presented in Ohkawa, Shimizu, and Takamatsu [22].

purchased components of consumption and investment for the farm sector. There are a number of ways in which one might attempt to adjust these estimates to derive estimates for the agricultural sector. One is to use the ratio of pure agricultural population to total farm population. Alternatively, we can use the ratio of total labor hours spent in agriculture to total labor hours of the farm household. Finally, we can use the ratio of gross value added (income) in the agricultural sector to gross value added in the farm sector.

This third alternative has been chosen by us for two reasons. In the case of either the population or labor hour ratios, we would have to rely entirely on small sample surveys covering a hundred to three hundred farm households over the period 1920-40, which include an unknown degree of bias [13, Table Appendix p. 2]. Secondly, in employing a ratio of, say, those engaged in agriculture to total farm household population, we implicitly treat all minors and old people not engaged anywhere as belonging to farm nonagriculture and thus introduce a further element of bias which reduces the estimate of agricultural consumption unjustifiably and thus introduces an over estimation bias in the estimates of  $AS^*$ . The population and labor ratios based on the farm surveys, which worked out to around 0.55 to 0.57, were thus rejected as being too low.

In preference to these, we have used the figures of agricultural income and total farm income given in the OST estimate itself to compute the ratio for

adjusting the farm sector consumption and investment figures of that estimate covering the period 1888–1937. In doing so, we have however cross-checked the above ratios against those implied in the farm household survey mentioned earlier. It turns out that the two sets of data are consistent in that the ratios are roughly in the range of between 70 per cent to 80 per cent in both cases.<sup>6</sup> The OST estimate based ratios of agricultural income to total farm income have been given in column 1 of Table I. By applying these ratios to total consumption and investment of the farm sector, as well as their purchased and self-supplied components, in the OST estimate, we have arrived at the corresponding estimates for the agricultural sector. These have been reproduced in columns 2 to 7 of Table I.

#### IV. SIZE OF THE AGRICULTURAL SURPLUS

Having separated agricultural consumption and investment, including their self-supplied and purchased components, from consumption and investment of the farm sector as a whole, we may now move on to estimating the actual size of the surplus mobilized from agriculture. In this section, we present estimates of both the trade surplus ( $AS^*$ ) as well as the savings surplus ( $AS$ ) for the period 1888–1937, i.e., the critical half century of Japan's transition to a modern industrial economy which falls between the Matsukata deflation of 1885 and the beginning of World War II. Since the existing data base for this period is still liable to be revised and improved, not too much significance can be attached to the exact estimates for individual years. As such we have presented only five-year averages with the added caution that the estimates are only broadly indicative of the magnitudes involved.

##### A. *The Trade Surplus*

The estimates of  $AS^*$  and its component elements have been presented in Table II. In terms of the accounting system set out in Section II above we have:

$$\text{Trade surplus } (AS^*) = \text{exports } (E) + \text{taxes paid in kind} - \text{imports } (M) - \text{government investment } (GI).$$

$E$  has been estimated residually by deducting the sum of *self-supplied* consumer goods ( $C_S$ ), intermediate goods ( $I_{CS}$ ), and fixed investment goods ( $I_{FS}$ ) from total agricultural output ( $X_A$ ). Of these  $C_S$  and  $I_{FS}$  were estimated in Section III and  $X_A$  and  $I_{CS}$  are available directly from the LTES (see Sources in Table II). For taxes paid in kind, we do not have data but from all accounts this is probably

<sup>6</sup> The farm household survey data has been reproduced in the Appendix Table I. The ratios have been computed for both ownership categories as well as holding size groups. It will be noticed that in the case of holding size groups the ratio is slightly lower for households holding less than one hectare. In the case of ownership categories, tenant households appear to have a slightly lower ratio. Finally over time, we notice a very mild increasing tendency in the late 1930s. The same is noticed in the OST estimate based ratio (see Table I, column 1). In both the farm survey data and the OST estimate, the ratio is roughly of the order of 70 per cent to 80 per cent.

TABLE II  
SELF-SUPPLY, PURCHASES, AND TRADE SURPLUS OF AGRICULTURE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$X_A$	$A$	$C_S$	$I_{CS}$	$I_{FS}$	$E$ (1) - (2)	$C_P$	$I_{CP}$	$I_{FP}$	$M$ (7) + (8) + (9)	$GI^a$	$AS^*$ (6) - (10) - (11)
1888-1892	473	285	210	51	24	188(39.7)	104	61	23	188(39.7)	1	1
1893-1897	645	375	276	66	33	270(41.9)	147	81	34	262(40.6)	1	6
1898-1902	948	508	373	94	41	440(46.4)	249	108	48	405(42.7)	2	33
1903-1907	1,237	662	498	115	49	575(46.5)	296	144	59	499(40.3)	2	74
1908-1912	1,544	728	551	124	53	816(52.8)	416	190	71	677(43.8)	5	134
1913-1917	1,850	960	770	135	55	890(48.1)	317	249	80	646(34.9)	6	238
1918-1922	4,205	1,579	1,193	275	111	2,626(62.4)	1,656	567	186	2,409(57.3)	22	195
1923-1927	4,005	1,363	1,002	228	133	2,642(66.0)	1,901	569	214	2,684(67.0)	59	-101
1928-1932	2,844	944	665	174	105	1,900(66.8)	1,435	454	177	2,066(72.6)	68	-234
1933-1937	3,331	1,060	782	192	86	2,271(68.2)	1,502	505	177	2,184(65.6)	62	25

Sources: Column (1) from LTES [24], Vol. 1, Table 15. Columns (4) and (8) are calculated from LTES, Vol. 9, Table 14. Columns (3), (5), (7), and (9) are from Table I. Column (11) is taken from an unpublished estimate by N. Takamatsu based on Koichi Emi, *Shihon keisei* [Capital formation], Chōki keizai tōkei [Estimates of long-term economic statistics of Japan since 1868], ed. K. Ohkawa, M. Shimohara, and M. Umemura, Vol. 4 (Tokyo: Tōyō-keizai-shimpōsha, 1971).

Note:  $X_A$  is value of agricultural production;  $A$  is total self absorption by agriculture of its own production;  $C_S$ ,  $I_{CS}$ , and  $I_{FS}$  are respectively self-supplied components of consumption, current input use, and fixed investment in agriculture;  $C_P$ ,  $I_{CP}$ , and  $I_{FP}$  are respectively purchased components of consumption, current input use, and fixed investment in agriculture.  $E$  is the export or sale of agriculture to nonagriculture.  $M$  is the import or purchase from nonagriculture by agriculture,  $GI$  is government investment in agriculture, and  $AS^*$  is the trade surplus of agriculture. Figures in parentheses give percentage of  $X_A$ .

<sup>a</sup> This is actually an estimate of government investment in primary sector (agriculture, forestry, and fisheries) and may amount to an overestimate for our purpose. However, since the bulk of this investment is in agriculture proper, the error involved is too small to distort our results. The components of this investment include riparian public works, agricultural investment, and natural disaster reconstructions other than buildings undertaken by central and local governments.



not a large item in Japan's case. Imports ( $M$ ) is estimated by adding together *purchased* consumer goods ( $C_P$ ), intermediate goods ( $I_{CP}$ ), and fixed investment goods ( $I_{FP}$ ). Of these  $C_P$  and  $I_{FP}$  were estimated in Section III and  $I_{CP}$  is available directly from the LTES. Government investment ( $GI$ ) is from an unpublished estimate by N. Takamatsu (see Note in Table II).

The estimated series of  $AS^*$  is presented in column 12 of Table II. We note first of all that  $AS^*$  was positive throughout except during the years of agricultural stagnation in the 1920s. Starting from a level close to zero in 1888–92 the trade surplus increased steadily to reach a peak of nearly 240 million yen in 1913–17. Thereafter it declined sharply and turned negative, the trade deficit in 1928–32 being almost as large as the peak trade surplus of 1913–17 at current prices. However, after the Depression, the trend was again reversed and  $AS^*$  had turned positive by 1933–37.

In terms of composition, we find that government investment was a relatively small item throughout the reference period, even though there was a sharp increase in its absolute volume from the twenties onwards. On the whole, the actual size of surplus seems to have been largely determined by the levels of private exports and imports from agriculture. In this context, we find that the sale ratio ( $E/X_A$ ) as well as the purchase ratio ( $M/X_A$ ) followed very similar patterns over time. Both started at around 40 per cent in 1888–92 and both had increased to a level of between 65 to 70 per cent by the end of the reference period. Of course, the purchase ratio was generally somewhat below the sale ratio, thus resulting in a positive  $AS^*$  in most years except the 1920s. Finally, consumption expenditure was, as expected, the largest component of total expenditure by agriculture on both self-supplied items as well as purchased items. This was followed by intermediate goods, fixed investment making up the smallest component.

### B. *The Savings Surplus*

The estimates of savings surplus ( $AS$ ) along with its component elements have been presented below in Table III. In terms of the accounting system presented in Section II, we have:

$$\text{Savings surplus } (AS) = \text{total export of capital} - \text{total import of capital} - \text{government investment } (GI) + \text{payment of taxes } (T_A).$$

Since the net export of capital on private account is nothing but the difference between private savings and investment in agriculture, the above identity may be restated as:

$$AS = S_A - I_{FA} - GI + T_A,$$

where  $S_A$  and  $I_{FA}$  are respectively private savings and fixed investment in agriculture.

Here  $S_A$  has been estimated residually by deducting total agricultural consumption ( $C_A$ ) and taxes paid by agriculture ( $T_A$ ) from income originating in agriculture ( $Y_A$ ). Of these  $C_A$  and  $I_{FA}$  were estimated in Section III above,  $T_A$  and  $Y_A$

TABLE III  
SAVINGS SURPLUS OF AGRICULTURE

	(Millions of yen, current prices)							
	(1)	(2)	(3)	(4)	(5) <sup>a</sup>	(6)	(7)	(8)
	$Y_A$	$C_A$	$S_A$	$I_{FA}$	$T_A$	$GI$	$S_A - I_{FA} - GI$	$AS$
			(1)-(2)-(5)				(3)-(4)-(6)	(7)+(5)
1888-1892	400	314	27	47	59	1	-21	38
1893-1897	553	423	65	67	65	2	-4	61
1898-1902	819	622	100	89	97	22	9	106
1903-1907	1,058	794	150	108	114	2	40	154
1908-1912	1,320	967	199	124	154	5	70	224
1913-1917	1,566	1,087	312	135	167	6	171	338
1918-1922	3,571	2,849	722	297	288	22	403	691
1923-1927	3,444	2,903	541	347	310	59	135	445
1928-1932	2,404	2,100	304	282	213	68	-46	167
1933-1937	2,782	2,284	498	263	198	62	172	371

Sources: Column (1) is from Ohkawa, Shimizu, and Takamatsu [22, Table 3, Panel A, Col. 2]. These estimates are revisions of the original estimate of agriculture income given in LTES, Vol. 1, Table 10. Columns (2) and (4) are from Table 1 above. Column (5) from Ohkawa, Shimizu, and Takamatsu [22, Table 3, Panel A, Col. 4]. Column (6) from Table II, column (11) above.

Note:  $Y_A$ : Income originating in agriculture;  $C_A$ : Agricultural consumption;  $S_A$ : Agricultural savings;  $I_{FA}$ : Agricultural investment;  $T_A$ : Taxes paid by agriculture;  $GI$ : Government investment in agriculture;  $AS$ : Savings surplus of agriculture.

<sup>a</sup> These estimates of taxes paid by agriculture are taken from earlier OST estimates (see Sources above) where they were treated as taxes paid by farm sector as a whole. However, it has been indicated in the earlier paper that these estimates are based on taxes paid by *agriculture* (see Ohkawa, Shimizu, and Takamatsu [22, Statistical Appendix, para. 4]) and consequently they may be interpreted in either way.

are based on the earlier OST exercise (see Sources and Notes in Table III), and  $GI$  is from an unpublished estimate by N. Takamatsu as we have already mentioned earlier. It will be noticed that taxes, which are first deducted while calculating private savings, are again added on to arrive at  $AS$ . This procedure is necessary to distinguish between private and government channels of savings transfer. In fact in a strict accounting sense,  $T_A$  should be treated as a current transfer. However, we include it here as part of the savings surplus since it is really in the nature of a regular forced savings transfer through government channels and it is analytically more meaningful to treat it as such.

The estimated series of  $AS$  is presented in column 8 of Table III. It is noted that the savings surplus was significantly positive throughout our reference period. Looking at the time pattern, we find that, starting from an initial modest outflow of less than 40 million yen, the savings surplus rose to a peak of nearly 700 million yen in 1918-22. Thereafter the trend reversed and  $AS$  declined sharply. However, after the Depression period the trend changed once more and  $AS$  again started rising. In terms of composition, we find that the agricultural tax was a large and important component of  $AS$ . Indeed prior to 1898-1902 and once again during 1928-32, when total investment in agriculture actually exceeded

savings in that sector, this gap was more than offset by the tax outflow such that the total savings surplus was always positive. On the other hand, during the period 1913–22 we find that the excess of private savings over investment in agriculture turned out to be a larger component of surplus outflow.

### C. Comparison of $AS$ and $AS^*$

The time series estimates of the two concepts of agricultural surplus,  $AS$  and  $AS^*$ , have been brought together in Table IV for purposes of comparison. It will be noticed that while  $AS^*$  was negative during the 1920s,  $AS$  was positive throughout and always larger than  $AS^*$ . However, these differences in absolute magnitude notwithstanding, the two variables followed very similar patterns over time. Starting from initially low levels, both increased to reach a peak around the time of World War I. After this, the trend reversed and both declined during the twenties, only to recover once again after the Depression. It should be pointed out that the turning point in both series around the time of World War I, 1913–17 in the case of  $AS^*$  and 1918–22 in the case of  $AS$ , may have interesting implications for the identification of phases in Japan's modern economic growth. However, the problem of phasing lies beyond the scope of the present paper and we do not pursue it further here.<sup>7</sup>

Returning to the difference in absolute magnitudes of  $AS$  and  $AS^*$ , we know from our accounting framework of Section II, especially the balancing relationship in equation 4, that the difference between the trade surplus and the savings surplus is equivalent to the sum of net factor income flows ( $F_{NA}$ ) and other current transfers ( $O_{NA}$ ):

$$AS - AS^* = F_{NA} + O_{NA}.$$

Thus the difference variable ( $AS - AS^*$ ) presented in column 6 of Table IV is an indirect estimate of the consolidated flow ( $F_{NA} + O_{NA}$ ). Of course, it is not possible to gauge the share of these two components nor the specific channels of their flow from this indirect estimate.

Nevertheless the estimate does tell us that factor income flows and/or other current transfers formed an important segment of the intersectoral balance of payments, their absolute magnitude being larger than  $AS^*$  or even  $AS$  in some periods. More specifically, we find that in an accounting sense only one portion of the capital outflow  $AS$  was accounted for by the net outflow of real goods and services ( $AS^*$ ). The remaining and usually larger component of it appears to have been accounted for by substantial current flows in the opposite direction. The relative size of these transfers, expressed as a percentage of  $AS$ , has been compared with the relative size of tax outflows from the sector in columns 7 and 8 of Table IV. It will be noticed that up to 1913–17 the rate of tax outflow was larger. But subsequently the rate of current flows in the opposite direction appear to have become much larger.

Finally, our present estimates of agricultural surplus for Japan can be com-

<sup>7</sup> For a discussion of the phasing problem see Ohkawa [21].

TABLE IV

RATES OF SAVINGS, INVESTMENT, AND RESOURCE TRANSFER FROM AGRICULTURE

	(1) $S_A/Y_A$ (%)	(2) $I_{FA}/Y_A$ (%)	(3) $(I_{FA} + GI)/Y_A$ (%)	(4) $AS/Y_A$ (%)	(5) $AS$	(6) $AS - AS^*$	(7) $(6)/(5)$ (%)	(8) $T_A/AS$ (%)	(9) $AS^*$
1888-1892	6.8	11.8	12.0	9.5	38	37	97.4	155.3	1
1893-1897	11.8	12.1	12.5	11.0	61	55	90.2	106.6	6
1898-1902	12.2	10.9	11.1	12.9	106	73	68.9	91.5	33
1903-1907	14.2	10.2	10.4	14.6	154	80	51.9	74.0	74
1908-1912	15.1	9.4	9.8	17.0	224	90	40.2	68.8	134
1913-1917	19.9	8.6	9.0	21.6	338	100	29.6	49.4	283
1918-1922	20.2	8.3	8.9	19.4	691	496	71.8	41.7	195
1923-1927	15.7	10.1	11.8	12.9	445	546	122.7	69.7	-101
1928-1932	12.6	11.7	14.6	6.9	167	401	240.1	127.6	-234
1933-1937	17.9	9.5	11.7	13.3	371	346	93.1	53.4	25

Sources: All columns derived from Tables II and III above.

Note:  $Y_A$ ,  $S_A$ ,  $I_{FA}$ , and  $GI$  denotes respectively income, savings, private investment, and government investment in agriculture.  $AS$ ,  $AS^*$ , and  $T_A$  denotes savings surplus, trade surplus, and tax payments of agriculture.

pared with similar estimates of agricultural surplus in presently developing economies like Taiwan and India for which time series estimates are available.<sup>8</sup> The estimates for Taiwan, covering the period 1890-1930, show a positive agricultural surplus increasing throughout the reference period. This contrasts with our own estimates for Japan which show that  $AS^*$  was positive in most years but that it started declining after reaching a peak in 1913-17 and even turned negative. In a sense, this pattern is resembled more closely by that of India. Here we have a relatively short time-series from 1951 to 1971, covering only the recent postcolonial period. Nevertheless the series shows positive agricultural surplus for most years, as found in both Japan and Taiwan, and also a turning point pattern in that the outflow peaked in 1965-66 and then started declining just as we have found in the case of Japan around the time of World War I.

## V. RATES OF SAVINGS, INVESTMENT, AND SURPLUS

In the preceding section, we have presented our estimates of the absolute size of surplus mobilized from the agricultural sector. However, in order to grasp the real significance of this surplus flow, it is necessary to compare the *rate* of this surplus flow with the savings and investment effort of the two sectors.<sup>9</sup>

Starting from the side of agriculture, we see (Table IV, columns 1 to 4) that

<sup>8</sup> The agricultural surplus estimates of both Taiwan [9] and India [16] correspond conceptually to our estimate of  $AS^*$ . However, in view of the differences in sources and methods of data compilation, we cannot attempt anything more than a very rough comparison.

<sup>9</sup> Though we have constructed estimates of both  $AS^*$  and  $AS$ , it seems more appropriate to use the savings surplus  $AS$  for our comparisons here since it is this variable which is directly related to the rates of savings and investment in the two sectors.

the rate of surplus outflow ( $AS/Y_A$ ) increased from an initial level of about 10 per cent to a peak of over 21 per cent in 1913–17. After this, the rate started declining, reaching a floor of about 7 per cent around the time of the Depression after which it again started recovering during the 1930s. These rates of surplus outflow are extremely high compared to the rate of investment within agriculture itself ( $I_{FA}/Y_A$ ) which was generally in the range of about 10 to 12 per cent. The savings rate which was well below 10 per cent in 1888–92 increased sharply in the subsequent period to reach a peak of over 20 per cent in 1918–22. Thereafter, the savings rate declined during the twenties but recovered once more after the Depression. The close similarity of the level and time pattern of the savings rate and the rate of surplus outflow will be evident to the reader.

In other words, the surplus outflow from agriculture was generally higher than the rate of investment within the sector and roughly comparable to the total savings effort of that sector—a heavy drain by any standards of comparison. An important question arises here about how agriculture was able to absorb this heavy drain. Though our expressed purpose in this paper is only to establish as firmly as possible the precise empirical position regarding surplus flow rather than delve into its analytical implications, one obvious answer which suggests itself is the specific nature of technological progress in Japan's agriculture. As it was suggested in the earlier OST paper, output and productivity gains in Japan's agriculture during this period was probably initiated and sustained on the basis of a traditional type of technological progress, informed by modern scientific knowledge but not in itself highly capital-intensive, such that it allowed the large-scale outflow of surplus alongside sustained gains in productivity.

On the other hand, it is also important to note that precisely after the sustained outflow of surplus peaked in 1918–22 there followed a whole decade of agricultural crisis when both production and the agricultural surplus itself declined sharply. Without attempting to prejudge the direction of causal relations we would like to remark that the rates of surplus outflow, which have hitherto been ignored in studies of the agricultural crisis, needs to be examined as one facet of that crisis along with price declines in the wake of Korean and Formosan rice imports, arrested technological progress and the crisis in agrarian relations which characterized the period.<sup>10</sup>

The fact that the agricultural surplus flow appears to have been very substantial for the greater part of our reference period when seen from the side of agriculture is not at all surprising, considering that we have here a case of the relatively smaller sector financially supporting the development of the larger sector. This will be evident from the distribution of income by sectors of origin presented in columns 1 to 5 of Table V. Already at the beginning of our reference period, we find that nonagriculture was contributing about 60 per cent of total income generated in the economy with agriculture generating the remain-

<sup>10</sup> For an analysis of the impact of colonial rice imports on domestic agricultural prices see Hayami and Ruttan [6]. On technological aspects of the crisis see, in addition to the above paper, Shintani [33]. For the crisis in agrarian relations see Ogura [18, Part II] and also Ōuchi [29]. For a somewhat unorthodox interpretation of the crisis see Nghiep [17].

TABLE V  
RELATIVE SIZE OF SECTORS AND SURPLUS CONTRIBUTION TO AGRICULTURE  
(Millions of yen, current prices)

(1) Y	(2) Y <sub>A</sub>	(3) Y <sub>A</sub> /Y (%)	(4) Y <sub>N</sub> (1)-(2)	(5) Y <sub>N</sub> /Y (%)	(6) S <sub>N</sub> /Y <sub>N</sub>	(7) I <sub>N</sub> /Y <sub>N</sub>	(8) AS/Y <sub>N</sub>	(9) <sup>a</sup> Long-swing Phases	(10) <sup>b</sup> g <sub>GNE</sub>
1888-1892	977	40.9	577	59.1	19.8	17.5	6.6	1887-1897 U	3.21
1893-1897	1,428	38.7	875	61.3	22.1	23.1	7.0		
1898-1902	2,266	36.1	1,447	63.9	15.5	20.2	7.3	1897-1904 D	1.83
1903-1907	3,056	34.6	1,998	65.4	11.3	14.6	7.7		
1908-1912	3,993	33.1	2,673	66.9	14.7	22.8	8.4	1904-1919 U	3.30
1913-1917	5,578	28.1	4,012	71.9	24.9	23.1	8.4		
1918-1922	13,351	26.7	9,780	73.3	21.5	27.8	7.1	1919-1930 D	2.40
1923-1927	14,703	23.4	11,259	76.6	14.6	21.6	4.0		
1928-1932	13,382	18.0	10,978	82.0	16.4	18.6	1.5	1930-1938 U	4.88
1933-1937	16,709	16.6	13,927	83.4	17.4	24.0	2.7		

Sources: Column (1) is based on LTES, Vol. 1, Table 9, Col. 6. But it has been adjusted for the revision of LTES estimate of income originating in agriculture (see Sources in Table III above). Column (2) is from Table III, Column (1). Column (4) = Col. (1) - Col. (2). The estimate of S<sub>N</sub> for constructing Column (6) and estimate of I<sub>N</sub> for constructing Column (7) was arrived at by deducting S<sub>A</sub> from aggregate savings (LTES, Vol. 1, Table 6, Col. 1) and I<sub>A</sub> from aggregate investment (LTES, Vol. 1, Table 4, Col. 28). Estimates of AS for constructing Column (8) is from Table IV, Col. (5) above. Columns (9) and (10) are from K. Ohkawa, M. Shinohara, and L. Meissner [23, Table 1.2].

Note: Y, Y<sub>A</sub>, and Y<sub>N</sub> denote total income, income originating in agriculture, and income originating in nonagriculture respectively; S<sub>N</sub> and I<sub>N</sub> denote savings and investment in nonagriculture. g<sub>GNE</sub> denotes average annual growth rate of gross national expenditure in constant prices.

<sup>a</sup> U and D denote upswing and downswing respectively. Figures in parentheses indicate length of the swing in years.

<sup>b</sup> The growth rate is estimated as a simple average, of annual rates of growth of gross national expenditure at constant prices, over each swing period.

ing 40 per cent or so. Moreover, the share of agriculture continued to decline throughout our reference period such that by 1933–37 it was well below 20 per cent, i.e., the size of the nonagricultural sector was now more than four times that of agriculture. Even in 1918–22, when the agricultural surplus flow was at its peak we find that the nonagricultural sector was nearly three times the size of agriculture in terms of income generated.

It should be already evident from the above description of relative size that what appeared to be a very large surplus flow when seen from the side of agriculture may have appeared to be much smaller when seen from the side of non-agriculture. To verify this quantitatively, we have compared the rate of surplus *inflow* into nonagriculture ( $AS/Y_N$ ) with the rates of investment ( $I_N/Y_N$ ) and savings ( $S_N/Y_N$ ) in that sector in columns 6 to 8 of Table V. It will be noticed that except in some subperiods the investment rate in nonagriculture was generally of the order of 20 to 25 per cent. The savings rate was roughly in the range of 15 to 20 per cent except in some subperiods when it was above or below this range. In contrast, the rate of surplus inflow from agriculture was in the range of only 6 to 8 per cent up to 1918–22 and subsequently declined to less than 5 per cent. These rates of surplus inflow, especially up to 1918–22, are by no means negligible but at the same time they are obviously quite low when compared with the internal rates of savings and investment within the non-agricultural sector.

This fact is also reflected in the lack of any clear positive association of the rates of surplus inflow with the long swings which are known to have characterized Japan's economic growth [32] [19] [26] [28]. For purposes of comparison, the surplus inflow rates ( $AS/Y_N$ ) of different periods have been roughly grouped in Table V to correspond to the most recent dating of the long swing phases [23] in column 9 and the average annual growth rate of real gross national expenditure of each swing in column 10. It will be noticed that while the rates of surplus inflow were relatively high in the upswings of 1887–97 and 1904–19, these were also quite high during the downswing of 1897–1904. Conversely, while the surplus inflow rate was low during the downswing of 1919–30 it was also low during the upswing of 1930–38.

Thus whether we compare the rate of surplus inflow into nonagriculture with the long swing phases of Japan's modern economic growth or with the internal rates of savings and investment in nonagriculture it is quite clear that these inflows did not play a decisive role in financing the development of the sector. What it did contribute to was the maintenance of the investment rate in non-agriculture at a level which was usually somewhat higher than the internal savings rate of that sector. This contrasts with the case in agriculture where we have seen the investment rate was usually somewhat lower than the savings rate of that sector. In other words, our comparison of the agricultural surplus flow with the internal rates of savings and investment in the two sectors points to the fact that the relative magnitude of the surplus, its largeness or smallness, depends very much on which point of view we assess it from. Seen from the side of agriculture *the rate of surplus outflow* ( $AS/Y_A$ ) was obviously very high, but

when viewed from the side of nonagriculture we see that *the rate of surplus inflow* ( $AS/Y_N$ ) was quite low. This asymmetry of the relative magnitude of agricultural surplus flow when viewed from the side of agriculture and from the side of non-agriculture is a feature of considerable importance for any attempt to analytically assess the role of agricultural surplus in Japan's economic development.

## VI. CONCLUSION

We may now briefly summarize some of our main conclusions.

(1) It has been our endeavor in this paper to construct a time series of estimates of agricultural surplus flow in Japan covering the period 1888 to 1937, i.e., the critical half century of Japan's transition to a modern industrial economy which falls between the Matsukata deflation of 1885 and the beginning of World War II. In doing so, we have confined ourselves to presenting the relevant historical facts on as firm an empirical basis as is permitted by the data base presently available and avoided delving into analytical questions concerned with the role of the agricultural surplus in Japan's economic development.

(2) The estimates have been constructed for the boundary between agriculture and nonagriculture rather than the farm: nonfarm demarcation or the traditional sector: modern sector demarcation. This choice of sectoral demarcation necessitated as a preliminary exercise the separation of *agricultural* consumption and investment from consumption and investment of the farm household sector as a whole. This exercise has been reported in Section III.

(3) We have constructed estimates of both the trade surplus  $AS^*$  as well as the savings surplus  $AS$ . From a comparison of these two sets of estimates we were also able to derive indirect estimates of the net intersectoral flow of factor payments and other current transfers. The trade surplus was positive except during the years of agricultural crisis in the twenties. The volume of the trade surplus was largely determined by the private sale ratio and purchase ratio of the agricultural sector, government investment having been a relatively small component throughout. The savings surplus was also positive throughout and indeed larger than the trade surplus. Tax payments by agriculture was usually the major component of the savings surplus. From comparisons of  $AS$  and  $AS^*$ , we also find that there was a substantial net inflow of factor payments and other current transfers to the agricultural sector.

(4) The time profile of both  $AS$  as well as  $AS^*$  show a similar pattern of rising from initially small volumes in 1888-92 to a peak around the time of World War I after which there was a decline during the twenties and another recovery after the Depression.

(5) The result of a positive agricultural surplus for Japan is consistent with similar estimates of a positive  $AS^*$  in presently developing economies like Taiwan and India. In India, we also find a reversal in the time profile of surplus flow around 1965 just as in Japan's case around the time of World War I.

(6) Compared with related magnitudes in agriculture, we find that *the rate of surplus outflow* from agriculture was generally higher than rates of investment



in that sector and more or less of the same order as the savings rate. These extremely high rates of surplus outflow alongside sustained productivity gains in agriculture is probably attributable to the specific traditional type of technological progress with a low capital-output ratio in the agriculture of this period. At the same time, the possible relationship of the sustained and rising outflow of agricultural surplus up to World War I period with the decade long crisis in agriculture in the immediately succeeding period should also be explored.

(7) The surplus outflow appears particularly large when viewed from the side of agriculture because we have here a case of the relatively smaller sector contributing to the development of the larger sector. Already at the outset of our reference period, nonagriculture was larger than agriculture in terms of income generated. By the end of the reference period, it had grown to more than four times the size of agriculture. In view of this size disparity, it is inevitable that what appeared as a heavy *outflow* from agriculture would appear as a relatively smaller *inflow* when viewed from the side of nonagriculture. This is confirmed by comparisons of *the rate of surplus inflow* with the internal rates of savings and investment in nonagriculture which show that the surplus inflow played only a subsidiary role in financing the development of the nonagricultural sector. This asymmetric picture of the relative size of the surplus when viewed from the side of agriculture and from the side of nonagriculture needs to be kept in mind in any attempt to analyze the role of the agricultural surplus in Japan's development experience.

## REFERENCES

1. CARR, E. H. *Socialism in One Country, 1924-26*, Vol. 1 (London: Macmillan, 1958).
2. DOBB, M. *Soviet Economic Development since 1917*, 6th rev. ed. (London: Routledge and Kegan Paul, 1966).
3. EHRLICH, A. "Preobrazhenski and the Economics of Soviet Industrialization," *Quarterly Journal of Economics*, February 1950.
4. ————. *The Soviet Industrialization Debate, 1924-1928* (Cambridge, Mass.: Harvard University Press, 1960).
5. FEI, J. C. H., and RANIS, G. *Development of the Labor Surplus Economy: Theory and Policy* (Homewood, Ill.: Richard C. Irwin, 1964).
6. HAYAMI, Y., and RUTTAN, V. W. "Korean Rice, Taiwan Rice and Japanese Agricultural Stagnation—An Economic Consequence of Colonialism," *Quarterly Journal of Economics*, Vol. 84, No. 4 (1970).
7. HYMER, S., and RESNICK, S. "A Model of an Agrarian Economy with Nonagricultural Activities," *American Economic Review*, Vol. 59, No. 4, Pt. 1 (September 1969).
8. ISHIKAWA, S. *Economic Development in Asian Perspective* (Tokyo: Kinokuniya Bookstore, 1967).
9. LEE, T. H. *Intersectoral Capital Flows in the Economic Development of Taiwan, 1895-1960* (Ithaca: Cornell University Press, 1971).
10. LEWIS, W. A. "Economic Development with Unlimited Supplies of Labor," *Manchester School of Economic and Social Studies*, Vol. 22, No. 2 (1954).
11. ————. "Unlimited Labor: Further Notes," *Manchester School of Economic and Social Studies*, Vol. 26, No. 1 (January 1958).
12. MINAMI, R. *The Turning Point in Economic Development: Japan's Experience* (Tokyo: Kinokuniya Bookstore, 1973).

13. Ministry of Agriculture and Forestry. *Time Series Statistics of Farm Economy*, Vol. 1, *Survey of Farm Economy*, by Ministry of Agriculture and Forestry, Department of Statistics and Information, Study Group on Agriculture and Forestry (Tokyo, 1973).
14. MUNDLE, S. "On the Question of the Home Market, Capitalism in Agriculture and the Drain of Agricultural Surplus," *Economic and Political Weekly, Review of Agriculture*, (June 1977).
15. ————. "Inter-sectoral Transfer of Resources between Agriculture and Non-agriculture" (Ph.D. diss., University of Delhi, 1977).
16. ————. "Inter-sectoral Resource Flows in Post Colonial India," *Indian Economic Review*, n.s. Vol. 12, No. 2 (1977).
17. NGHIEP, L. T. "The Agricultural Stagnation in Prewar Japan: Its Causes and Implications to Economic Development Strategy," (Ph.D. diss., Hokkaido University, 1975).
18. OGURA, T., ed. *Agricultural Development in Modern Japan* (Tokyo: Japan FAO Association, 1963).
19. OHKAWA, K. *Nippon keizai bunseki: seichō to kōzō* [Analysis of the Japanese economy: growth and structure] (Tokyo: Shunjū-sha, 1962).
20. ————. *Differential Structure and Agriculture: Essays on Dualistic Growth* (Tokyo: Kinokuniya Bookstore, 1972).
21. ————. "Dualistic Development and Phases: Strategy Implications of Japanese Model for Contemporary LDCs," mimeographed (Tokyo: IDCJ, 1979).
22. OHKAWA, K.; SHIMIZU, Y.; and TAKAMATSU, N. "Agricultural Surplus in an Overall Performance of Savings and Investment," in "Papers and Proceedings of the Conference on Japan's Historical Development Experience and the Contemporary Development Countries: Issues for Comparative Analysis," ed. K. Ohkawa and Y. Hayami, mimeographed (Tokyo: International Development Center of Japan, 1978).
23. OHKAWA, K.; SHINOHARA, M.; and MEISSNER, L., eds. *Patterns of Japanese Economic Development: A Quantitative Appraisal* (New Haven: Yale University Press, forthcoming).
24. OHKAWA, K.; SHINOHARA, M.; and UMEMURA, M., eds. *Estimates of Long Term Economic Statistics of Japan since 1868 (LTES)*, Vols. 1-13 (Tokyo: Tōyō-keizai-shimpōsha, 1966-).
25. OHKAWA, K., and ROSOVSKY, H. "The Role of Agriculture in Modern Japanese Economic Development," *Economic Development and Cultural Change*, Vol. 9, No. 1 (1960).
26. ————. "Recent Japanese Growth in Historical Perspective," *American Economic Review*, Vol. 53, No. 2 (1963).
27. ————. "A Century of Japanese Economic Growth," in *The State and Economic Enterprise in Japan*, ed. W. W. Lockwood (Princeton: Princeton University Press, 1965).
28. ————. *Japanese Economic Growth: Trend Acceleration in the Twentieth Century* (Stanford: Stanford University Press, 1973).
29. ŌUCHI, T. *Nōgyō mondai* [Problems of agriculture], 5th ed. (Tokyo: Iwanami-shoten, 1965).
30. PREOBRAZHENSKY, E. *The New Economics*, trans. Brian Pearce (London: Oxford University Press, 1965).
31. RANIS, G. "The Financing of Japanese Economic Development," *Economic History Review*, Vol. 11, No. 3 (1959).
32. SHINOHARA, M. *Growth and Cycles in the Japanese Economy* (Tokyo: Kinokuniya Bookstore, 1962).
33. SHINTANI, M. "Technological Change and Stagnation of Production in Prewar Japanese Agriculture," *Nōgyō keizai kenkyū*, Vol. 44, No. 1 (1972).

APPENDIX TABLE I  
RATIO OF AGRICULTURAL INCOME TO TOTAL FARM INCOME (%)

	(1) Owned Farms	(2) Semi-owned Farms	(3) Tenant Farms	(4) Weighted Average	(5) 0.5-1 ha	(6) 1-1.5 ha	(7) 1.5-2 ha	(8) Over 2 ha	(9) Weighted Average
1922	76.4	77.7	72.2	75.7	59.4	80.5	72.5	75.4	73.8
1923	76.5	77.4	72.4	75.7	-19.4	75.3	79.9	77.6	75.7
1924	77.7	79.6	74.7	77.7	82.4	80.7	82.7	81.2	81.6
1925	74.0	81.6	79.7	77.9	78.4	74.3	85.8	87.2	83.6
1926	73.5	77.4	71.3	74.5	87.0	83.1	80.0	77.4	81.1
1927	77.1	74.6	72.1	75.1	72.1	78.0	80.2	79.4	78.8
1928	75.1	74.1	69.2	73.6	64.8	71.4	75.0	81.4	73.8
1929	72.2	73.6	71.3	72.5	60.2	78.8	78.2	79.1	76.8
1930	69.2	69.6	66.4	68.8	52.8	71.3	77.6	79.8	72.8
1931	74.6	73.1	69.5	72.7	64.9	81.0	85.9	81.5	75.1
1932	77.4	77.4	73.9	76.4	68.5	83.6	83.6	80.8	79.4
1933	79.6	79.1	73.8	77.8	71.3	82.5	87.7	83.2	80.8
1934	80.4	76.6	73.4	77.3	69.7	83.8	80.0	83.6	78.5
1935	80.2	80.0	73.6	78.4	69.7	83.4	85.2	86.6	80.4
1936	82.4	81.1	73.9	79.6	73.2	86.3	86.1	87.1	82.9
1937	84.3	80.6	76.4	80.9	71.6	82.7	87.4	87.5	81.8
1938	85.5	80.0	74.4	80.5	71.8	83.8	85.5	91.2	81.8
1939	85.0	84.3	79.8	83.2	74.3	85.6	89.5	88.0	83.8
1940	80.1	80.2	76.2	79.0	73.9	83.3	87.2	86.0	82.6

Source: Ministry of Agriculture and Forestry [13, Tables I-2 and II-1].

Note: The ratios have been calculated from data of average farm income and average income from agriculture in each class. Similarly the ratios in columns (4) and (9) have been calculated from the weighted average of agricultural incomes and total farm incomes of all ownership categories (col. 4) or all holding size groups (col. 9). The specific weights attached to each class are themselves not indicated.