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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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PROTOTYPE MACRO-MODELS OF THE MACROECONOMIC SECTOR AND IMPLICATIONS 1/

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[illegible] addressed.

It is [illegible] completed by [illegible] Frisch.

I. Prof. [illegible]

Professor [illegible] for the [illegible] made by [illegible]

A. The [illegible]

The [illegible] dependent [illegible] and imports of manufactures value added, real domestic utilization of manufactures value added for consumption and intermediate uses, and an implicit price [illegible]

* In the work [illegible] the word "[illegible]" and "[illegible]" to [illegible] These [illegible]

B. The Model

(1) [illegible]

(2) [illegible]

(3) $M = 29.09 + 0.282\,Y - 30.132\,P^{ex}_{-1}$, $R^2 = 0.98$ $D\text{-}W = 1.60$
(0.011) (5.715)

(4) $EX = 86.35 + 0.146\,VA - 1.498\,P^{ex}_{-1} + 2.603\,X^{i}_{-1}$, $R^2 = 0.99$ $D\text{-}W = 2.13$
(0.013) (0.159) (0.379)

and (5) $D = Y - EX + M$

in which the endogenous variables are

D = domestic utilization of manufactured goods in constant prices,

P_m = price index for manufactured goods,

M = real manufactured value added in imports,

EX = real manufactured value added in exports, and

VA = real value added in domestic manufacturing production.

The exogenous variables are

Y = real GDP

DT_p = the excise tax rate (collections/price deflator for manufactures/ domestic use of manufactures)

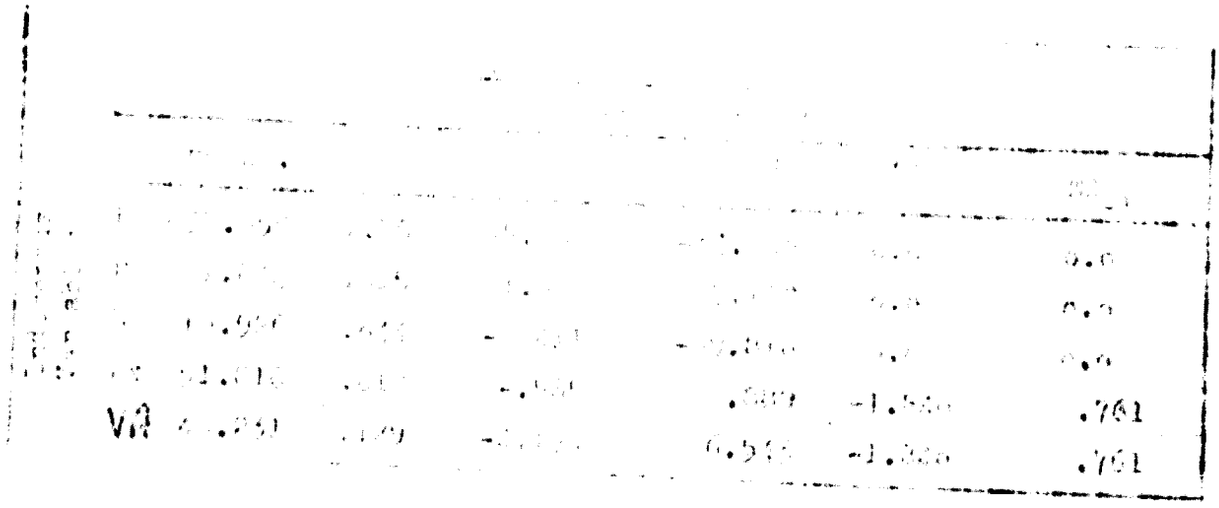
X^i = the exchange rate for imports/price deflator for manufactures,

P^{ex} = the price index for manufactured exports from developing countries (Monthly bulletin of statistics, November issues),

and EX_{-1} = manufactured exports lagged one period.

It is clear that all coefficients are highly significant statistically, and the equations are satisfactory. It should be noted, however, that some

* P_m enters the conversion of excise taxes collections to a tax rate; the exchange rate was deflated by a wholesale price index, which is closely related.



(6) B = −3,[illegible] + [illegible] B[illegible] − 1.4[illegible] P + [illegible] Trend, R^2 = 0.93 D-W = 2.03
(207) (417) (3.6) (27.1)

(7) P = − 869 + 0.[illegible] + [illegible] t^2 − 176 Dum
(61) (0.0[illegible]) (0.023) (26) R^2 = 0.98 D-W = 1.81

(8) M = −311 + 0.18[illegible] − 0.[illegible]X^2 − 70.[illegible] Dum
(37) (0.0[illegible]) (0.014) (27.8) R^2 = 0.83 D-W = 1.50

(9) EX = [illegible] + 0.0178[illegible] − [illegible] − [illegible] Dum
(2.3) (0.00[illegible]) (5.1[illegible])[illegible] (1.4) R^2 = 0.99 D-W = 3.04

[illegible](10) [illegible]

	X^{1^X}	X^0					
D	-0.062	0			0		
F	0.943	0			0		
H	-0.776	0			0		
bZ	0	0.14			0		
VA	0.015	0.015					

In general, the model for [illegible] than that for the Philippines. Here there [illegible] variable and a dummy variable to [illegible] past industrial development in the [illegible] light on the nature of the [illegible] rate policy has had [illegible] economy is governed [illegible] cent variable [illegible] way as a proxy for [illegible] its coverage. However, [illegible]

ported by Prof.Frisch.

below.

(11) [illegible] R^2 = .994 DW = 1.670

(12) [illegible] R^2 = .936 DW = 1.877

(13) [illegible] R^2 = .775 DW = 2.713

(14) [illegible] R^2 = .956 DW = 1.505

(15) [illegible]

in which the [illegible]

Sub-[illegible],

T^b = [illegible],

FX_{hcc} = [illegible], and

D_T^1 = [illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

In conclusion, it may be said that [illegible] made a valuable contribution to [illegible] interest rate policy [illegible] similar form for a number of [illegible]

[illegible]

[illegible] employed [illegible] in [illegible] equation [illegible]

The [illegible] variables (the [illegible], the rate of indirect taxation and the rate of [illegible] variable ([illegible]). This set of equations appears below, [illegible] number in parentheses now represents the Student's t-coefficient:

(16) D = [illegible] Y [illegible] TT_r R^2 = 0.98 D-W = 2.02

(17) F = 624.0 [illegible] (2.9) R^2 = [illegible] D-W = 1.87

(18) M = [illegible] (6.0) [illegible] R^2 = 0.998 D-W = 2.48

(19) EX = [illegible] XR R^2 = 0.99 D-W = 1.33

(20) [illegible] = 4[illegible].0 +1.[illegible] (17.7) R^2 = 0.97 D-W = 1.53

(21) VA = D-M+EX

in which the variables are as above, and TT_r is the rate of indirect tax collections (see footnote on next page for definition). The log versions showed invariably low Durbin-Watson coefficients.

[illegible]

The reduced form matrix must be calculated from this equation system before the projections can be made.

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* It must be pointed out that the indirect tax rate in equation (16) is based on manufactures value added, (V_m), while that in equation (17) is based on gross domestic product (Y). To consolidate these two variables, it is suggested that the latter variable be used in the equation (16).

[illegible] ted. [illegible] of the [illegible] in Table [illegible] below. [illegible] In [illegible], the sign of the [illegible] in the [illegible] equation is positive in contrast to [illegible] our experience with the other countries [illegible]. Also the sign of the exchange rate in the import equation is [illegible], which may be explained in that quantitative controls [illegible] exchange rate [illegible] in India; [illegible] dropped from the equation. Some more work will have to be devoted to improving the Model for India.

Table II/1. Selected Equations for India a/

A. Dependent Variable: Domestic Use of Manufacturing Value Added

	Y	Pm	YRnom	XPreal	Intercept	R^2	$\bar{R}^2$	D-W
linear	1.400 (2.39)				600.7	213.1	0.987	1.67
linear	0.323 (2.01)	1.677 (8.32)	-26.289 (6.17)		-1559.9	72.9	0.956	2.74
linear	0.243 (1.46)	3.320 (7.59)		-30.156 (0.69)	258.9	72.3	0.950	2.81

B. Dependent Variable: Import Price Deflator for Manufacturing Value Added

	YA	P	IP	YRnom	ITrend	Intercept	R^2	$\bar{R}^2$	D-W
linear			0.508 (20.19)			30.6	0....	0....	1....
linear		.172 (17.25)		.375 (9.32)		53.7	0....	0....	2....
linear	0.187 (35.22)			1.134 (4.07)		95.9	0....	0....	....
linear	0.158 (0.30)				0.238 (3.33)	1.3	0....	0....	....

C. Dependent Variable: Imports of Manufacturing Value Added

	Y	PA	Ptrade	Preal	Intercept	R^2	$\bar{R}^2$	D-W
linear	0.091 (2.78)	0.217 (1.36)				24.37	0....	....
linear	0.178 (13.72)		-1.098 (1.0...)	0.657 (4.82)	-312.5	13.16	0.7	....

a/ The Student's t-statistics appear in parentheses below the coefficients.

Although the [illegible] through 1973, [illegible] are available [illegible] 1970. [illegible] through the year [illegible] projection [illegible] other [illegible]

Growth [illegible] combined with [illegible] manufacturing [illegible] price of [illegible] rate with a [illegible] GDP is then [illegible] rate is assumed to be held constant relative to [illegible] excise tax rates are treated [illegible] variables for the projection [illegible] Table III/1.

...nufactured

1969	9,6[illegible]	[illegible]				
1970 a/	10,[illegible]	[illegible]				
1971 a/	10,72[illegible]	[illegible]				
1972	11,395	[illegible]	[illegible]			
1973	12,[illegible]7	[illegible]				
1974	12,[illegible]79	[illegible]				
1975	13,[illegible]30	[illegible]				
1976	14,[illegible]43	[illegible]				
1977	15,[illegible]88	[illegible]				
1978	16,[illegible]9	[illegible]				
1979	17,36	[illegible]				
1980	18,[illegible]14	[illegible]	[illegible]			

a) Entries above the line in each column represent observed historical data.

b) The exchange rate is calculated relative to the world trade index for manufactured value added. The [illegible] are [illegible] rate projections assuming a five [illegible] rate as a [illegible] rate in 1979; the [illegible] rate revalued in proportion to price movements, [illegible] constant.

c) The excise tax rate refers to total collections divided by manufacturing value added.

d) The unit value index of manufactured exports (SITC 5-8) from all developing countries (Monthly Bulletin of Statistics, November issues) is projected at 3 % per year.

Table II/2

Projected Trends Patterns of the Manufacturing Sector for the 1970's.

Groups	A	D	X	M	P
Fixed Exchange rate					
GDP Growth at 5% p.a.	5.1	5.7	7.7	7.4	3.9
GDP Growth at 6% p.a.	6.1	6.8	11.6	8.5	4.8
GDP Growth at 7% p.a.	8.1	7.8	14.6	9.6	5.7
Sliding Exchange Rate					
GDP Growth at 6% p.a.	6.1	6.5	11.2	7.5	5.2

Key: A = Value added in Philippine manufacturing.
D = Domestic use of manufacturing value added.
X = Exports of manufactured value added.
M = Imports of manufactures value added.
P = Profits [illegible] of manufactured value added.

The relationship between the growth rate of GDP and that of manufacturing is to be noted. Clearly the growth of manufacturing affects that of the other components of GDP and vice-versa. The International Development Strategy for the Second United Nations Development Decade takes cognizance of the 2 way effect in its contention that an average growth rate of [illegible] in manufacturing is needed to reach an average rate of 6% for GDP in developing countries as a group. Here we incorporate the reverse chain of causation, i.e. that GDP growth is a determinant of manufacturing growth. [illegible] more reasonable to assume, as we do, that growth of the sector as a whole reflects a sector comprising only 15% of the whole [illegible] the composite. In any case, a 6% growth rate for GDP, which [illegible] the goal of the International Development Strategy, is [illegible] a sufficient [illegible] rate of manufacturing

1968 Level.					
Projected Levels					
Fixed Exchange Rate with 15% Devaluation					
GDP Growth 5% p.a.					
1975	1641	1853	163	489	152
1977	1918	2078	156	537	145
1978	1969	2144	166	551	175
1980	2145	2448	303	717	169
GDP Growth=6% p.a.					
1975	1674	1897	196	499	159
1977	1958	2217	259	579	175
1978	1993	2329	293	573	190
1980	2264	2656	307	699	208
GDP Growth=7% p.a.					
1975	1730	2050	210	524	165
1977	2038	2385	241	629	155
1978	2137	2525	308	624	204
1980	2449	2930	393	751	226
Sliding Exchange Rate					
GDP Growth = 6% p.a.					
1975	1636	1947	156	485	160
1977	1863	2208	225	558	177
1978	1987	2351	291	599	167
1980	2264	2663	307	666	207

Key: VA = Value added in Philippine manufacturing.
D = Domestic use of manufacturing value added.
A = Exports of manufactured value added.
M = Imports of manufactured value added.
P = Implicit price deflator of manufactured value added.

of only [illegible]

to GDP [illegible] relative-

[illegible] in the Philippines,

On the [illegible] to a certain extent,

problems, [illegible].

It appears [illegible] the record most

more [illegible] in [illegible]. The increase

in [illegible] industrial [illegible] to

industrial [illegible] of exports. The

imbalance [illegible] however, because

of the low [illegible] In examining the projections

in Table [illegible], [illegible] of trade in manufactures

in Table [illegible], [illegible] exists. The

[illegible]

[illegible]

Projected [illegible] Under Alternative Assumptions Regarding Import Prices and Protected Costs

Case	Real GDP Growth Rate (Average Annual Rate)	Change in Real GDP Growth Rate if Trade Reform
1968 Level	- 2%	
Projected Levels		
Fixed exchange rate with 1978 Devaluation		
GDP growth - 5% p.a.		
1975		
1977	- 30%	
1978	- 35%	- 46
1980	- 39%	+ 29
	- 380	- 59
GDP growth - 6% p.a.		
1975		
1977	- 309	
1978	- 35%	- 43
1980	- 37%	- 32
	- 37%	- 53
GDP growth - 7% p.a.		
1975		
1977	- 31%	
1978	- [illegible]	- 40
1980	- 42%	+ [illegible]
	- 38%	- 40
Slightly [illegible]		
GDP growth [illegible]		
[illegible]		
1977	- [illegible]	- 31
[illegible]	- [illegible]	- [illegible]
[illegible]	- [illegible]	- [illegible]

[illegible] ch
scenario, [illegible]
imports rise to [illegible]
the 1978 terms [illegible]
growth. By 1979, [illegible]
at higher growth rates [illegible]
between exports and imports [illegible]
rates (ranging from $ 3bn to $ 5bn or more. By assumption, [illegible]
1978 has a slightly greater positive effect [illegible] / [illegible]
rates ($ 3bn million for 5 % GDP growth and $ 5 billion for 5% growth).
After 1978, faster GDP growth seems to work favourably upon the balance of
trade in manufactured goods. After that year, in any event, the imbalance
becomes smaller at each rate of development and increases at a slower
rate. This is an important fact that should be emphasized, if possible,
in future reports of this nature. Indeed, I expect in the late 1980's or
early 1990's, the trade deficit will start to decline in absolute terms.

A similar analysis could be carried out between domestic production and consumption of manufactured goods. In terms of growth rates (Table III/2), the growth of production is more than of consumption only at higher rates of the expansion. In absolute terms, however, the difference VA - I = X - M, and / is shown in Table III/4. Pro[illegible] discussion above, therefore, we know that the imbalance between manufactured production and consumption also grows over time in every scenario, except in the year of the devaluation. In the early 1970's (not shown in the tables), it grows faster at higher rates of overall (GDP) expansion, but this relationship reverses itself after about 1975. Table III/3 shows that by 1975-1977, it grows by $ 46 million with 5% GDP growth and at only $ 10 million with 7 % growth. After 1978, the level of imbalance remains similar for higher rates of development.

It remains to comment on the price projections. They are influenced by the rate of GDP growth, the excise tax rate, and especially by the exchange rate. They are not influenced in this model by the rate of domestic production, because it is assumed exogenously [illegible]

[illegible] between the [illegible] expectations [illegible] latter [illegible] earlier adjustment of the [illegible] rapid growth, but the [illegible] trade indicates an [illegible] in a satisfactory [illegible]

Let us turn now to the effects of the exchange rate itself on the endogenous variables. [illegible] analysis of the projections for the devaluation year [illegible] and from analysis of the [illegible] exchange rate, it is clear that devaluation [illegible] affects on imports (which fall) and prices (which rise sharply) [illegible] restraining domestic consumption. It affects hardly at all the level of domestic construction and of exports. If this is so, then devaluation [illegible] result of the contractionary propensity of the [illegible] to exceed payments possibilities with no effect on real output growth.

Because of limited time to prepare this report, no separate sensitivity tests are presented for changes in the exchange rate. It is clear from the equations themselves [illegible] matrix, however, that its effects permeate throughout the system of endogenous variables but that they are entirely [illegible] to those of the exchange rate.

It will be recognized that the projections for the fixed exchange rate regime encompass an [illegible] resulting from the need to deflate exchange rate by the endogenous price level. Thus, an assumed price increase of 5 % per annum underlies the predetermination of the exchange rate. As Table III/2 shows, the projected rate of price increase corresponds closely to this assumption only in the case of [illegible] growth. For the other cases, an iterative procedure must be used to obtain a convergence between the assumption and the projection. On the other hand, where the exchange rate is treated as a policy variable instead of fixed, it can be assumed that the authorities maintain it in a certain relationship to the price level,

which them need not itself be predetermined, and this problem does not arise. Tax rate variables also may be treated this way.

Appendix A: ESTIMATES OF STRUCTURAL EQUATIONS FOR KOREA

Table A1

Domestic Use Equation (Korea)

No.	Version	Y	Pm	IT	IT_r	Xm	Intercept	Standard error of Estimate	R^2	D-W
1.1	Linear	0.32 (8.6)					- 5,2.1	117.1		
1.2	Linear	0.56 (12.0)	-0.48 (5.5)				- 9[illegible].8	67.1	0.9[illegible]	1.7
1.3	Linear	[illegible].13 (9.4)		-1.57 (5.6)			-25[illegible].5	10[illegible].3	[illegible]	[illegible]
* 1.4	Linear	0.65 (8.36)	-0.71 (4.1)		-4.46 (1.5)		- 728.5	5[illegible].[illegible]	[illegible]	[illegible]
1.5	Linear	0.85 (11.2)	-0.40 (1.7)			-0.43 (0.4)	- 942.2	60.4	[illegible]	[illegible]

* Version selected for reduced form.

Note: Variables are as indicated in Section I and II of this report; IT represents tax collections of indirect taxes in the Philippines, and IT_r indicates these collections as a rate of [illegible] against manufacturing value added (VA).

Table A2

Price Equation (Korea)

No.	Version	D	XR	D^{i}_{r}	IF_{r}	Intercept	Standard Error of Estimate	R^2	D-W
2.1	Linear		8.21 (16.2)			241.2	[illegible]	[illegible]	[illegible]
2.2	Linear	0.13 (1.0)	4.8[illegible] (10.6)			206.5	[illegible]	[illegible]	[illegible]
2.3	Linear	0.6[illegible] (3.3)		1.26 (3.3)		- [illegible]3.9	21[illegible].4	[illegible]	[illegible]
* 2.4	Linear	1.36 (4.7)		0.8[illegible] (2.5)	- [illegible]2.1 (2.5)	224.0	102.3	[illegible]	[illegible]

* Version selected for reduced form.

Table A3

Import Equation (Korea)

No.	Version	D	D^1	XB	D_T^1	Intercept	Standard Error of Estimate	R^2	D-W
3.1	Linear	3.78 (21.0)				- 921.2	[illegible]	0.98	[illegible]
3.2	Linear	6.14 (7.8)	-7.40 (3.3)			-1736.2	[illegible]	[illegible]	[illegible]
3.3	Linear	4.13 (30.[illegible]		-1.89 (4.0)		- 964.2	[illegible]	[illegible]	[illegible]
3.4	Linear	5.52 (10.[illegible]	-4.58 (2.6)	-1.41 (3.5)		-1369.4	[illegible]	[illegible]	[illegible]
* 3.5	Linear	4.06 (39.[illegible]		-2.16 (6.0)	-3.51 (2.8)	- 550.9	[illegible]	[illegible]	[illegible]

* Version selected for reduced form.

Table A4

Export Equation (Korea)

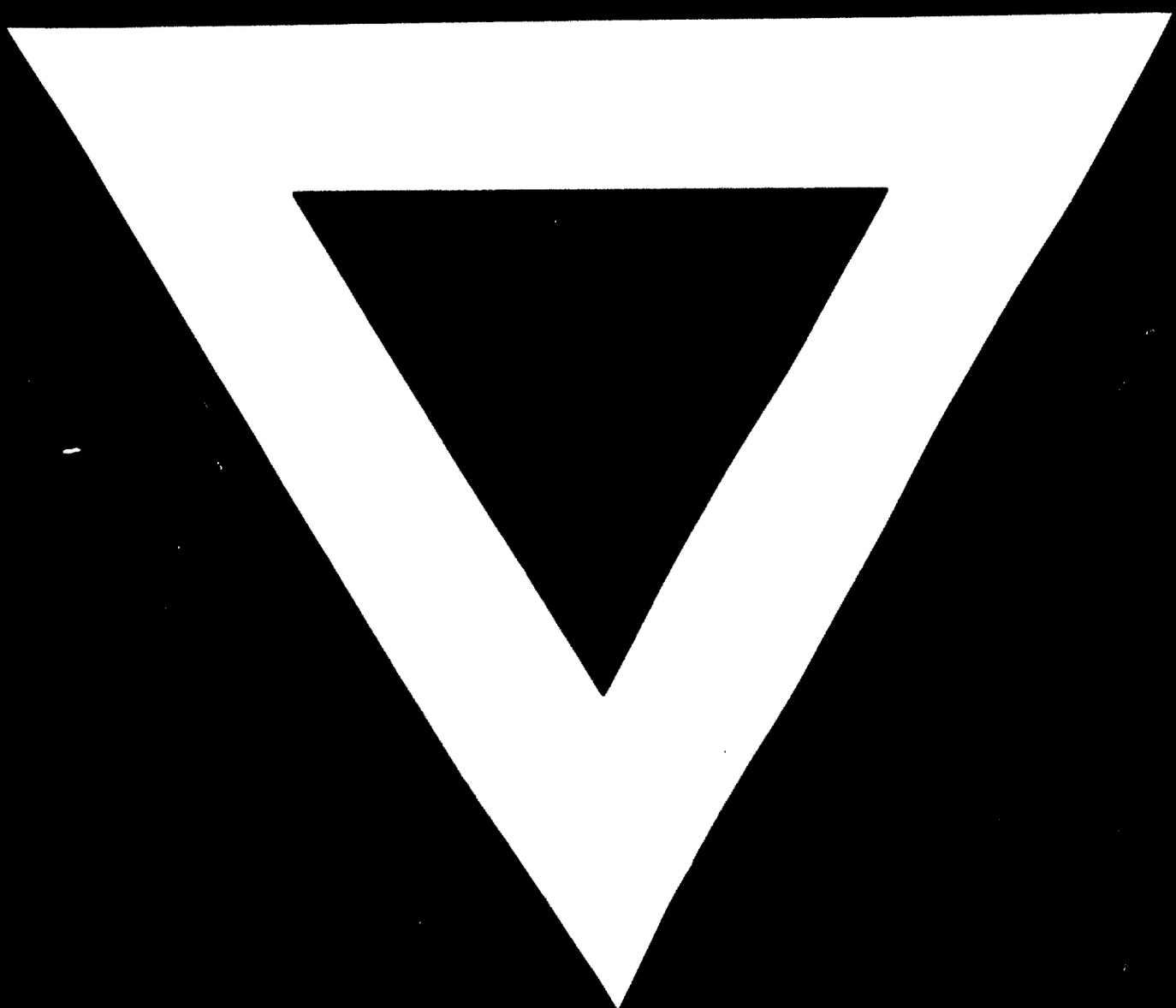
No.	Version	VA	XR	WP/XR	C_{USP}	Intercept	Standard Error of Estimate	R^2	D-W
4.1	Linear	1.70 (25.4)				- 582.6	54.1	0.986	0.99
4.2	Linear			-060 (1.51)		996.6	112.7	0.[illegible]72	0.38
4.3	Linear	1.39 (11.2)			0.13 (3.75)	- 364.9	41.2	0.[illegible]93	[illegible]03
* 4.4	Linear	1.53 (20.5)	0.62 (3.8)			- 537.3	35.8	0.[illegible]94	1.[illegible]1
4.5	Log		0.523 (0.046)		7.686 (6.584)	- 61.7310	0.2057	0.[illegible]55	0.[illegible]02

Table A5

Employment

5.1	Log	0.983 (18.0)			0.3478	0.3675	0.97	1.67
5.0	Linear	1.19 (17.7)			49.0	54.3	0.972	1.53

* Version selected for reduced form.



17.7.74