

**THE WORLD BANK GROUP ARCHIVES**

**PUBLIC DISCLOSURE AUTHORIZED**

**Folder Title:** Agriculture - Patterns of Protection, by P.L. Scandizzo - Draft paper

**Folder ID:** 1852510

**Series:** Subject files of the Office of the Director of the Economics and Policy Division

**Dates:** 07/01/1982 - 07/31/1982

**Fonds:** Records of the Agriculture and Rural Development Sector

**ISAD Reference Code:** WB IBRD/IDA AGR-4445S

**Digitized:** 05/04/2023

To cite materials from this archival folder, please follow the following format:  
[Descriptive name of item], [Folder Title], Folder ID [Folder ID], ISAD(G) Reference Code [Reference Code], [Each Level Label as applicable], World Bank Group Archives, Washington, D.C., United States.

The records in this folder were created or received by The World Bank in the course of its business.

The records that were created by the staff of The World Bank are subject to the Bank's copyright.

Please refer to <http://www.worldbank.org/terms-of-use-earchives> for full copyright terms of use and disclaimers.



THE WORLD BANK

Washington, D.C.

© International Bank for Reconstruction and Development / International Development Association or

The World Bank

1818 H Street NW

Washington DC 20433

Telephone: 202-473-1000

Internet: [www.worldbank.org](http://www.worldbank.org)

**PUBLIC DISCLOSURE AUTHORIZED**


AGREP  
DIVISION FILES


Agriculture - Patterns of Protection

1982



**DECLASSIFIED**  
WBG Archives

 **Archives**

 **1852510**

A1992-004 Other #: 6 Box # 210664B

Agriculture - Patterns of Protection, by P.L. Scandizzo - Draft paper

DRAFT: H.Binswanger/P.L.Scandizzo

July 26, 1982

## Patterns of Agricultural Protection

### Introduction

1. Agricultural policies of developing as well as developed countries present a vast array of market interventions which often appear to be irrational, partially overlapping and conflicting and dictated more by the circumstances than by any specific policy design. Any analysis of these policies, however, cannot escape the basic fact that beyond what seems to be the effect of the particular combination of historical and political events that have determined the individual policies, both the stage of growth and the endowment of resources establish the framework within which government intervention may be displayed.
2. Whether such a framework is sufficiently restrictive that it determines a predictable regularity of market intervention policies across commodities and across countries is the basic hypothesis examined in this paper. More specifically, our analysis reviews qualitative and quantitative evidence on the effects of commercial policies and foreign exchange regimes on the agricultural price structure and examines its relationship with the stage of growth of the various countries and some of the characteristics of the growth pattern associated with different degrees of protection.
3. The paper is divided into two parts. The first part reviews the basic data on the incentive structure for agriculture in a large sample of countries and the characteristics and rationale of the policies that have led to such a structure. The second part uses the same data and set of structural indicators of the pattern of development to investigate the

-2-

statistical association between the effects of these policies and selected country characteristics.

4. Both the qualitative and the quantitative analysis of the evidence shows that there is a strong association between agricultural protectionism (or anti-protectionism) and such characteristics as the country income per capita, the relative size of the agricultural sector and the population/agricultural land ratio. Foreign exchange and purchasing parity variables also appear to have a strong effect on the degree to which countries decide to tax or protect agriculture.

## II. Policies and Incentives

5. Examination of the incentive structure for agriculture in many countries in the past three decades suggests that market intervention policies have played a major role in the differential performance of agricultural sectors in developing and developed countries alike.

6. Incentive policies as they affect agriculture are exceedingly complex. They include prices, taxes, subsidies and other related policies, but the issue is not whether prices are high or low, but the configuration of all of these policies and whether they stimulate or retard production. A credit subsidy to a food producer, for example, may be offset by an overvalued exchange rate arising out of a country's industrial policy, which by reducing the domestic price of agricultural imports, makes it hard for domestic producers to compete. Many agricultural policies are reactions to policies originating in other parts of the economy and inconsistencies often arise where one policy attempts to compensate for the consequences of another.

-3-

7. A further complication is the multiplicity of parties interested in the level of agricultural prices. Since basic staples in poor countries are essential in determining the cost of labor as well as the cost of living of the poor, presumed conflicts between welfare and agricultural production considerations create some of the most difficult policy issues facing governments. The fact that agricultural price policies have repercussions on employment, foreign exchange, and government revenues further complicates the issue.

8. Because the issues are so sensitive, most countries intervene in their agricultural sectors. In the developed countries, these interventions had their origins in the two world wars and the prolonged agricultural depression between them. The objective was to raise and stabilize farm income and the means often chosen was to influence farming prices. In much of the developing world these policies arose out of earlier colonial experience and the development perceptions of the early 1950s. The objective was to stimulate industrial growth, generate savings and channel these savings into industry. Despite the enormous diversity of circumstances and concerns, a few sharply contrasting policy patterns emerged during the period 1950-80 which are illustrated in Figure 1.

9. What is measured in Figure 1 are adjusted nominal protection coefficients (ANPC) from a large number of studies carried out primarily in the World Bank during the late 1970s. ANPCs are the ratio of import prices to the price (adjusted for transport costs) received by agricultural producers (see box 5). These coefficients have been adjusted by the World Bank's estimated equilibrium exchange rate shown by the red lines in the graph. Its length to the right of one measure undervaluation (protection), and to the left overvaluation (discrimination of the sector). These

-4-

coefficients change in the course of time and cannot be measured precisely so they need to be used as general indicators of policy impact not as precise measurements. They also do not show protection or discrimination arising from input subsidies.

#### Developed Countries

10. The EEC countries have protection levels between 30 and 80 percent which are achieved by a combination of tariffs, variable levies and non-tariff barriers (country adjustments result in further divergencies from these averages). The USA has much lower protection levels and protection is concentrated on a few import competing commodities such as tobacco, groundnuts and sugar products of the poorer south. Japan has the highest level of protection among developing countries, where rice, for example, is priced internally at twice the import price and wheat and barley even more. The developed countries with large agricultural resources relative to population are not included in Figure 1. For efficiently produced commodities they do not provide protection, but substantial support is provided for research and infrastructure for some less competitive crops and for industry.

11. Developed countries support their agriculture with other policies as well, such as research and technical assistance and income support but the costs involved are not easily obtained. In 1968, public expenditures for agriculture in the developed market countries totalled nearly \$14 billion, and per farm worker ranged from \$186 in Japan to \$1,630 in the United States. The lower Japanese figure reflects the high degree of protection provided by quantitative trade restrictions. In the Common Market in 1968 these public expenditures were about 55 percent of gross domestic agricultural product and in the United States 38 percent. In 1980

-5-

EEC public expenditure to finance national and community agricultural policies amounted to approximately \$37.0 billion.

12. Since 1950 these policies have generated even higher levels of agricultural self-sufficiency, except for tropical products and fruits and vegetables which contain tropical or sub-tropical items (Table 1). This configuration of policies helps to explain the rapid increases in developed country agricultural production in the 1950s and 1960s and the slowdown in the 1970s (as self-sufficiency limits were increasingly reached or exceeded). In the 1970s, as the European agricultural surpluses increased, the volume of exports of agricultural produce also increased, averaging 5.9 percent per annum 1970-79, considerably exceeding the growth of production. In North America and Oceania, these policies had better natural comparative advantage in agriculture and strong world market growth resulted in agricultural exports growing at 7 percent per annum during 1970-79.

Table 1: Self-Sufficiency Ratios for Industrial Countries

	<u>All Industrial Countries</u>		<u>EEC</u>	
	<u>1955/57</u>	<u>1964/66</u>	<u>1968/69</u>	<u>1977/78</u>
Wheat and coarse cereals	101	105		
Wheat alone			94	105
Rye			100	106
Grain maize			45	52
Rice	97	99		
Fats and oils	83	90		
Sugar	68	79		
Cotton	83	88		
Meat			93	97
Eggs			99	100
Cheese			98	103
Butter			91	111
Fresh vegetables			98	93
Fresh fruits			80	60
Citrus fruits	94	91		
Tobacco	94	91		

## Sources;

- (a) Provisional Indicative World Plan For Agricultural Development  
(Rome: FAO, 1969), Ch. 14, pg. 111
- (b) Agricultural Situation in the Community, EEC, 1980.

Developing Countries

13. African countries have usually pursued opposite policies. Exchange rates are often overvalued, resulting in an implicit tax on agriculture of 10 to 30 percent. Tropical product exports are often further taxed, and some countries further attempt to maintain food prices at low levels through a variety of domestic and import subsidies. The policies pursued in Africa were also used by many Latin American countries in earlier years, but underwent substantial changes by the mid-1970s (to which most of the data refer). Food sectors in Latin America are now receiving some compensation for overvalued exchange rates, with Mexico, an oil exporter, recently providing some protection.

14. In Asian countries policies differ substantially. India limits the export of some crops (rice for example) but provide a broad range of production support through subsidized irrigation, extension, research, credit, and sometimes fertilizer. These policies substantially offset the adverse price incentives of other policies. The Philippines has similar offsetting production supports. Malaysia protects domestic rice production and taxes other agricultural exports. Thailand has had variable taxes on rice exports.

15. The origin of many developing country policies can be traced to a desire for rapid industrialization which led to import protection for industry and later industrial exports. Upward pressures on exchange rates also result when large mineral or petroleum exports become important (Middle East, Nigeria and Mexico). they can also arise from large inflows of aid or remittances (Egypt, Bangladesh), or private foreign capital (Switzerland). Such exchange rate appreciation may not be permanent, as in the case of exhaustible oil reserves, and the penalty implied for

-8-

agriculture (Algeria) may need to be offset in order to assure the long-run viability of the sector as has been attempted by Nigeria and Mexico. In the OECD countries, particularly Japan and Europe, extremely rapid productivity-growth in industrial sectors during the 1950s and 1960s shifted comparative advantage away from agriculture, which in part explains the persistence of protection.

#### Government Revenue

16. Agriculture is the major source of potential government revenue at early stages of development, but many countries have come close to "killing the goose that lays the golden eggs". Sub-Saharan Africa and Latin America have relied heavily on agricultural export taxes as a principal source of government revenue, especially taxes on coffee, cocoa and tea, where world prices reflect an element of rent and are well above production costs. Demand elasticities for these commodities are low which further encourages such taxes. Consumption in developed countries will be nearly the same amount within a wide price range and lower prices would only reduce incomes for developing country producers. There is a justification for the producing country to tax such exports if other (?) agree to limit production, but in the case of most tropical products, other producers have entered the market reducing prices and tax revenues. One response has been to further raise taxes thereby reducing producer incomes, which reduces output and lowers incomes in rural areas. Excessive taxation of this type has been especially detrimental to agricultural production in Africa, with consequent market losses to other producers.

Improving Incentives In Developing Countries

17. Slow growing food sectors initially did not create serious problems in middle income countries with large resources, such as Argentina and other regions of Latin America and Africa. But poor, agricultural export oriented countries, such as Sri Lanka and somewhat later Colombia, could not afford to neglect their food sectors, given the impact of high food prices on the welfare of their poor. Natural events, such as the Sahelian drought, have also caused policy shifts in favor of the food sector. India and many other Asian countries entered the 1950s with food deficits which required substantial foreign exchange outlays and/or reliance on aid. Major industrialization efforts, such as the Second Five Year Plan in India, quickly proved too costly in terms of food production, nutrition, and foreign exchange costs. Foreign exchange savings and food security thus became closely aligned policy objectives. Domestic drives to raise production of basic cereals as a form of import substitution have been highly successful in India, Philippines, Indonesia and Malaysia. Malaysia, Thailand and the Philippines have been equally successful in stimulating the growth and export of rubber, palm oil and coconut products by a judicious mix of taxes and support. Rising wheat imports were a substantial drain on foreign exchange in Mexico and Brazil in the 1950s and 1960s leading to early support of these sectors. Many developing countries have thus altered or adjusted their incentive policies toward agriculture during the past three decades with remarkably good results. (Tables 10 and 11). Some have made constructive adjustments and then faltered (for example Mexico, Kenya, Pakistan).

-10-

18. While the historic evolution of this policy configuration in developed and developing countries can be explained, the policies pursued have pushed most countries into extremely complicated and sometimes offsetting and self-defeating policy measures: physical or financial limits on production in countries which support producer incomes; serious inconsistencies in protection or tax levels for commodities with essentially similar characteristics; high budget outlays for subsidies; and reduced government revenue from agricultural export taxes. The combination of over-incentives in OECD countries and disincentives in many developing countries have contributed to the poor agricultural growth and export performance of some developing countries.

19. It might be argued that developing country consumers have benefited as a group from the lowered international prices associated with developed country policies, but it is more likely that a combination of lower OECD protection and higher developing country incentives would have increased world production at similar or faster rates, at lower overall costs, and contributed much more effectively to solving poverty and nutrition problems in developing countries. This is not simply an agricultural issue. Disincentive biases in agriculture have broadly adverse consequences on rural non-farm employment and income, and, thus lead to accelerated urbanization.

### III. Quantitative Analysis

20. As Figure 1 shows, the general pattern emerging from the distribution of protection coefficients across countries seems to reveal an association between the country's wealth (in terms of per capita income, degree of industrialization and its position in the hierarchy of growth) and the extent to which policies for agriculture move from taxation to protection.

21. In order to explore more systematically whether this perceivable association holds up statistically, we performed regression analysis of the degree of protection as related to five characteristics of economic development: income per capita, percentage of agricultural GDP in total GDP, per capita agricultural land area, per capita oil export and purchasing parity coefficient (as estimated by Kravis). Because the statistical analysis runs across countries and commodities, dummy variables were used to test hypotheses on specific subgroups of countries and/or commodities. Also both linear and loglinear equations were fitted.

22. Table 2 shows a first set of results for the linear equations offering strong empirical support to the hypothesis that the intensity of agricultural protection is a result both of the stage and the pattern of development. The two variables that appear most important in explaining the variance of the protection coefficient are the relative size of agricultural GDP and the per capita agricultural land area. In both cases the coefficients are large, significantly different of zero at a very high level of confidence and, as expected, negative.

-12-

23. The fact that these two variables do explain a significant part of the variance of the indicators of protection shows that the type of policies adopted toward agriculture depends both on how far ahead is the country in its process of industrialization (the "stage of growth") and on the country's agricultural base.

24. Given these results, the relative wealth of the country, as measured by the customary indicator of per capita income also appears to have a significant and positive effect on the willingness to protect agriculture, even though this effect is tempered by characteristics of the country's internal price system as measured by the Kravis index of purchasing parity. Furthermore, while the effect of the agricultural land per capita does not show a significant difference when the observations are grouped according to the dummy variables (import, export and tropical beverages), differences in coefficients do emerge for the other variables. Per capita oil export, in particular, shows a negative association with protection in the case of imported commodities and a positive one for exports.

25. Table 3, presenting the results for the logarithmic equations, shows clearly that all the variables considered have large and significant statistical association with the degree of agricultural protection. While the size of the agricultural share of GDP does not conform to expectations in the equations with unified coefficients, all other coefficients follow the expected pattern of size. As expected, tropical beverages and export commodities are not generally favored by agricultural policies.

-15-

Variable IdentificationIndependent Variables

<u>Symbol</u>	<u>Name</u>
AGGDP	% contribution of Agriculture to GDP
AGLPC	Agricultural land per capita
INCPC	Income per capita
NOILEX	Net oil exports per capita
STDCF	Standard conversion factor
PPPR	Purchasing power parity rate
D1	Dummy for tropical beverages
D2	Dummy for import commodity
D3	Dummy for export commodity

$$\text{AGGDP1} = \text{AGGDP} \times \text{D1}$$

$$\text{AGGDP2} = \text{AGGDP} \times \text{D2}$$

$$\text{AGGDP3} = \text{AGGDP} \times \text{D3}$$

$$\text{PPPR3} = \text{PPPR} \times \text{D3}$$

Dependent Variables

NPC	Nominal protection coefficient
ADNPC	Adjusted nominal protection coefficient

-16-

Sources of Nominal Protection Coefficients (NPC) and Economic and Financial  
Prices used to compute NPC

<u>Country</u>	<u>Report No./(Author)</u>	<u>Title</u>
Germany	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects. An International comparison.
France	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects. An international comparison.
U.K.	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects. An international comparison.
Japan	World Bank Reprint Services No. 173	Price distortions in Agriculture and their effects. An international comparison.
Yugoslavia	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects. An International comparison.
Argentina	W.B. Staff Working Paper No. 386	Argentina: Country case study of Agricultural prices and subsidies .
Egypt		Agricultural price management in Egypt.
Pakistan	W.B. Staff Working Paper No. 387	Prices, taxes and subsidies in Pakistan Agriculture 1960-1976

-17-

Thailand	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects: An International comparison.
Korea	Joseph Wambia	Korea: Agriculture Sector Study (draft).
Philippines	Staff Appraisal Report No. 2695-PH	Philippines: Rainfed Agricultural Development (ILOILO) Project.
India	Staff Appraisal Report No. 3629-IN	India: Fourth Agricultural Refinance and Development Corporation Credit Project.
Brazil	Staff Appraisal Report No. 3635-BR	Brazil: Northwest Region Development Program - Phase II Mato Grosso Development Project.
Colombia	Staff Appraisal Report No. 3661-CO	Colombia: Second Integrated Rural Development Project.
Turkey	Report No. 3641-TU	Turkey: Industrialization and Trade Strategy Volume II - Main report.
Tunisia	(Judith Graves)	The Impact of Government Intervention on Agricultural prices in Tunisia.
Yemen (PDRY)	ULG Consultants Report	PDRY - Study on Agricultural prices and subsidies.

-18-

Ivory Coast	Bela Bellasa et al	Incentives and Resource costs in the Ivory Coast.
Ivory Coast	African Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Nigeria	African Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Nigeria	Western Africa Regional Office (Ag. sector note - final version)	Agricultural Marketing and Prices in Nigeria's Green Revolution - recent Developments and Policy Issues.
Cameroon	Regional Projects Department Western Africa Regional Office Report No. 1479-CM.	Cameroon: Appraisal of a Rural Development Fund Project.
Cameroon	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Zambia	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Senegal	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Sudan	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Sudan	Africa Strategy Review Group Report No. 1836-SU	Sudan: Agricultural Sector Survey.
Togo	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Ghana	Western Africa Country Programs - Report No. 1769-GH	Ghana: Agricultural Sector Review.

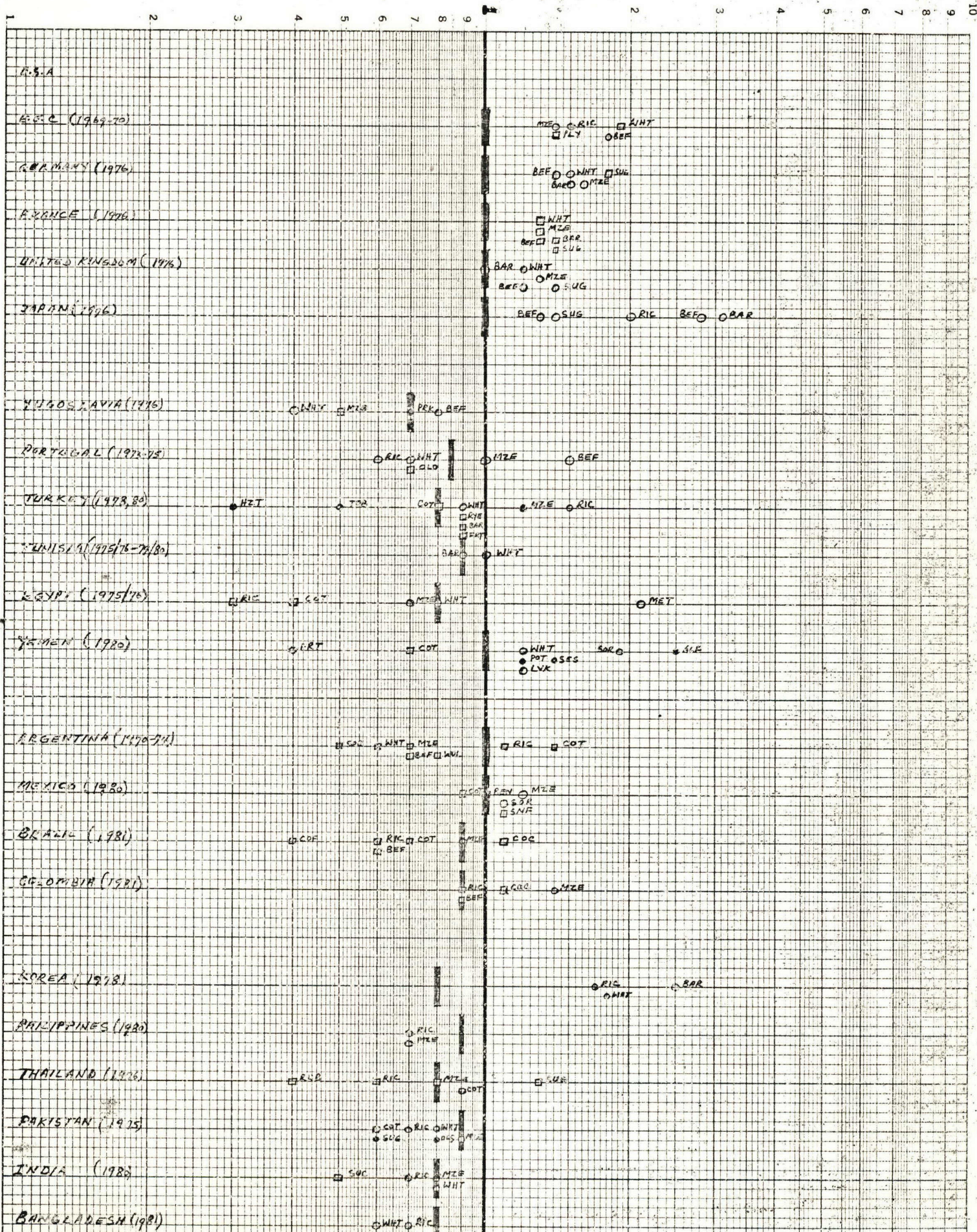
-19-

Kenya	Eastern Africa Region Report - Report No. 3456-KE.	Kenya: Country Economic Memorandum and Annex on Agricultural Issues.
Malawi	African Strategy Review Group	Accelerated Development in Sub- Saharan Africa.
Mali	African Strategy Review Group	Accelerated Development in Sub- Saharan Africa.
Upper Volta	African Strategy Review Group	Accelerated Development in Sub- Saharan Africa.

# ADJUSTED NOMINAL PROTECTION COEFFICIENTS IN AGRICULTURE IN THE LATE 1970's

DISCRIMINATION REGION

PROTECTION REGION

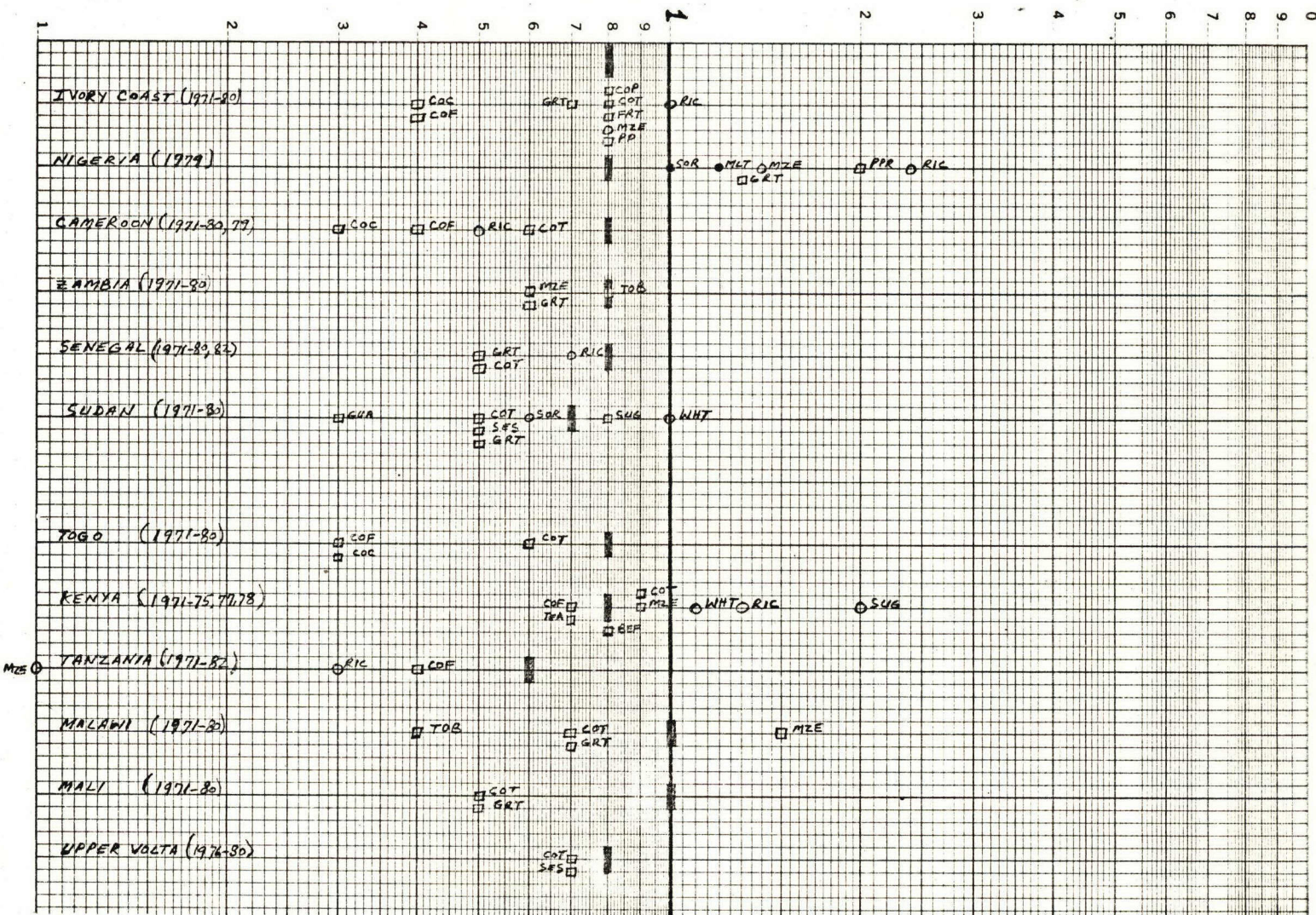


CONTINUED ON NEXT PAGE

# ADJUSTED NOMINAL PROTECTION COEFFICIENTS IN AGRICULTURE IN THE LATE 1970'S

DISCRIMINATION REGION

PROTECTION REGION



○ IMPORT COMPETING COMMODITY

□ EXPORT COMPETING COMMODITY

■ LITTLE TRADE OR BOTH IMPORTED AND EXPORTED

STANDARD CONVERSION FACTOR: DISTANCE FROM ONE INDICATES THE EXTENT OF DISCRIMINATION ARISING FROM OVERALL EXCHANGE RATE

SOURCES: VARIOUS WORLD BANK RESEARCH STUDIES, SPECIAL SECTOR REPORTS AND PROJECT APPRAISAL REPORTS; U.S.A.; USDA; EEC: SAMPSON AND YEATS, (1977)

DATES: WHERE PERIODS ARE LONG, ALL NPC'S MAY NOT REFER TO SAME YEAR WITHIN A COUNTRY.

Table 1

Results of Stepwise Regression for Nominal Protection  
Coefficients (F statistics in parenthesis)

Independent Variables	Linear Function					
	ADNPC-I	ADNPC-II	ADNPC-III	NPC-I	NPC-II	NPC-III
AGGDP	$-0.118 \times 10^{-1}$ (12.29) *	$-0.121 \times 10^{-1}$ (11.83) *		$-0.880 \times 10^{-2}$ (5.23) *	$-0.970 \times 10^{-2}$ (5.79) *	
AGLPC	-0.382 (9.16) *	-0.378 (8.65) *		-0.389 (7.31) *	-0.386 (7.12) *	
INCPC	$0.279 \times 10^{-4}$ (3.54) *	$0.235 \times 10^{-4}$ (0.97)		$0.184 \times 10^{-4}$ (1.19)	$0.252 \times 10^{-4}$ (1.32)	
NOILEX	-	$-0.175 \times 10^{-3}$ (0.043)				
PPPR	-				-0.274 (0.39)	
STDCF	-					
D1	-0.288 (4.35) *	-0.288 (4.29) *		-0.290 (3.41) *	-0.287 (3.32) *	
D2	-	$0.288 \times 10^{-1}$ (0.042)	0.605 (7.70) *		$-0.852 \times 10^{-1}$ (0.29)	0.790 (5.83)
D3	-0.183 (5.58) *	-0.158 (1.26)	-0.440 (4.04) *	-0.238 (7.33) *	-0.172 (1.15)	
AGGDP2	-		$-0.160 \times 10^{-1}$ (11.43) *			$-0.126 \times 10^{-1}$ (6.40) *
AGGDP3			$0.559 \times 10^{-3}$ (0.01)			$0.137 \times 10^{-2}$ (0.06)
AGLPC1	-		-0.580 (5.00) *			-0.593 (4.03) *
AGLPC2	-		-0.618 (5.81) *			-0.550 (3.58) *
AGLPC3	-					-0.164 (0.86)
INCPC2	-		$-0.253 \times 10^{-4}$ (0.72)			
INCPC3	-		$0.126 \times 10^{-3}$ (8.53) *			$0.167 \times 10^{-2}$ (6.93) *
NOILEX2			$-0.191 \times 10^{-2}$ (2.90) *			$-0.134 \times 10^{-2}$ (1.97) **
NOILEX3			$0.273 \times 10^{-2}$ (3.39) *			$0.356 \times 10^{-2}$ (4.41) *
PPPR2						-0.561 (1.74)
PPPR3						-0.959 (2.38) **
Constant/Intercept	1.422	1.407	1.042	1.540	1.609	1.174
R <sup>2</sup>	0.40	0.40	0.43	0.30	0.30	0.34
R <sup>2</sup> adjusted	0.38	0.37	0.39	0.27	0.27	0.29

\* = significant at 1% level

\*\* = significant at 5% level

Table 3  
Results of Stepwise Regression for Nominal Protection  
Coefficients (F statistics in parenthesis)

Independent Variables	Log Function					
	ADNPC-I	ADNPC-II	ADNPC-III	NPC - I	NPC - II	NPC - III
AGLPC	-0.260 (32.57)			-0.298 (36.53) *		
INCPC	0.262 (16.60) *			0.414 (32.99) *		
NOILEX	0.080 (11.59) *			0.100 (15.18) *		
AGGDP	0.145 (2.37) **			0.486 (18.71) *		
STDCF				0.384 (6.18) *		
D1	-0.360 (7.78) *			-0.284 (3.93) *		
D2		-4.27 (18.48)			-6.418 (32.93) *	-6.377 (33.02) *
D3	-0.116 (2.50) **	-2.132 (2.53) *	-2.154 (2.32) **	-0.207 (6.70) *		-3.241 (4.73) *
AGGDP1		-0.148 (4.30) *	-0.099 (5.79) *			
AGGDP2		0.343 (7.78) *	-0.154 (17.16) *		0.719 (23.97) *	0.719 (24.43) *
AGGDP3		0.090 (0.23)	0.094 (0.230)			0.333 (2.18) **
AGLPC1		-0.182 (0.68)				
AGLPC2		-0.354 (31.14) *	-0.298 (36.10) *		-0.373 (29.13) *	-0.373 (29.69) *
AGLPC3		-0.092 (1.58)	-0.112 (2.34) **		-0.082 (1.35)	-0.125 (2.70) *
INCPC1					0.051 (5.32) *	0.056 (6.33) *
INCPA2		0.396 (18.82) *			0.566 (30.50) *	0.566 (31.09) *
INCPC3		0.223 (3.85) *	0.255 (3.51) *			0.296 (5.31) *
NOILEX 1						
NOILEX2		0.127 (10.65) *	0.086 (4.74) *		0.126 (8.74) *	0.126 (8.91) *
NOILEX3		0.046 (1.68)	0.045 (1.40)		0.034 (1.02)	0.070 (3.19) *
STDCF1						
STDCF2					0.544 (6.10) *	0.544 (6.21) *
STDCF3						
PPPR1						
PPPR2						
PPPR3					0.497 (10.78) *	0.216 (0.14)
Constant/Intercept	-1.562	1.042	1.020	-3.401	1.211	1.171
R2	0.47	0.50	0.43	0.45	0.46	0.48
R2 adjusted	0.45	0.45	0.39	0.42	0.42	0.43

\* - significant at 1% level  
\*\* - significant at 5% level

-16-

Sources of Nominal Protection Coefficients (NPC) and Economic and Financial  
Prices used to compute NPC

<u>Country</u>	<u>Report No./(Author)</u>	<u>Title</u>
Germany	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects. An International comparison.
France	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects. An international comparison.
U.K.	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects. An international comparison.
Japan	World Bank Reprint Services No. 173	Price distortions in Agriculture and their effects. An international comparison.
Yugoslavia	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects. An International comparison.
Argentina	W.B. Staff Working Paper No. 386	Argentina: Country case study of Agricultural prices and subsidies .
Egypt		Agricultural price management in Egypt.
Pakistan	W.B. Staff Working Paper No. 387	Prices, taxes and subsidies in Pakistan Agriculture 1960-1976

-17-

Thailand	World Bank Reprint Series No. 173	Price distortions in Agriculture and their effects: An International comparison.
Korea	Joseph Wambia	Korea: Agriculture Sector Study (draft).
Philippines	Staff Appraisal Report No. 2695-PH	Philippines: Rainfed Agricultural Development (ILOILO) Project.
India	Staff Appraisal Report No. 3629-IN	India: Fourth Agricultural Refinance and Development Corporation Credit Project.
Brazil	Staff Appraisal Report No. 3635-BR	Brazil: Northwest Region Development Program - Phase II Mato Grosso Development Project.
Colombia	Staff Appraisal Report No. 3661-CO	Colombia: Second Integrated Rural Development Project.
Turkey	Report No. 3641-TU	Turkey: Industrialization and Trade Strategy Volume II - Main report.
Tunisia	(Judith Graves)	The Impact of Government Intervention on Agricultural prices in Tunisia.
Yemen (PDRY)	ULG Consultants Report	PDRY - Study on Agricultural prices and subsidies.

-18-

Ivory Coast	Bela Bellasa et al	Incentives and Resource costs in the Ivory Coast.
Ivory Coast	African Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Nigeria	African Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Nigeria	Western Africa Regional Office (Ag. sector note - final version)	Agricultural Marketing and Prices in Nigeria's Green Revolution - recent Developments and Policy Issues.
Cameroon	Regional Projects Department Western Africa Regional Office Report No. 1479-CM.	Cameroon: Appraisal of a Rural Development Fund Project.
Cameroon	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Zambia	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Senegal	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Sudan	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Sudan	Africa Strategy Review Group Report No. 1836-SU	Sudan: Agricultural Sector Survey.
Togo	Africa Strategy Review Group	Accelerated Development in Sub-Saharan Africa.
Ghana	Western Africa Country Programs - Report No. 1769-GH	Ghana: Agricultural Sector Review.

-19-

Kenya	Eastern Africa Region Report - Report No. 3456-KE.	Kenya: Country Economic Memorandum and Annex on Agricultural Issues.
Malawi	African Strategy Review Group	Accelerated Development in Sub- Saharan Africa.
Mali	African Strategy Review Group	Accelerated Development in Sub- Saharan Africa.
Upper Volta	African Strategy Review Group	Accelerated Development in Sub- Saharan Africa.

Table 1

Results of Stepwise Regression for Nominal Protection  
Coefficients (F statistics in parenthesis)

Independent Variables	Linear Function					
	ADNPC-I	ADNPC-II	ADNPC-III	NPC-I	NPC-II	NPC-III
AGGDP	-0.118x10 <sup>-1</sup> (12.29) *	-0.121x10 <sup>-1</sup> (11.83) *		-0.880x10 <sup>-2</sup> (5.23) *	-0.970x10 <sup>-2</sup> (5.79) *	
AGLPC	-0.382 (9.16) *	-0.378 (8.65) *		-0.389 (7.31) *	-0.386 (7.12) *	
INCPC	0.279x10 <sup>-4</sup> (3.54) *	0.235x10 <sup>-4</sup> (0.97)		0.184x10 <sup>-4</sup> (1.19)	0.252x10 <sup>-4</sup> (1.32)	
NOILEX	-	-0.175x10 <sup>-3</sup> (0.043)				
PPPR	-				-0.274 (0.39)	
STDCF	-					
D1	-0.288 (4.35) *	-0.288 (4.29) *		-0.290 (3.41) *	-0.287 (3.32) *	
D2	-	0.288x10 <sup>-1</sup> (0.042)	0.605 (7.70) *		-0.852x10 <sup>-1</sup> (0.29)	0.790 (5.83)
D3	-0.183 (5.58) *	-0.158 (1.26)	-0.440 (4.04) *	-0.238 (7.33) *	-0.172 (1.15)	
AGGDP2	-		-0.160x10 <sup>-1</sup> (11.43) *			-0.126x10 <sup>-1</sup> (6.40) *
AGGDP3			0.559x10 <sup>-3</sup> (0.01)			0.137x10 <sup>-2</sup> (0.06)
AGLPC1	-		-0.580 (5.00) *			-0.593 (4.03) *
AGLPC2	-		-0.618 (5.81) *			-0.550 (3.58) *
AGLPC3	-					-0.164 (0.86)
INCPC2	-		-0.253x10 <sup>-4</sup> (0.72)			
INCPC3	-		0.126x10 <sup>-3</sup> (8.53) *			0.167x10 <sup>-2</sup> (6.93) *
NOILEX2			-0.191x10 <sup>-2</sup> (2.90) *			-0.134x10 <sup>-2</sup> (1.97) **
NOILEX3			0.273x10 <sup>-2</sup> (3.39) *			0.356x10 <sup>-2</sup> (4.41) *
PPPR2						-0.561 (1.74)
PPPR3						-0.959 (2.38) **
Constant/Intercept	1.422	1.407	1.042	1.540	1.609	1.174
R2	0.40	0.40	0.43	0.30	0.30	0.34
R2 adjusted	0.38	0.37	0.39	0.27	0.27	0.29

\* = significant at 1% level

\*\* = significant at 5% level

-12-  
Table 1  
Results of Stepwise Regression for Nominal Protection  
Coefficients (F statistics in parenthesis)

Independent Variables	Linear Function					
	ADNPC-I	ADNPC-II	ADNPC-III	NPC-I	NPC-II	NPC-III
AGGDP	-0.118x10-1 (12.29) *	-0.121x10-1 (11.83) *		-0.880x10-2 (5.23) *	-0.970x10-2 (5.79) *	
AGLPC	-0.382 (9.16) *	-0.378 (8.65) *		-0.389 (7.31) *	-0.386 (7.12) *	
INCP	0.279x10-4 (3.54) *	0.235x10-4 (0.97)		0.184x10-4 (1.19)	0.252x10-4 (1.32)	
NOILEX	-	-0.175x10-3 (0.043)				
PPPR	-				-0.274 (0.39)	
STDCF	-					
D1	-0.288 (4.35) *	-0.288 (4.29) *		-0.290 (3.41) *	-0.287 (3.32) *	
D2	-	0.288x10-1 (0.042)	0.605 (7.70) *		-0.852x10-1 (0.29)	0.790 (5.83)
D3	-0.183 (5.58) *	-0.158 (1.26)	-0.440 (4.04) *	-0.238 (7.33) *	-0.172 (1.15)	
AGGDP2	-		-0.160x10-1 (11.43) *			-0.126x10-1 (6.40) *
AGGDP3			0.559x10-3 (0.01)			0.137x10-2 (0.06)
AGLPC1	-		-0.580 (5.00) *			-0.593 (4.03) *
AGLPC2	-		-0.618 (5.81) *			-0.550 (3.58) *
AGLPC3	-					-0.164 (0.86)
INCP2	-		-0.253x10-4 (0.72)			
INCP3	-		0.126x10-3 (8.53) *			0.167x10-2 (6.93) *
NOILEX2			-0.191x10-2 (2.90) *			-0.134x10-2 (1.97) **
NOILEX3			0.273x10-2 (3.39) *			0.356x10-2 (4.41) *
PPPR2						-0.561 (1.74)
PPPR3						-0.959 (2.38) **
Constant/Intercept	1.422	1.407	1.042	1.540	1.609	1.174
R2	0.40	0.40	0.43	0.30	0.30	0.34
R2 adjusted	0.38	0.37	0.39	0.27	0.27	0.29
* = significant at 1% level						
** = significant at 5% level						

Table 3  
Results of Stepwise Regression for Nominal Protection  
Coefficients (F statistics in parenthesis)

Independent Variables	Log Function					
	ADNPC-I	ADNPC-II	ADNPC-III	NPC - I	NPC - II	NPC - III
AGLPC	-0.260 (32.57)			-0.298 (36.53) *		
INCPC	0.262 (16.60) *			0.414 (32.99) *		
NOILEX	0.080 (11.59) *			0.100 (15.18) *		
AGGDP	0.145 (2.37) **			0.486 (18.71) *		
STDCF				0.384 (6.18) *		
D1	-0.360 (7.78) *			-0.284 (3.93) *		
D2		-4.27 (18.48)			-6.418 (32.93) *	-6.377 (33.02) *
D3	-0.116 (2.50) **	-2.132 (2.53) *	-2.154 (2.32) **	-0.207 (6.70) *		-3.241 (4.73) *
AGGDP1		-0.148 (4.30) *	-0.099 (5.79) *			
AGGDP2		0.343 (7.78) *	-0.154 (17.16) *		0.719 (23.97) *	0.719 (24.43) *
AGGDP3		0.090 (0.23)	0.094 (0.230)			0.333 (2.18) **
AGLPC1		-0.182 (0.68)				
AGLPC2		-0.354 (31.14) *	-0.298 (36.10) *		-0.373 (29.13) *	-0.373 (29.69) *
AGLPC3		-0.092 (1.58)	-0.112 (2.34) **		-0.082 (1.35)	-0.125 (2.70) *
INCPC1					0.051 (5.32) *	0.056 (6.33)*
INCPA2		0.396 (18.82) *			0.566 (30.50) *	0.566 (31.09) *
INCPC3		0.223 (3.85) *	0.255 (3.51) *			0.296 (5.31) *
NOILEX 1						
NOILEX2		0.127 (10.65) *	0.086 (4.74) *		0.126 (8.74) *	0.126 (8.91) *
NOILEX3		0.046 (1.68)	0.045 (1.40)		0.034 (1.02)	0.070 (3.19) *
STDCF1						
STDCF2					0.544 (6.10) *	0.544 (6.21) *
STDCF3						
PPPR1						
PPPR2						
PPPR3					0.497 (10.78) *	0.216 (0.14)
Constant/Intercept	-1.562	1.042	1.020	-3.401	1.211	1.171
R2	0.47	0.50	0.43	0.45	0.46	0.48
R2 adjusted	0.45	0.45	0.39	0.42	0.42	0.43

\* - significant at 1% level  
\*\* - significant at 5% level

Table 1

RESULTS OF STEPWISE REGRESSION FOR NOMINAL PROTECTION  
COEFFICIENTS (F statistics in parentheses)

	INDEPENDENT VARIABLES	1	2	LINEAR FUNCTION		5	6	7	8	9	10	11	12	13
		ADNPC-I	ADNPC-II	ADNPC-III	NPC-I	NPC-II	NPC-III							
1	AGGDP	$-0.118 \times 10^{-1}$ (2.29) *	$-0.121 \times 10^{-1}$ (11.83) *		$-0.880 \times 10^{-2}$ (5.23) *	$-0.970 \times 10^{-2}$ (5.79) *								
2	AGLPC	$-0.282$ (9.16) *	$-0.278$ (8.65) *		$-0.389$ (7.31) *	$-0.386$ (7.12) *								
3	INPC	$0.279 \times 10^{-4}$ (3.54) *	$0.235 \times 10^{-4}$ (0.97) *		$0.184 \times 10^{-4}$ (1.19) *	$0.252 \times 10^{-4}$ (1.32) *								
4	NOILEX	-	$-0.176 \times 10^{-3}$ (0.043)											
5	PPPR	-				$-0.274$ (0.39) *								
6	STDCF	-												
7														
8	D1	$-0.288$ (4.35) *	$-0.288$ (4.29) *		$-0.290$ (3.41) *	$-0.287$ (3.32) *								
9														
10	D2	-	$0.288 \times 10^{-1}$ (0.042) *	$0.605$ (7.70) *		$0.852 \times 10^{-1}$ (0.29) *	$0.790$ (5.83) *							
11														
12	D3	$-0.183$ (5.58) *	$-0.158$ (1.26) *	$-0.440$ (4.04) *	$-0.238$ (7.33) *	$-0.172$ (1.15) *								
13														
14	AGGDP2	-		$-0.160 \times 10^{-1}$ (11.43) *			$-0.126 \times 10^{-1}$ (6.40) *							
15														
16	AGGDP3	-		$0.559 \times 10^{-3}$ (0.08) *			$0.137 \times 10^{-2}$ (0.06) *							
17														
18	AGLPC1	-		$-0.580$ (5.00) *			$-0.593$ (4.03) *							
19														
20	AGLPC2	-		$-0.618$ (5.81) *			$-0.550$ (3.58) *							
21														
22	AGLPC3	-					$-0.164$ (0.86) *							
23														
24	INPC2	-		$-0.253 \times 10^{-4}$ (0.72) *										
25														
26	INPC3	-		$0.126 \times 10^{-3}$ (8.53) *			$0.167 \times 10^{-2}$ (6.93) *							
27														
28	NOILEX2	-		$-0.191 \times 10^{-2}$ (2.90) *			$-0.134 \times 10^{-2}$ (1.97) *							
29														
30	NOILEX3	-		$0.273 \times 10^{-2}$ (3.39) *			$0.356 \times 10^{-2}$ (4.41) *							
31														
32	CONSTANT													
33	PPPR2	-					$-0.561$ (1.74) *							
34	PPPR3	-					$-0.959$ (2.38) *							
35	CONSTANT / INTERCEPT	1.422 *	1.407 *	1.042	1.540 *	1.609 *	1.174 *							
36	R <sup>2</sup>	0.40 *	0.40	0.43 *	0.30 *	0.30 *	0.34 *							
37														
38	R <sup>2</sup> ADJUSTED	0.38 *	0.37	0.39 *	0.27 *	0.27 *	0.29 *							
39														
40														

\* = SIGNIFICANT AT 1% LEVEL  
\*\* = SIGNIFICANT AT 5% LEVEL

- Table 3 -

RESULTS OF STEPWISE REGRESSION FOR NOMINAL PROTECTION  
COEFFICIENTS (F-STATISTICS IN PARENTHESES)

		1	2	3	4	5	6	7	8	9	10	11	12	13
INDEPENDENT VARIABLES		LOG FUNCTION												
		ADNPC-I	ADNPC-II	ADNPC-III	NPC-I	NPC-II	NPC-III							
1	AGLPC	-0.260 (32.57) *			-0.298 (36.53) * ✓									
2	INCP	0.262 (16.60) x			0.414 (32.99) * ✓									
3	NOILEX	0.080 (11.59) *			0.100 (15.18) * ✓									
4	AGGDP	0.145 (2.37) **			0.486 (18.71) * ✓									
5	STDCF				0.384 (6.18) * ✓									
6	D1	-0.360 (7.78) *			-0.284 (3.93) * ✓									
7	32		-4.27 (18.48) ✓			-6.418 (32.93) * ✓		-6.377 (33.02) * ✓						
8	D3	-0.116 (2.50) **	-2.132 (2.53) * ✓	-2.154 (2.32) ** ✓	-0.207 (6.70) * ✓			-3.241 (4.73) * ✓						
9														
10	AGGDP1		-0.148 (4.30) * ✓	-0.099 (5.79) * ✓										
11														
12	AGGDP2		0.343 (17.78) * ✓	-0.154 (17.14) * ✓		0.719 (23.97) * ✓		0.719 (24.43) * ✓						
13														
14	AGGDP3		0.090 (0.23) ✓	0.094 (0.230) ✓				0.333 (2.18) ** ✓						
15														
16	AGLPC1		-0.182 (0.68) ✓											
17														
18	AGLPC2		-0.354 (31.14) * ✓	-0.298 (36.10) * ✓		-0.373 (29.13) * ✓		-0.373 (29.69) * ✓						
19														
20	AGLPC3		-0.092 (1.58) ✓	-0.112 (2.34) ** ✓		-0.082 (1.35) ✓		-0.125 (2.70) * ✓						
21														
22	INCP1					-0.051 (5.32) * ✓		-0.056 (6.33) * ✓						
23														
24	INCP2		0.396 (18.82) * ✓			0.566 (30.50) * ✓		0.566 (31.09) * ✓						
25														
26	INCP3		0.223 (3.85) * ✓	0.225 (3.51) * ✓				0.296 (5.31) * ✓						
27														
28	NOILEX1													
29	NOILEX2		0.127 (10.65) * ✓	0.086 (4.74) * ✓		0.126 (8.74) * ✓		0.126 (8.91) * ✓						
30	NOILEX3		0.046 (1.68) ✓	0.045 (1.40) ✓		0.034 (1.02) ✓		0.070 (3.19) * ✓						
31	STDCF1													
32	STDCF2					0.544 (6.10) * ✓		0.544 (6.21) * ✓						
33	STDCF3													
34	PPPR1													
35	PPPR2													
36	PPPR3					0.497 (10.78) * ✓		0.216 (0.14) ✓						
37	CONSTANT / INTERCEPT	-1.562 ✓	1.042 ✓	1.020 ✓	-3.401 ✓	1.211 ✓		1.171 ✓						
38	R <sup>2</sup>	0.47 ✓	0.50 ✓	0.43 ✓	0.45 ✓	0.46 ✓		0.48 ✓						
39	R <sup>2</sup> ADJUSTED	0.45 ✓	0.45 ✓	0.39 ✓	0.42 ✓	0.42 ✓		0.43 ✓						
40		* = SIGNIFICANT AT 10% LEVEL ** = SIGNIFICANT AT 5% LEVEL												