Hitotsubashi Journal of Economics 35 (1994) 1-22. © The Hitotsubashi Academy

EXCHANGE RATE AND ECONOMIC RECOVERY OF JAPAN IN THE 1930s

MASANORI OKURA AND JURO TERANISHI

Abstract

This paper investigates why Japan's recovery from the depression of the early 1930s was so quick. A simple macromodel is constructed and carefully estimated. A dynamic simulation analysis is conducted in order to evaluate various causes of recovery. It is found that the recovery of Japan owed mainly to both deficit spending and expansion of exports, while the contribution of a rise in profit rate (fall in real wage) or low interest rate policy is rather marginal. The expansion of exports was ignited by exchange rate depreciation, but their sustained growth was due to development of markets in colonial and semicolonial regions based on capital exports from Japan.

1. *Introduction*

In 1933 when GDP of most European countries (UK, France, Germany, Italy, Sweden, Belgium, Switzerland and Austria) were still less than the 1929 level and the US was at the bottom of depression, Japan's GDP was already above the 1929 level, and GNP (GDP) in 1937 when the US's GNP barely returned to pre-Depression level was already 45 percent (46 percent) higher than the 1929 level.[1] The purpose of this paper is to investigate the reasons for this quick recovery of Japan from the depression of the early 1930s. A simple macromodel is carefully estimated based on the time-series data during 1910-1937, and a dynamic simulation analysis for the period 1931-36 is conducted. It is shown that the recovery of Japan owed mainly to both deficit spending and expansion of exports, while the contribution of a rise in profit rate (fall in real wage) or low interest rate policy is rather marginal. The expansion of exports was ignited by exchange rate depreciation, but their sustained growth was due to development of markets in colonial and semi-colonial regions based on capital exports from Japan.

Next section provides a brief summary of the historical process of depression and recovery during the 1920s and 1930s, and compares it with the experience of Europe. Section 3 develops a macro economic model, and Section 4 provides an empirical estimation of the model. Section 5 is devoted to a simulation analysis and evaluates the relative importance of various causes of the recovery. Section 6 discusses such related topics as

[1] GDP and GNP data for western countries are from Maddison (1961) and (1982), and for Japan *LTES* (refer to footnote (2) Appendix table), Vol. 1, Tables 18 and 25.

exchange rate overvaluation, expansion of exports to colonial areas and price elasticity of exports and imports. Section 7 concludes the paper by discussing areas for further research.

2. *Depression and Recovery*

2.1 From depression to recovery

The depression in the early 1930s was caused by double shocks; the disastrous return to the gold standard and the impact of the Great Depression. Japan returned to the gold standard on January 11, 1930, when the crises of the system was manifesting itself in some of the primary commodity exporting countries. Tight fiscal and monetary policy together with the loss of competitiveness in foreign trade owing to the adoption of prewar par rate caused an unprecedented recession on the economy. The Great Depression added difficulty mainly through a decline in exports of light industry products and raw silk to the US. The price of raw silk was almost halved during the year 1930 and Japan's exports to the US declined from 948 million yen in 1929 to 439 million yen in 1931.

Although total industrial production did not decline, WPI decreased 29.4% from 1929 to 1931 (Table 1), and the estimated rate of unemployment increased from 5% at the end of 1929 to 17% at the end of 1931 [Sato (1981)]. Unemployment occurred mainly in large manufacturing firms in modern sector, and small firms and traditional sector provided temporary employment opportunity probably with negligible marginal productivity. Ag-

TABLE 1. INDICES OF MACRO VARIABLES IN 1931 AND 1935
(1929=100)

	Actual Value		Predicted Value in 1935
	1931	1935	
Exchange rate (¥/$)	106.1	62.01	—
Industrial production	102.3	163.0	111.1
Real wage (Nominal wage/WPI)	130.3	98.3	113.3
Nominal wage	90.7	90.9	—
WPI	69.6	92.5	—
Export volume	93.5	184.2	92.5
Tobin's q	94.1	125.1	78.4

Note: Predicted values are calculated by substituting the index of exchange rate in 1935 into equation (1) for industrial production, equation (4) for real wage, equation (5) for export volume and equation (7) for Tobin's q of Table 3 in Eichengreen and Sachs (1985).

Sources: (1) Industrial production is from *LTES* Vol. 10, Table 2.
(2) Exchange rate and WPI are from Bank of Japan, *One-Hundred Year History* (Statistics volume).
(3) Nominal wage is average wage of factory workers and obtained from *Nihon Choki Tokei Sokan* vol. 4, p. 242.
(4) Export volume is from *LTES* Vol. 14, Table 3.
(5) Tobin's q is calculated as the ratio stock price index to WPI. Stock price is series P, (F) of Table 1-5 in Fujino and Akiyama *Shoken Kakaku to Rishiritsu* (Hitotsubashi University).

riculture was hit hardest owing to the fall in prices of cocoon and rice. GDP in agriculture fell from 2,987 million yen to 2,762 million yen, whereas workforce increased from 13.9 million to 14.0 million during 1929–1931.

Prior to the depression during 1929–1931 was a decade of turbulency of the 1920s [Yamamura (1972)]. Average growth rate of GNP (GDP) was 1.87% (2.78%), comparable to the UK but much lower than other major western economies or from the historical standard of Japan.[2] Reasons for low growth are multifold: policy muddle and deflationary impact regarding the attempt to return to the gold standard [Patrick (1971), and Faini and Toniolo (1990)], lack of international competitiveness of newly-established heavy and chemical industries, gradual decline of commodity prices including raw silk after 1926 [emphasized in Kindleberger (1973)], and fragile financial system [Teranishi (1990)]. Needless to say, it is not entirely pertinent to focus on the dark side of the 1920s, because personal consumption was very high (Table 2) reflecting westernization of life style and urbanization, and because there was a significant increase in the labor productivity of manufacturing sector partly owing to the active imports of foreign capital goods availing itself of the real exchange rate appreciation. However, the aggravation of the traditional sector (agriculture and indigenous industries) became increasingly serious. The effect of deflation was hardest on the sector since the price elasticity of the products was low [Sato (1981)].

Crisis in agriculture, depletion of foreign exchange reserves owing to speculative attack, and increasing social unrest in the form of labor and tenancy disputes made it inevitable for

TABLE 2. REAL GNP (IN 1934–36 PRICES)
(Unit: a hundred million yen)

	Personal Consumption	Government Consumption	Gross Capital Formation			Export	Import	GNP
			Total	Private	Government			
Real GNP								
1920	86	10	25	18	6	11	18	114
1925	103	10	22	13	10	15	36	123
1930	110	15	24	14	10	21	32	139
1935	126	21	34	20	14	43	40	184
1940	139	34	71	38	35	40	50	228
Changes in real GNP								
1920–25	17	0	−3	−5	4	4	8	9
1925–30	7	5	2	1	0	6	6	16
1930–35	16	6	10	6	4	22	8	45
1935–40	13	13	37	18	18	−3	10	44
1930–33	8	7	1	−1	3	7	2	21
1933–36	11	0	10	9	1	16	8	27

Source: *LTES* Vol. 1, Table 18.

[2] GNP growth rate is calculated as a growth rate from the average GNP during 1919–1922 to the GNP in 1929. Growth rate of Japan in the 1920s differs widely depending on the choice of base year or between GNP and GDP, and authors made diverse judgement on the degree of stagnation (or relative prosperity) of the 1920s. GNP (GDP) growth rate is 1.80 (2.38)% from 1919 to 1929, is 2.06 (3.36)% from 1920 to 1929, 1.54 (2.46)% from 1921 to 1929, and 2.14 (2.87)% from 1922 to 1929 (based on the data in *LTES* Vol. 1, Tables 18 and 25).

the government to abandon the gold standard. Korekiyo Takahashi, new minister of finance of the cabinet formed on Dec. 13, 1931, immediately severed the tie of currency with gold and embarked on a sort of "Keynesian" policy of low interest rate and deficit spending. Exchange rate depreciated gradually and with occasional jumps from 49.45 \$/¥ of Dec. 11, 1931 to 20.06 \$/¥ of Nov. 29, 1932 and returned to the level around 29 \$/¥ after July 1933 until 1937 [(Ito, Okina and Teranishi (1988)]. Concomitant with the depreciation of exchange rate occurred a rapid expansion of production. As is shown in Table 1 and 2, industrial production index (1929=100) increased from the bottom of 58.5 in 1931 to 163.0 in 1935, or GNP increased by 32% from 13.9 billion yen in 1930 to 18.4 billion in 1935.

2.2 Comparison with European case

Let us compare the relationship between the recovery of production and the exchange rate depreciation with the experience of European countries. Regression equations of such relationship on a sample of ten European countries estimated by Eichengreen and Sachs (1985) can be used for such a comparison. Eichengreen and Sachs consider both supply and demand side relationship. On the supply side, exchange rate devaluation, putting an upward pressure on prices, is considered to have contributed to the reduction of real wages, with consequent stimulating effects on production. Table 1 shows, Japan's real wage index has declined from 100 in 1929 to 98.3 in 1935, which is much lower than 113.3, predicted from the regression equation between real wage index and exchange rate index in 1935 among European countries. However, when this low wage index is applied to the regression equation between industrial production index and real wage index in 1935, shown on Figure 2 of Eichengreen and Sachs (1985), the predicted industrial production index is 116.4, again much lower than the actual index of 163.0. Supply side mechanism through real wage reduction identified among European countries is not sufficient to explain the large expansion of production which occurred in Japan. As for the demand side, exchange rate depreciation is expected to boost exports through expenditure switching effect and, at the same time, stimulate investment because central bank, freed from the obligation of exchange rate pegging, could take accommodating monetary policy and lower interest rate. From the regression equation between export volume index and exchange rate index in 1935 among European countries, export volume index of 92.5 is predicted, which is only half of the value of index 184.2 actually attained, and European case again fails to explain Japan's experience. As for the effect through investment, Eichengreen and Sachs (1985) gives a relationship between Tobin's q and the exchange rate, and the predicted value of q 78.4 is again lower than the actual value of 125.1.[3] Finally, as an overall relation, let us predict a value of industrial production of 1935 directly from regression equation between production index and the exchange rate index in 1935. The predicted value of 111.1 is again considerably lower than the actual value of 163.0.

In sum, the relationship between exchange rate depreciation and economic recovery identified among European countries fails to predict Japanese experience. Export expansion and an increase in production is considerably higher than is predicted from the rela-

[3] The regression equation between central bank discount rate and exchange rate yielded negative discount rate, so that it is not reported.

tionship based on European experience. The low level of real exchange rate also fails to predict the level of production actually occurred in Japan.

3. *Model*

Our model comprises following eight equations.

Identity of GNP

$$Y-C-G-I=X-M \tag{1}$$

Consumption function

$$C=C\left(\frac{Y-T(Y)}{\gamma}\right) \tag{2}$$

Investment function

$$I=I(Y, r, \rho) \tag{3}$$

Export function

$$X=X(\sigma\tau\theta, WM) \tag{4}$$

Import function

$$M=M\left(\frac{\varepsilon}{\theta\delta}, Y\right) \tag{5}$$

Price equation for manufactured goods

$$\delta=f(\varepsilon/\theta) \tag{6}$$

Price equation for consumption goods

$$\gamma=g(\delta) \tag{7}$$

Price equation for exports

$$\sigma=h(\delta) \tag{8}$$

where Y=GNP, C=consumption, G=government expenditure, I=investment, X=exports, M=imports, r=real interest, ρ=rate of profit, WM=world import. And,

$\theta=eP/P^*$ (real dollar/yen exchange rate)

$\sigma=P_x/P$ (relative price of exports)

$\tau=P^*/P_w$

$\varepsilon=eP_m/P^*$

$\delta = P_t/P$ (relative price of manufactured goods)

$\gamma = P_c/P$ (relative price of consumption goods)

where e=\$/¥ foreign exchange rate, P=GNP deflator (in yen), P^*=GNP deflator in the US (in dollar), P_x=export price (in yen), P_m=import price (in yen), P_t=manufactured goods price (in yen), P_c=consumption goods price (in yen), P_w=world import price (in dollar).

The first variable in the right hand side of equation (2) denotes real disposable income ($(PY-T(PY))/P_c$), where T, tax revenue function, is assumed to be linear homogeneous in P. In equation (4), $\sigma\tau\theta = eP_x/P_w$ represents relative price of Japanese exports in foreign markets. In equation (5), $\varepsilon/(\theta\delta) = P_m/P_t$ indicates relative price of imports to domestic manufactured goods. Likewise, in equation (6), $\varepsilon/\theta = P_m/P$ denotes relative price of imports in domestic markets. Subscript -1 indicates lag of one period.

By substitution, equation (1) becomes

$$Y - C[(Y - T(Y)/g(f(\varepsilon/\theta))] - G - I(Y,r,\rho) = X[\tau\theta h(f(\varepsilon/\theta)), WM] - M[\varepsilon/(\theta f(\varepsilon/\theta)), Y]. \quad (9)$$

3.1 *Equilibrium exchange rate*

For this model equilibrium exchange rate is defined as follows. It is assumed that Japan at the time faced with a relatively well-developed international financial market over the pacific ocean.[4] Let us also focus on a medium or long-term equilibrium where real exchange rate $\hat{\theta}$ stabilizes. Under these conditions real interest rate r is equal to the real interest rate of the world or of the US r^*, and equilibrium real exchange rate $\hat{\theta}$ is defined as the rate which is compatible with full employment. By substituting r^* for r, Y^f (full employment level GNP) for Y in equation (9), we can express $\hat{\theta}$ as a function of Y^f, r^* and all other variables treated as exogenous parameters,[5]

$$\hat{\theta} = G[Y^f, r^*, G, \rho, WM, \varepsilon, \tau]. \quad (10)$$

Equilibrium nominal exchange rate can be calculated for a given level of GNP deflator in Japan and the US as $\theta P^*/P$.

3.2 *Degree of contribution to GNP growth*

Let us also define degree of contribution to GNP growth by each exogenous parameter in this model. From equation (9), GNP is expressed as follows;

$$Y = F[G, r, \rho, WM, \theta, \varepsilon, \tau].$$

[4] This assumption is rather bold with respect to the period before WWI. However, after WWI, the link between Japanese and the US financial markets became significantly strong. A single correlation coefficient of short-term interest rates between Japan and the US was 0.62, 0.93 between the US and UK, 0.34 between the US and France and 0.77 between the US and Germany during January 1925 to December 1938. With respect to long-term interest rates, correlation of nominal rate was 0.87 and real rate was 0.40 between the US and Japan during January 1925 to February 1937 [Morgenstern (1959) and Teranishi (1991)].

[5] It goes without saying, when lagged variables are introduced as below, this expression should be changed in due course.

In the model estimated below, lagged dependent variables are added in equations (2) and (3), and lagged independent variables in equations (6), (7) and (8).[6] It is easy to see the solution for Y in this case takes following form;

$$Y=F[G, r, \rho, WM, \theta, \theta_{-1}, \varepsilon, \varepsilon_{-1}, \tau, C_{-1}, I_{-1}, \gamma_{-1}, \sigma_{-1}]. \tag{11}$$

Degree of contribution of an exogenous parameter, say ρ, in the growth of GNP from period O to period T is defined as follows. At first, T-th period base value of GNP $Y_{b,T}$ is generated from the difference equation (11) in Y with all parameters of each period kept at O-th period level as

$$Y_{b,T}\equiv F[G_0, r_0, \rho_0, \ldots, \tau_0, ENDO_{-1}, EXO_{-1}],$$

where $ENDO_{-1}$ is a vector of lagged dependent variables, EXO_{-1} a vector of lagged independent variables.

Next, T-th period value of GNP generated from (11) when observed ρ at each period is substituted while all other parameters were kept at O-th period values, is given as

$$Y_{\rho,T}\equiv F[G_0, r_0, \rho_0, \rho_1, \ldots, \rho_T, \ldots, \tau_0, ENDO_{-1}, EXO_{-1})].$$

Then the degree of contribution of the change in parameter (ρ) in the growth of GNP from period O to T is defined as follows;

$$(Y_{\rho,T}-Y_{b,T})/[(Y_{G,T}-Y_{b,T})+(Y_{r,T}-Y_{b,T})+(Y_{\rho,T}-Y_{b,T})+\ \ldots\ +(Y_{\tau,T}-Y_{b,T})].$$

4. *Estimation*

Each equation of the model is estimated by OLS based on annual data from 1910 to 1937. Since this period covers years of significant external shocks, and since in order to conduct a simulation analysis, a good "fitness" is required, following dummy variables are introduced;

DM1 1915, 16=1

DM2 1916, 17=1

both represents extraordinary boom years during WWI,

DM3 1915—20=1

representing the general shock of WWI and its aftermath,

DM4 1917—19=1

indicating the confusion immediately after WWI, and

[6] Estimated form of these equations are
$C=C((Y-(T(Y)/\gamma,C_{-1}), I=I(Y,r,\rho,I_{-1}),$
$\delta=f(\partial/\theta, (\varepsilon/\theta)_{-1}), \gamma=g(\delta,\gamma_{-1}),$
$\sigma=h(\delta,\sigma_{-1})$

DM5 1923=1

representing the shock of the great Kanto Earthquake. (Sources of data and notations are shown in the appendix table. Figures in parentheses in the following indicate t-values).

4.1 Private consumption function

Private consumption is assumed to be dependent on real disposable income DY and lagged consumption.

$$C=121.291+0.237\ DY+0.761\ C(-1)$$
$$(0.64)\quad (3.71)\quad (10.69)$$
$$(\bar{R}^2=0.990,\ DW=2.149,\ \text{Durbin's}\ h=-0.53)$$

DY is calculated as the ratio of nominal disposable income NDY to Pc, where NDY is endogenously generated by the following empirical relation.

$$NDY=120.415+0.868\ (PY-T+HOJ)$$
$$(1.08)\quad (93.43)$$
$$(\bar{R}^2=0.997,\ DW=1.033),$$

where PY is nominal GNP and HOJ subsidies.

4.2 Tax Revenue

Government revenue T comprises indirect tax TXI (including revenue of state enterprises) and direct tax TDX.

$$T=TXD+TXI.$$

Direct tax is assumed to be dependent on nominal GNP, and indirect tax on real GNP and GNP deflator since it is composed of both proportional (to weight) and ad valorem tax.

$$\log(TXD)=-5.526+1.252\ \log(PY)-0.207\ \text{DM3}$$
$$(19.96)\ (42.60)\qquad (5.47)$$
$$(\bar{R}^2=0.987,\ DW=1.267)$$

$$\log(TXI)=-3.896+0.777\ \log P+0.803\ \log Y-0.263\ \text{DM3}$$
$$(6.71)\ (11.63)\qquad (10.34)\qquad (6.59)$$
$$(\bar{R}^2=0.969,\ DW=0.972)$$

Negative sign of DM3 implies expansion of tax revenue could not catch up with the boon of the economy during and immediately after WWI.

4.3 Investment Function

Investment is assumed to be a function of real GNP (Y), real interest r, rate of profit ρ and lagged investment.

$$I = -340.942 + 0.0069Y - 6.232r + 10.031\rho + 0.516I(-1) - 290.507\ \text{DM5}$$
$$(2.41)\quad (5.24)\quad (1.93)\quad (2.53)\quad (5.24)\quad (2.68)$$
$$(\bar{R}^2 = 0.940,\ DW = 1.357,\ \text{Durbin's } h = 1.86),$$

where negative sign of DM5 shows the impact of the earthquake.

4.4 Export and import function

Export and import functions of goods are estimated separately from those of services.

As for export of goods, a conventional export function with income and relative price variables was tried, at first.

$$\log(X) = -5.566 + 2.399 \log(WM)$$
$$(2.83)\quad (5.84)$$
$$-1.804 \log(eP_x/P_w) + 0.192\ \text{DM1} + 0.663\ \text{DM4}$$
$$(6.37)\quad (0.79)\quad (3.18)$$
$$(\bar{R}^2 = 0.683,\ \text{DM} = 0.417)$$

The low value of the coefficient of determination indicates the conventional export function based on income and price variables is not necessarily sufficient to explain the movement of exports. This leads us to introduce a set of new variables in order to capture an expansion of exports to colonial (Korea and Taiwan) and semi-colonial regions (Kwangtung Province, Manchuria and other areas of China). The first East Asia Export dummy DMX is the composition of export to these regions, and is introduced in the coefficient of the income variable. The assumption here is that an increased demand in these regions had more impact on Japanese exports than that in other regions because of special customer relationship. The result is

$$\log(X) = -2.229 + (1.318 + 1.180\ DMY) \log(WM)$$
$$(1.31)\quad (3.25)\quad (4.19)$$
$$-1.078 \log(eP_x/P_w) + 0.670\ \text{DM1} + 0.842\ \text{DM4}$$
$$(3.89)\quad (3.09)\quad (5.11)$$
$$(\bar{R}^2 = 0.816,\ DW = 1.622).$$

Alternatively, East Asia Investment dummy DMI defined as the real value of foreign direct investment and concessionary loans to these regions is introduced as an additional variable, assuming these capital flows were "tied" with exports of goods. The result is

$$\text{Log}(X) = -2.309 + 1.476 \log(WM)$$
$$(1.92)\quad (5.54)$$
$$-1.287 \log(eP_x/P_w)$$
$$(7.31)$$
$$+0.297\ DMI + 0.169\ DM1 + 0.258\ \text{DM4}$$
$$(7.07)\quad (1.24)\quad (1.97)$$
$$(\bar{R}^2 = 0.899,\ DW = 1.507)$$

By the introduction of either of these two East Asia dummies, the coefficient of determination is significantly improved. It is also interesting to note the coefficient of price variable in thses estimations has become much smaller than in the conventional equation. DM1 seems to indicate the extraordinary export boom toward the end of WWI, and DM4 lagged supply of exports after the termination of the war.

As for imports of goods, a conventional equation with real GNP as income variable and P_m/P as price variable is not successful with considerable serial correlation in error term. Therefore, following equation with $C+I+X$ as income variable and relative price of imported goods to the price of manufactured goods is adopted.

$$\begin{aligned}\log(M) = &-7.132 + 1.559 \log(C+I+X) \\ &\quad (10.18)\ (21.63) \\ &-0.692 \log(P_m/P_i) \\ &\quad (3.58) \\ &-0.160\ \mathrm{DM1} - 0.235\ \mathrm{DM4} \\ &\quad (2.70)\qquad (4.96)\end{aligned}$$

$(\bar{R}^2=0.970,\ DW=0.986)$

DM1 seems to indicate the difficulty of import toward the end of WWI, and DM4 impact of turmoil after the war.

Receipts and payments of services comprise not only such conventional items as tourism, transportation, insurance, and investment income but also a special overseas transaction by the government called imperial government transaction (Teikokuseifu Torihiki) related to military and diplomatic activities abroad. Estimation is conducted with respect to receipts (NXO) and payments (NMO) excluding the imperial government transaction. (In simulation, this item is treated as exogenous). It is assumed receipts and payments of services are related to export and import of goods with adjustment lag.

$$\begin{aligned}\log(NXO) = &-1.733 + 0.632 \log(NX) + 0.508 \log(NXO(-1)) \\ &\quad (4.85)\ (6.10)\qquad\qquad (6.19) \\ &-0.246\ \mathrm{DM1} + 0.248\ \mathrm{DM4} \\ &\quad (2.73)\qquad (3.70)\end{aligned}$$

$(\bar{R}^2=0.980,\ \mathrm{DM}=1.504,\ \text{Durbin's } h=1.29)$

$$\begin{aligned}\log(NMO) = &-0.138 + 0.091 \log(NM) + 0.912 \log(NMO(-1)) + 0.164\ \mathrm{DM4} \\ &\quad (0.67)\ (1.27)\qquad\quad (10.27)\qquad\qquad (2.66)\end{aligned}$$

$(\bar{R}^2=0.971,\ DW=1.381,\ \text{Durbin's } h=1.13)$

4.5 Price Function

Impacts of changes in import price on the prices of exports and consumption goods are assumed to occur by way of effects on the price of manufactured goods of import prices of raw materials and capital goods. Therefore, relative price of manufactured goods was considered to be a function of relative price of imports, and relative price of consump-

tion as well as relative price of exports were assumed to be dependent on the price of manufactured goods.

$$P_i/P = 0.655 + 0.535\ (P_m/P) + 0.125(P_m/P)(-1) - 0.011\ TIME$$
$$(8.80)\quad (6.35)\qquad (1.46)\qquad (9.46)$$
$$(\bar{R}^2 = 0.922,\ DW = 1.686)$$

$$P_c/P = 0.436 + 0.111\ (P_i/P) + 0.369(P_c/P)(-1) + 0.003\ TIME - 0.073\ DM2$$
$$(2.93)\quad (2.48)\qquad (2.57)\qquad (3.24)\qquad (4.19)$$
$$(\bar{R}^2 = 0.652,\ DW = 2.271,\ \text{Durbin's } h = -1.58)$$

$$P_x/P = -0.243 + 0.650\ (P_i/P) + 0.624\ (P_x/P)(-1) - 0.101\ DM4$$
$$(1.76)\quad (3.60)\qquad (6.04)\qquad (1.52)$$
$$(\bar{R}^2 = 0.875,\ DW = 1.757.\ \text{Durbin's } h = 0.71)$$

TIME is a time trend variable starting with 1 in 1910, and the negative sign of the coefficient of this variable seems to reflect a higher speed of productivity increase in manufacturing than in other sectors. Although the coefficient of relative price of manufactured goods is significant and large in the equation for the relative price of exports, it is very small in the equation for the relative price of consumption goods. Moreover, degree of fitness is not satisfactory[7] so that P_c/P is treated as exogenous in the simulation analysis below. Evaluated at the mean of observed value, elasticity of P_i/P with respect to P_m/P is 0.56, and elasticity of P_x/P is 1.48, so that it is concluded that an increase in the relative price of imports by one percent causes an increase of the relative price of exports by 0.83%.

5. *Simulation Analysis——Causes of Recovery*

In order to investigate into the causes of recovery of Japan after 1932, a simulation analysis is conducted on the estimated model and degree of contribution of each parameter to GNP growth is calculated. In the following, export function is concerned with the estimation utilizing East Asia Investment dummy *DMI*.

5.1 Method of Simulation

At first, with every exogenous parameters kept constant at 1931 level, a dynamic simulation of GNP is carried out, and base value of Y for each year is obtained. For the initial values of lagged variables, observations of 1930 are utilized.

Second, in order to calculate the contribution of each or each group of exogenous variables, a dynamic simulation of Y is conducted by substituting the yearly realized value of the relevant parameter with every other parameter kept constant at 1931 level. The difference of this value of Y with the base value calculated above is considered to be the

[7] One of the reasons for this is that the role of nontradable goods price in the CPI is not captured in our model.

absolute contribution of the parameter for the change in real GNP.

Third, by dividing the contribution of each parameter by the sum of contributions of all parameters, degree of contribution of the parameter is derived.

It must be noted that the degree of contribution for the year T calculated this way is the cumulative effect of the changes in the relevant parameter from year O to T.

Exogenous parameters were classified into following eight groups: (1) government expenditure (G), (2) rate of profit (ρ), (3) real interest rate (r), (4) world import (WM), (5) East Asia Investment dummy (DMI), (6) domestic price factors . . . price of consumption goods (P_c) and GNP deflator (P), (7) overseas price factors . . . import price of Japan (in dollar) (eP_m), world import price (in dollar) (P_w) and GNP deflator in the US (in dollar), and (8) nominal exchange rate (e).

In terms of the theoretical model in Section 3, treating parameters contained in (6), (7), (8) amounts to treat three relative prices, θ, τ and ε exogenous.

5.2 Result of simulation

Let us examine the cumulative degree of contribution of each parameter shown in Table 3.

The effect of government expenditure is significant throughout the period and especially during the early period of recovery. Although we did not treat consumption and capital formation of the government separately, the expansion of government consumption (especially in the rural area) seems to have been effective: government consumption increased by 0.7 billion yen during 1930–33 in Table 2.

The expansion of export was another important factor which caused Japan's recovery.

The role of exchange rate depreciation is most significant during the early period of recovery, but its importance has rapidly declined. Although the fall of nominal exchange rate was large and had a significant impact, there was concomitant fall in prices of foreign

TABLE 3. FACTORS FOR ECONOMIC RECOVERY—PERCENTAGE COMPOSITION OF CUMULATIVE DEGREE OF CONTRIBUTION

	1932	1933	1934	1935	1936
(1) Government expenditure (G)	40.8	35.8	34.0	32.5	34.9
(2) Real interest rate (r)	4.3	4.7	6.6	5.5	5.7
(3) Rate of profit (ρ)	2.2	3.2	5.5	5.2	5.5
(4) Volume of world import (WM)	−10.8	−0.3	19.2	27.9	36.3
(5) East Asian Investment dummy (DMI)	16.1	24.2	31.3	35.8	30.9
(6) Prices	47.4	32.4	3.4	−6.8	−13.2
(6-1) Overseas prices (eP_m, P_w, P^*)	−95.6	−49.1	−44.3	−39.9	−32.7
(6-2) Domestic Prices (P, P_c)	−2.5	−9.9	−20.1	−22.0	−27.2
(6-3) Nominal exchange rate (e)	145.5	91.4	67.8	55.1	46.7

[8] The negative effect on recovery of domestic prices occurred because a rise in the relative price of consumption decreased real disposable income and gave a downward impact on consumption demand. (Notwithstanding, consumption expanded compared with the period 1925–30 owing to the expansion of nominal GNP as is shown in Table 2).

competitors. As is documented in Eichengreen and Sachs (1985, p. 929) the abandonment of the gold standard of Japan was done in the midst of competitive devaluation among countries. Therefore, *ex post* impact of nominal depreciation was largely offset by the fall of foreign prices. Moreover, the upward impact on yen import price of nominal depreciation caused a rise in export price.[8]

After 1934, the expansion of exports was led by a shift of export regions from industrial countries to colony and semi-colony countries. This was a result of capital exports to these regions as well as the growing protectionism in the world market.

The effects of real interest rate and rate of profit are not significant enough. As is indicated by the relatively large rise in Tobin's q above, a decrease in real interest and a rise of profit rate are rather significant during the period. However, their effects on growth are not large. The reason for this is smallness of the coefficients of these variables in investment function. According to the estimates above, one percent point change in r or ρ causes only 0.006–0.010 billion changes in investment. It is true that private investment increased significantly during the latter period of recovery (Table 2), but this seems to be the results of rapid expansion of GNP caused by other reasons, say, an increase in G (acceleration principle)[9]. In this sense, Takahashi's Keynesian policy could be said to have been successful in its deficit spending part but not in the low interest policy part. In addition, it must be noted that a relatively large decline in real wage rate compared with European case was not a significant factor for economic recovery since the effect of profit rate on recovery is not large.

In sum, our analysis has shown that the rapid recovery of Japan was ignited by deficit spending and exchange rate depreciation, and sustained and accelerated by the expansion of exports to East Asia regions as well as by the high level of deficit spending. With respect to the opposing views about the role of exchange rate depreciation [Nakamura (1983) and Nanto and Takagi (1985) emphasize positive effects, and Sato (1980) and Takagi (1989) deny them], our result favors the latter view after 1934, while it admits large positive effects of depreciation during the early period of recovery.

6. *Exchange Rate, Foreign Trade and Recovery*

6.1 Equilibrium exchange rate

Our finding that depreciation of nominal exchange rate and decline in foreign competitors' prices offset each other suggests exchange rate during the recovery period was more or less in equilibrium. Let us investigate this point.

In order to apply our definition of equilibrium exchange rate, estimation of full employment level GNP is crucial. We have conducted three alternative cases of estimation.[10] Case I and Case II take into consideration the dual structure of the economy. Since it

[9] For example, in 1934 when real GNP was 16 billion yen, ten percent increase of GNP could have caused an expansion of investment by 0.11 billion yen.

[10] More sophisticated methods such as de Leeuw and Holloway (1982) were not adopted owing to the lack of data.

is said there was "disguised" unemployment in the agricultural sector where people work with almost zero marginal productivity of labor [Minami (1973)], we assume that a constant fraction (5% for Case I and 10% for Case II) of the product of workforce of agriculture multiplied by wage differentials between agriculture and nonagriculture represents difference of actual GNP with full employment GNP.[11] In case III, following regression was conducted,

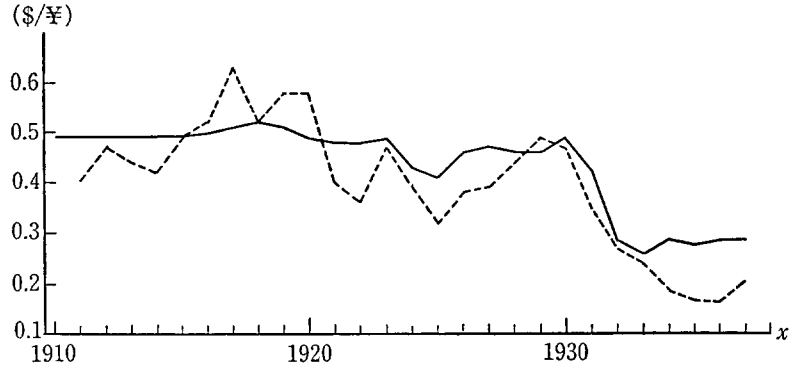
$$\log Y = 0.8930 + 0.326\ TIME - 0.0707\ D12 - 0.0899\ D13 - 0.0424\ D23 - 0.04560\ D24 - 0.0404\ D29$$
$$(\bar{R}^2 = 0.9666,\ DW = 0.5104),$$

where D12, D13, D23, D24 and D29 are dummies which take value of 1 in 1912, 1913, 1923, 1924 and 1929 when growth rates of Y are negative. With this regression, estimate of Y generated by time trend only (excluding dummy variables) is assumed to be full employment level of GNP in Case III.

Following equation (10) above, equilibrium real exchange rate θ is calculated by substituting Y^f thus estimated for Y, and r^* (US real interest rate) for r, and nominal exchange rate is calculated by the relation $\theta = eP/P^*$. The results were reported in Appendix (B). Since there is not much difference among the results of three cases, Figure 1 compares the equilibrium value of nominal exchange rate in Case (II) with actual value. It can be seen that during WWI actual exchange rate was undervalued and, during the 1920s, considerably overvalued,[12] while during the early 1930s it was more or less close to the equilibrium level.

It is true that changes and speed of yen depreciation were strongly affected by the risk

FIGURE 1. NOMINAL EXCHANGE RATE: EQUILIBRIUM AND ACTUAL RATE



Note: Bold line shows actual and dotted line shows equilibrium $/¥ rate. Equilibrium rate is case II rate in Appendix (B).

[11] Data are given in Appendix (A). In terms of notation there, difference between Ye and Y is equal to $\grave{a}(Wa...We)L/P$, where $\grave{a}=0.05$ for Case I and 0.10 for Case II.

[12] The undervaluation of yen during WWI occurred owing to the purchase of foreign exchanges by the government (so-called Zaigai-seika). The accumulated foreign exchange reserves were utilized for intervention in the foreign exchange market in the 1920s. The anchoring effect stemming from the expectation of return to gold standard at the prewar parity was also responsible for the overvaluation of yen in the 1920s.

caused by political and military outcomes [Ito, Okina and Teranishi (1988)]. However, the ultimate level of exchange rate seems to be compatible with the equilibrium for a given international environment. As Patrick says, "It has been argued that Japan depreciated excessively, that the yen was fundamentally undervalued after 1932. By standard criteria for an equilibrium exchange rate—full use of resources, reasonably rapid growth, no increase in direct controls over foreign economic transactions, and equilibrium in the balance of payments—this does not seem to have been the case" [Patrick (1971)]

6.2 East Asia dummies

We have treated East Asia dummies (East Asia Export dummy *DMX* and East Asia Investment dummy *DXI*) as exogenous parameters. This assumption implies expansion of regions under political control (annexation of Korea in 1910, succession of German interests in Santung province in 1915 and establishment of puppet state in Manchuria in 1932) and gradual strengthening of control there provided Japanese exporters with non-price competitive power. Exports to these regions significantly benefitted by the foreign direct investment related to national policy firms (Kokusaku-gaisha) as well as extension of concessionery loans to these areas. Conglomerates newly established after WWI were quite ardent with respect to this kind of business. In terms of technological familiarity, accessibility to credits and information accumulation on buyers, this type of market expansion is considered to have offered special competitive edge to Japanese exporters.[13]

A drastic change in the export direction is seen from Table 4. From 1925 to 1935, exports to industrial countries decreased by 0.036 billion yen while exports to less-developed countries and colony and semi-colony countries increased by 0.055 and 0.042 billion yen, respectively. Moreover, since exports of textile products were decreased by 0.016 billion yen as a total, the increase in the exports occurred mainly in the exports of heavy and chemical industry products, of which major part (0.035 billion yen) was directed to colony and semi-colony regions. For heavy and chemical industries, expansion of markets in Manchuria and Kwangtung Province of China after the invasion into Manchuria in 1931 and establishment of puppet regime in 1932 was especially important. For example, exports of railway

TABLE 4. CHANGES IN EXPORT VALUE FROM 1925 TO 1935
(Unit: ten million yen)

	Textile products	Heavy and chemical industry products	Others	Total
Industrial countries	−47	3	8	−36
Less-developed countries	39	11	5	55
Colonial and semi-colonial countries	−6	35	13	42
Total	−16	50	26	61

Source: Yukizawa and Maeda (1978).
Note: Colony and semi-colony comprise Korea, Taiwan and China (including Manchuria and Kwangtung Province).

[13] As for the expansion of markets under Japanese "imperialism," refer to Beasley (1987). Importance of changes in the direction of exports as a cause for export expansion is suggested in Blumenthal (1981).

vehicles, which comprised 46.0% for locomotive, 55.5% for passenger car and 15% for cargo car of total production, were entirely directed to Manchuria. About 80 percent of export of electrical machinery and communication equipments were directed to Manchuria and Kwangtung Province [Hashimoto (1984, p. 236)]. It is important to know these exports of heavy and chemical industry do not necessarily reflect technical comparative advantage of Japan. In the case of domestic markets for general machinery industry, large and high-grade models were mostly imported from western countries, and only small and low-grade models were produced domestically. Let us take a look at Table 5, which shows changes in comparative production cost structure between Japan and the US, calculated from WPI for some category of products. An increase in figures indicates improvement in comparative advantage of Japan in terms of production cost. It can be seen for two industries which belong to heavy and chemical industry, chemical and metal, Japan's comparative advantage structure did not show any clear improvement during the 1930s.

These are background evidence for why we consider the East Asia Dummies important. However, it must be noted that the relationship between capital exports (*DMI*) and the changes in the direction of exports (*DMX*) are not touched upon here, but rather left for a task of future research. A more detailed micro economic research is certainly needed in this respect. Incidentally, it would be worth pointing out that in Table 5 comparative advantage of textile continued to increase throughout the interwar period. This seems to be one of the reasons for the expansion of exports of Japanese textile into less-developed countries during 1925–35 (Table 4), especially after 1932.[14] Finally, it must be also noted

TABLE 5. CHANGES IN COMPARATIVE PRODUCTION COST
(Base year=1880–1890 average)

Period (t)	Food	Textile product	Chemical product	Metal product	Farm product
1891–1895	1.17	1.10	1.07	1.00	0.76
1896–1900	1.20	1.17	0.87	1.04	0.77
1901–1905	1.09	1.17	0.88	1.07	0.73
1906–1910	0.96	1.22	0.81	1.01	0.76
1191–1915	1.01	1.38	0.76	1.05	0.57
1916–1920	1.15	1.19	0.84	0.98	0.54
1921–1925	1.16	1.34	0.99	1.34	0.49
1926–1930	1.04	1.73	0.89	1.23	0.48
1931–1935	0.98	2.10	0.89	1.11	0.60
1936–1940	1.31	2.18	0.89	0.81	0.54

Note and Sources: Calculated as Ai of US divided by Ai of Japan, where Ai

$$=\left(\frac{\text{WPI of } i\text{-th product in period } t}{\text{WPI of } i\text{-th product in 1880–1890}}\right)\Big/\left(\frac{\text{average WPI in period } t}{\text{average WPI in 1880–1890}}\right)$$

For Japan, WPI of each product is obtained from *LTES* Vol. 8, Table 10 and 15 and average WPI from Bank of Japan, *One-Hundred Year History* (Statistics). For the US, Series E 13–14 and Series E 1–12 in *Historical Statistics of the United States: Colonial Times to 1957* are used (two series are linked at 1890).

[14] Other possible reasons are (a) dumping and (b) specialization of low quality product and the fall of income in the regions. The evaluation of relative importance of these factors is left as an agenda of future research.

that the funds exported to the regions were largely imported from abroad, especially by floating bonds in the US markets, so that the aggregate and direct effect on the current-account of the capital exports was not significant.

6.3 Price elasticity of import and export

One of the important findings above is the relative magnitude of coefficients of price variables in export and import functions. Without East Asia dummy, price elasticity of exports is -1.803, three times larger than the price elasticity of imports -0.692. This conventional contrast is considerably mitigated when we introduce East Asia dummies in the export function; resulting price elasticities are -1.078 for the case of DMX and -1.287 for DMI.

It seems that in the interwar economy the role of exchange rate in import deserves more attention compared with export. In the export markets, Japan was a small country, and had to follow international prices [Sato (1983) and Takagi (1989)], so that effects of exchange rate on export expansion was rather limited. On the other hand, it has been a conventional belief that price elasticity of Japan's imports is small because her specialty is processing trade. However, although the elasticities of imports of raw materials and foods were low, that of manufacturing goods is considerably large. Results of regression for the period 1910–1937 are as follows:

Imports of manufactured goods.

$$\log(Mi) = \underset{(8.47)}{-7.484} + \underset{(16.42)}{1.492}\log(C+I+X) - \underset{(7.62)}{1.537}\log(P_{Mi}/P_i) - \underset{(0.72)}{0.067}\,\mathrm{DM1} - \underset{(1.13)}{0.076}\,\mathrm{DM4}$$

$(\bar{R}^2=0.953,\ DW=2.120)$

Imports of foods.

$$\log(Mf) = \underset{(9.48)}{-14.775} + \underset{(13.22)}{2.243}\log C - \underset{(0.31)}{0.115}\log(P_{Mf}/P_c) - \underset{(2.30)}{0.360}\,\mathrm{DM1} - \underset{(0.65)}{0.085}\,\mathrm{DM4}$$

$(\bar{R}^2=0.899,\ DW=1.767)$

Imports of raw materials

$$\log(Mm) = \underset{(13.53)}{-9.027} + \underset{(23.77)}{1.669}\log(C+I+X) - \underset{(1.13)}{0.179}\log(P_{Mm}/P_i) + \underset{(2.35)}{0.175}\mathrm{DM1} - \underset{(2.79)}{0.161}\,\mathrm{DM4}$$

$(\bar{R}^2=0.959,\ DW=1.414)$

Estimated elasticity of 1.537 for manufactured goods is 13.4 or 8.6 times higher than that of foods or raw materials, respectively. In the case of appreciated exchange rate during

the 1920s, for example, domestic manufactures had to face severe competition with imported commodities, and at the same time, availed themselves with inexpensive supply of capital equipments and raw materials from abroad. It might be that traditional emphasis on export in the analysis of balance of payments problems in interwar Japan needs to be reconsidered in view of these points.

7. *Concluding Remarks*

As is indicated in Section 2, the depreciation of the exchange rate is not sufficient to explain the rapid recovery in production and expansion of exports which occurred in Japan. Difference with the European case seems to be owing to two factors; deficit spending and an increase in exports to East Asia countries closely related to capital exports to the region.

There are some important areas remaining for further research. First, as is already touched upon, the mechanism of export expansion in colonial region caused by capital exports needs close examination from micro economic viewpoint. Analysis in such areas as behavior of Kokusaku-gaisha as well as method of trade financing are important agenda in order to complement our analysis. Second, the role of non-traded goods should be examined more closely. Whenever necessity of stabilization (or deflation) of prices was discussed in the policy debate during the interwar period, it was always related with the high level of non-tradable prices. Third, the effect of low real wage needs further investigation. Especially important would be its impact on exports. The accusation on Japan in the mid-1930s of dumping should be shed new light by means of modern analytical tools.

SENSHU UNIVERSITY AND HITOTSUBASHI UNIVERSITY

APPENDIX (A) *SOURCES OF DATA USED IN THE ESTIMATION*

Y	Real GNP; Newly estimated[1]
PY	Nominal GNP; Newly estimated[1]
C	Personal Consumption; *LTES*[2] Vol. 1, Table 18.
NDY	Nominal personable disposable income; *LTES* Vol. 1, Table 32.
DY	Real personal disposable income (NDY/P_c).
I	Private investment; *LTES* Vol. 1, Table 21.
G	Government expenditure (Government consumption + government capital formation); *LTES* Vol. 1, Tables 18–21.
NX	Nominal exports of goods; *LTES* Vol. 14, Table 16.

[1] Since we make use of foreign trade data in *LTES* Vol. 14 extensively, and since export and import data in the GNP series in *LTES* Vol. 1 are old, new series of GNP (nominal and real) are estimated by utilizing new estimates of balance of payments statistics reported in *LTES* Vol. 14, (other items of GNP components are the same as the *LTES* Vol. 1 series), and GNP deflator is calculated as the ratio [of newly estimated nominal and real GNP.

[2] *LTES* is Long-term economic statistics estimated by the Institute of Economic Research of Hitotsubashi University and published from *Toyokeizai Shinposha* in fourteen volumes during 1966–1988.

X	Real exports of goods (NX/P_x).
WM	Quantity index of world imports; *LTES* Vol. 14, Table 23.
DMX	East Asia Export dummy (composition of exports to Korea, Taiwan, Kwangtung Province, Manchuria and other areas of China to total exports); *LTES* Vol. 14, Table 13.
DMI	East Asia Investment dummy (foreign direct investments and government loans to Korea, Taiwan, Kwantung Province, Manchuria and other areas of China divided by GNP deflator).[3]
NM	Nominal imports of goods; *LTES* Vol. 14, Table 16.
M	Real imports of goods (NM/P_m).
NXO	Nominal exports of services and receipts of factor income from abroad (excluding receipts in imperial government transactions); *LTES* Vol. 14, Table 16.
NMO	Nominal imports of services and payments of factor income to abroad (excluding payments in imperial government transactions); *LTES* Vol. 14, Table 16.
T	Government revenue; *LTES* Vol. 1, Table 3.
TXD	Direct tax; *LTES* Vol. 7, Table 7.
TXI	Indirect tax ($T-TXD$).
HOJ	Transfer expenditures and subsidies by government; *LTES* Vol. 1, Table 3.
ρ	Rate of profit; Newly estimated.[4]
r	Real interest rate (rate of return of national bond minus rate of change of P); rate of return of national bond from Fujino and Akiyama (1977) *Shokenkakaku to Rishiritsu* (Hitotsubashi University).
r^*	Real interest rate in the US (rate of return of national bond-rate of change of P^*); rate of return of national bond from *HSUS*[5] Series X330.
e	Nominal yen-dollar exchange rate (\$/¥); *LTES* Vol. 14, Table 26.
P	GNP deflator; Newly estimated.[1]
P^*	GNP deflator in the US; *HSUS* Series F5.
P_w	Price index of world imports; *LTES* Vol. 14, Table 24.
P_c	Deflator of personal consumption expenditure; *LTES* Vol. 1, Table 30.
P_x	Export price index (in yen); *LTES* Vol. 14, Table 5.
P_m	Import price index (in yen); *LTES* Vol. 14, Table 6.

[3] Foreign direct investments and concessionary loans comprise the following three items: (i) Foreign direct investments into Korea and Taiwan (Data is obtained from *LTES* Vol. 14, Table 19 and 20); (ii) Foreign direct investments into Manchuria (Estimated from Tables 1-25, 4-16 and 7-19 in Kaneko (1991) and Manshi Kai (1964), p. 876. It is assumed that before 1914 foreign direct investment into Manchuria is composed only of investments into South Manchuria Railway.); and (iii) Concessionary loans to China including Kawngtung Province and Manchuria) (Estimated from the stock data in Kokkashihonyushuisu-Kenkyukai (1986), pp. 258–309).

[4] Rate of profit is net profit/net worth. Data are obtained from Toyokeizai, *Jigyogaisha Keieikoritsu no Kenkyu* during 1914–1929, and Mitsubishi Keizai Kenkyusho, *Honpo Jigyoseiseki Bunseki* during 1930–37. Coverage of industry is cotton spinning, fertilizer, cement, flour product, sugar refinery, silk product and beer brewery for the former period, and manufacturing, printing and wood product for the latter period. As for the period 1910–13, the rate of profit is calculated by substituting the dividend rate reported in R. Miwa (1973) into the equation estimated by regressing the rate of profit on dividend rate for the period during 1914–37.

[5] *HSUS=Historical Statistics of the United States: from Colonial Times to 1957* (A statistical Abstract Supplement) published from U.S. Bureau of Census, 1960.

P_i Price index of manufacturing (in yen); *LTES* Vol. 1, Table 31.
M_i Imports of manufactured goods; *LTES* Vol. 14, Table 4.
M_f Imports of foods; *LTES* Vol. 14, Table 4.
M_m Imports of raw materials; *LTES* Vol. 14, Table 4.
P_{Mi} Import price index (in yen) of manufactured goods; *LTES* Vol. 14, Table 6.
P_{Mf} Import price index (in yen) of foods; *LTES* Vol. 14, Table 6.
P_{Mm} Import price index (in yen) of raw materials; *LTES* Vol. 14, Table 6.
W_A Yearly wage in agriculture; *LTES* Vol. 9, Table 34.
W_I Yearly wage in nonagriculture (daily wage of manufacturing worker multiplied by average working day); *LTES* Vol. 8, Table 27 and *Nihon Roudo Undo-shi Shiryo* Vol. 10.
L Workforce in primary sector; Minami (1973).

APPENDIX (B) *Equilibrium and Actual Exchange Rate*

	Real Exchange Rate				Nominal Exchange Rate			
	Actual	Case I	Case II	Case III	Actual	Case I	Case II	Case III
1910	0.856	0.754	0.716	0.749	0.49	0.44	0.41	0.43
1911	0.962	0.819	0.778	0.757	0.49	0.42	0.40	0.39
1912	1.006	1.002	0.965	0.752	0.49	0.49	0.47	0.37
1913	1.046	0.983	0.948	0.674	0.49	0.46	0.45	0.32
1914	0.948	0.844	0.799	0.506	0.49	0.44	0.42	0.26
1915	0.877	0.922	0.879	0.717	0.49	0.51	0.49	0.40
1916	0.916	0.993	0.956	0.953	0.50	0.54	0.52	0.52
1917	0.943	1.197	1.153	1.535	0.51	0.64	0.62	0.82
1918	1.088	1.150	1.109	1.863	0.52	0.54	0.52	0.88
1919	1.179	1.392	1.320	2.240	0.51	0.60	0.57	0.97
1920	1.041	1.283	1.217	1.710	0.49	0.61	0.58	0.81
1921	1.109	0.980	0.911	1.306	0.48	0.42	0.39	0.57
1922	1.245	1.009	0.945	1.221	0.48	0.39	0.36	0.47
1923	1.238	1.269	1.198	1.098	0.49	0.50	0.47	0.43
1924	1.118	1.070	1.013	0.883	0.43	0.42	0.39	0.34
1925	1.023	0.849	0.804	0.800	0.41	0.34	0.32	0.32
1926	1.145	0.993	0.938	0.848	0.46	0.40	0.38	0.34
1927	1.157	1.004	0.950	0.940	0.47	0.41	0.39	0.38
1928	1.078	1.075	1.012	1.080	0.46	0.46	0.44	0.46
1929	1.068	1.192	1.126	1.072	0.46	0.52	0.49	0.47
1930	1.028	1.035	0.976	0.889	0.49	0.50	0.47	0.43
1931	0.873	0.784	0.735	0.604	0.42	0.38	0.35	0.29
1932	0.655	0.669	0.624	0.519	0.29	0.29	0.27	0.23
1933	0.625	0.615	0.574	0.574	0.26	0.25	0.24	0.24
1934	0.683	0.484	0.450	0.546	0.29	0.21	0.19	0.24
1935	0.666	0.433	0.403	0.550	0.28	0.18	0.17	0.24
1936	0.693	0.435	0.405	0.562	0.29	0.18	0.17	0.24
1937	0.746	0.575	0.541	0.773	0.29	0.22	0.21	0.30

REFERENCES

Beasely, W.G. (1987), *Japanese Imperialism 1894–1945*, Oxford University Press.

Blumenthal, T. (1981), "Senkanki no Nihonkeizai" [Interwar Japanese Economy—an International Comparison], in: T. Nakamura ed., *Senkanki no Nihonkeizai Bunseki*, Tokyo, Yamakawa Shuppansha, pp. 31–51.

Eichengreen, B. and J. Sachs (1985), "Exchange Rates and Economic Recovery in the 1930s," *Journal of Economic History* 45, pp. 925–946.

Faini, R. and G. Toniolo (1990), "Deflation Reconsidered: Japan in the 1920s," *European Economic Review* 34, pp. 616–623.

Hashimoto, J. (1984), *Daikyokoki no Nihon-Shihonsyugi* [Japanese Capitalism during Great Depression], Tokyo, Tokyo University Press.

Ito, T., Okina, K. and J. Teranishi (1988), "News and the Dollar/Yen Exchange Rate, 1931–1933: The End of Gold Standard, Imperialism and Great Depression," *NBER Working Paper*, No. 2683 (forthcoming in the Journal of the Japanese and International Economies).

Kaneko, F. (1991), *Kindai Nihon ni okeru Tai-Manshu-Toshi no Kenkyu* [A study on Investments into Manchuria of Modern Japan], Tokyo, Kondo-Shuppansha.

Kindleberger, C.P. (1973), *The World in Depression, 1929–1939*, University of California Press, Berkeley and Los Angeles.

Kokka Shihonyushutsu-Kenkyukai (1986), *Nihon no Shihonyushutsu—Taichu Shakkan no Kenkyu* [A Study on Capital Export to China], Tokyo, Taga-Shuppan.

de Leeuw, F. and T.M. Hollaway (1982), "The High Employment Budgets: Revised Estimates and Automatic Inflation Effect," *Survey of Current Business* 62 (No. 4), pp. 21–33.

Maddison, A. (1962), "Growth and Fluctuation in the World Economy 1870–1960," *Banca Nazionale del Lavoro Quarterly Review* 61, pp. 127–195.

Maddison, A. (1982), *Phases of Capitalist Development*, Oxford, Oxford University Press.

Manshkai (1964), *Manshu Kaihatsu 40-nenshi* [Forty Year History of Manchurian Development], Tokyo, Manshu Kaihatsu 40-nenshi Kanko-Kai.

Minami, R. (1973), *The Turning Point in Economic Development: Japan's Experience*, Tokyo, Kinokuniya.

Miwa, R. (1971), "Daiichijitaisengo no Keizaikozo to Kinkaikinseisaku," [The Economy after WWI and Return to Gold Standard], in: Y. Ando ed., *Nihonkeizai Seisakushiron* 1, Tokyo, Tokyo University Press, pp. 259–329.

Morgenstern, O. (1959), *International Financial Transactions and Business Cycle*, Princeton University Press.

Nakamura, T. (1983), *Economic Growth in Prewar Japan*, New Haven, Yale University Press.

Nanto, D.K. and S. Takagi (1985), "Korekiyo Takahashi and Japan's Recovery from the Great Depression," *American Economic Review* 75, pp. 369–374.

Patrick, H. (1971), *The Economic Muddle of the 1920s*, in: J.W. Morley ed., *Dilemmas of Growth in Prewar Japan*, Princeton University Press, pp. 211–266.

Sato, K. (1980). "Senkanki Nihon no Makurokeizai to Mikurokeizai," [Macro and Micro Economy in Interwar Japan], in: T. Nakamura ed., *Senkanki no Nihonkeizai*, Tokyo, Yamakawa Shuppansha.

Sato, K. (1981), "Senkanki Nihon no Makurokeizaikiko," [Macroeconomic Mechanism of Interwar Japan], *Keizaikenkyu*, Tokyo, Hitotsubashi University 32, pp. 193–201.

Takagi, S. (1989), "Senkanki Nihon Keizai to Hendosobasei," [Flexible Exchange System and Interwar Japanese Economy], *Kinyukenkyu*, Bank of Japan 8, pp. 109–140.

Teranishi, J. (1990), "Financial System and the Industrialization of Japan 1900–1970," Banca Nazionale del Lavoro, *Quarterly Review*, No. 174, pp. 309–341.

Teranishi, J. (1991), *Kogyoka to Kinyushisutemu* [Industrialization and Financial System], Tokyo, Toyokeizaishinposha.

Yamamura, K. (1972), "Then Came the Great Depression: Japan's Interwar Years," in: H. van der Wee ed., *The Great Depression Revisited*, (Essays on the Economics of the Thirties), Martinus Nijhott, The Hague, pp. 182–211.

Yukizawa, K. and S. Maeda (1978), *Nihonboeki no Chokitokei* [Longterm Statistics of Foreign Trade in Japan], Kyoto, Dohosha.