

UNIVERSITY OF CAPE TOWN

SCHOOL OF ECONOMICS

REGULATION OF SOUTH AFRICAN AGRICULTURE -
PERFORMANCE OF AGRICULTURAL MARKETING BOARDS

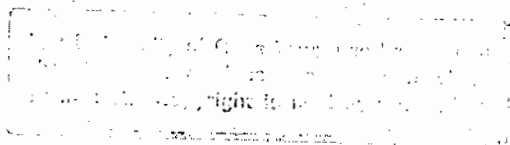
BY

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FRANCIS WILSON OF THE SCHOOL OF ECONOMICS IN FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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ABSTRACT

The object of this thesis is to examine the policies of South African agricultural marketing boards, both as separate entities and within the broader context of South African agricultural policy.

Stabilisation and subsidisation are examined from a theoretical standpoint and the analysis supported with empirical evidence. The possibility of a centralised policy of price control is considered and a technique suggested whereby such a policy might be implemented. It is suggested, however, that market uncertainty and the vast amount of information necessary make such an ambitious programme of market control unworkable in practice.

The policies followed by some of the major marketing boards are examined. Three possibilities are identified:

- i) Revenue maximisation
- ii) Revenue stabilisation
- iii) Price/quantity stabilisation

In view of the wide differences between the boards in respect of type of product handled and export possibilities, it is to be expected that they will follow divergent policies. The evidence presented suggests, however, that the boards have not used their monopoly powers in the manner predicted by conventional economic theory. In the case of several of the boards, price policy seems to have been neutral.

The reason for this disparity between theory and empirical observation is discussed. The behaviour of South African agricultural marketing boards is related to evidence on regulatory authorities in the United States. It is suggested that close parallels exist. Due to different property rights arrangements, the conventional monopoly profit maximisation model is inapplicable. Instead, marketing boards follow a variety of other policies. Whilst the objectives of the marketing

boards may not always be clear, it can be concluded that in certain significant cases, the results have been little different from those generated by the free market. It is stressed, however, that marketing boards are political rather than economic organisations and political constraints are likely to be overriding.

This view is further confirmed by an examination of agricultural policy over the last fifty years. It is argued that policy has been dictated by political reality rather than economic rationality. The rôle of the economist has been to offer evidence in support of predetermined policies.

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENTS	(ii)
ABSTRACT	(iv)
TABLE OF CONTENTS	(vi)
LIST OF APPENDICES	(ix)
CHAPTER ONE	THE PROBLEM STATED
1.1	INTRODUCTION
1.2	THESIS OUTLINE
CHAPTER TWO	SOUTH AFRICAN AGRICULTURE - THE PRESENT STRUCTURE
2.1	INTRODUCTION
2.2	HISTORICAL BACKGROUND
2.3	THE STRUCTURE AT PRESENT
2.4	ASPECTS OF MARKETING POLICY
2.5	MAJOR PRODUCTS
CHAPTER THREE	STABILISATION - THEORY AND PRACTICE
3.1	INTRODUCTION
3.2	CAUSES OF AGRICULTURAL MARKET INSTABILITY
3.3	THE TIME-LAG EXPLANATION
3.4	STOCKS, UNCERTAINTY AND RISK
3.5	EXPECTATIONS
3.6	PRICE STABILISATION SCHEMES
3.7	A FLOOR/CEILING PRICE SCHEME
3.8	IS MARKET INSTABILITY UNDESIRABLE?

		PAGE
CHAPTER FOUR	SUBSIDIES IN AGRICULTURE	59
4.1	INTRODUCTION	59
4.2	MEASUREMENT	60
4.3	THE THEORY OF SUBSIDIES	65
4.4	DISTRIBUTION EFFECTS - THEORY	69
4.5	DISTRIBUTION IN SOUTH AFRICA	71
4.6	CONCLUSION. ARE THE SUBSIDIES JUSTIFIED?	80
CHAPTER FIVE	MARKETING BOARD PERFORMANCE	84
5.1	INTRODUCTION	84
5.2	POLICY PRESCRIPTIONS	86
5.3	THE EMPIRICAL EVIDENCE	91
5.4	THE PERFORMANCE OF THE BOARDS	94
5.5	THE THEORY OF REGULATION	98
5.6	CONCLUSION	99
CHAPTER SIX	CENTRALISATION AND CONTROL	102
6.1	INTRODUCTION	102
6.2	AGRICULTURAL SUPPLY FUNCTIONS	103
6.3	SUPPLY FUNCTIONS IN SOUTH AFRICA	106
6.4	WINTER CEREALS	108
6.5	DISCUSSION	112
6.6	SUMMER CROPS	114
6.7	CONCLUSION	117
CHAPTER SEVEN	AGRICULTURAL POLICY IN SOUTH AFRICA - AN EVALUATION	124
7.1	INTRODUCTION	124
7.2	VILLIAN NO. 1: FOREIGN COMPETITION	125
7.3	VILLIAN NO. 2: THE DISTRIBUTOR	131

	PAGE
7.4	139
	VILLIAN NO. 3: THE CONSUMER
7.5	140
7.6	143
	THE QUESTION OF SUBSIDIES THE PROBLEM OF CENTRALI- SATION
CHAPTER EIGHT	149
	THE THEORY OF ECONOMIC REGULATION
8.1	149
	INTRODUCTION
8.2	152
	THE THEORY OF MONOPOLY
8.3	155
	THE AMERICAN EXPERIENCE
8.4	157
	THE THEORY OF BUREAUCRACY
8.5	158
	THEORIES OF REGULATION
8.6	164
	CONCLUSION
APPENDICES	169
FIG. 1	191
FIG. 2	192
FIG. 3	193
FIG. 4	194
FIG. 5	195
FIG. 6	196
FIG. 6A	197
FIG. 7	198
FIG. 8	199
FIG. 9	200
FIG. 10	201
FIG. 11	202
FIG. 12	203
FIG. 13	204
FIG. 14	205
FIG. 15	206
BIBLIOGRAPHY	207

LIST OF APPENDICES

		PAGE
APPENDIX 1	CORRELATIONS: PERCENTAGE OF OUTPUT OF EACH PRODUCT ACROSS 60 ECONOMIC REGIONS	169
APPENDIX 2	NUMBER OF STAFF EMPLOYED AND SALARIES PAID BY EACH MARKETING BOARD 1973-4	170
APPENDIX 3	INFLATION INDEXED PRICE SUPPORTS	171
APPENDIX 4	THE REWARD FOR IGNORANCE	176
APPENDIX 5	THE COBWEB MODEL	178
APPENDIX 6	LINEAR REGRESSION	182
APPENDIX 7	THE WELFARE TRIANGLE	188
APPENDIX 8	THE NERLOVE MODEL	189

CHAPTER ONE

THE PROBLEM STATED

1.1 INTRODUCTION

1.1.1 Forty years ago the Marketing Act ⁽¹⁾ was passed in an atmosphere of acrimony and ambiguity. It became law on 8th May, 1937.

1.1.2 Its passage through the legislative procedures of Parliament was characterised by clear and fundamental differences of opinion on issues as basic as the functions of the free enterprise system and the rôle of the State in influencing economic decision making. The debate in the House of Assembly was both heated and acrimonious and this in many ways reflected the response which the issue of controlled marketing evoked amongst the economic profession in South Africa as a whole - a controversy which now appears as history in the pages of the South African Journal of Economics. ⁽²⁾

1.1.3 This seems to be a suitable time to consider and attempt to evaluate the agricultural policies which have been followed for the past forty years. Recent evidence ⁽³⁾ suggests that the problems of agricultural marketing were not solved by the Marketing Act. Thus an examination of marketing policies is of more than historical interest. It may provide us with certain information of a prescriptive kind indicating policies that should be followed in the future. No comprehensive study has been carried out of marketing board policies in South Africa over the last forty years, despite

(1) Act No.26, 1937.

(2) See various issues of the South African Journal of Economics, 1936 - 1938.

(3) See, for example, Report of the Commission of Enquiry into Agriculture, Third (Final) Report, RP 19/1972.

the influence of this sector on labour markets,⁽¹⁾ foreign exchange markets and commodity markets. Most discussions of marketing policy have been descriptive rather than analytical.

1.1.4 In returning to the debate of the 1930s, there are two major objectives:

1.1.5 a) To review the activities of the marketing boards and to evaluate them. We are concerned not only to pass judgement on the boards. In the course of the Economists' Protest debate, the participants made fairly precise predictions. We are, therefore, entitled to pose the question: Have these predictions proved correct? In effect, we are putting economic theory to the test.

1.1.6 b) To attempt to answer larger and more fundamental questions about the nature of State intervention in the economy and how it works. The questions to be asked about agriculture and the control and functioning of agricultural markets are in an important sense part of a wider debate. It is widely observed fact that government interests and organisations are spreading - social welfare, defence, health, pensions, education, full-employment policies. For better or worse, the State takes a direct interest in and responsibility for all of these and as the degree of autonomy of the bureaucrat (resulting from his rapidly expanding responsibilities) increases and his powers of discretion widen, so it becomes more necessary to understand the constraints on and determinants of his behaviour.

1.1.7 These are questions at an empirical level. At a normative level, we may ask whether government intervention has

(1) See J Nattrass, 'Migration Flows in and out of Capitalist Agriculture,' in Francis Wilson, Alide Kooy and Delia Hendrie (eds) Farm Labour in South Africa (Cape Town: David Philip, 1977) pp. 51-61.

proved to be a Good Thing. Returning to the debate of the 1930s, of course, we do so with the benefit of hindsight. We live in a different world now and we should be careful to judge participants in the debate too harshly. Nevertheless, it is something of a puzzle that an issue which was regarded as being of such importance to so many of the economists of the 1930s should have attracted little attention afterwards. It is unfortunate that this should be so, because the questions raised at the time were important ones, and, if anything, the issues are more pressing now than they were then. The debate did not close on a note of agreement - the opposing parties did not even agree to differ: "When an interchange of opinions has reached a certain stage, it begins to verge upon the tedious and the futile." (1)

1.1.8 Though one of the objectives in this thesis is to evaluate the actions of marketing boards, we face an obvious and fundamental difficulty. Evaluation is only possible against some well-defined criterion, but we cannot easily judge the marketing boards in this way for the simple reason that we do not know precisely what they are supposed to be doing. At no point in the Marketing Act is there a statement of the objectives of the Act, nor are the objectives of the boards defined. The first statement of objectives appears in the report of the Cabinet Committee as:

1.1.9 '(a) One more to foster the spirit of independence amongst farmers by enabling them to help themselves instead of continually applying to the government for assistance;

1.1.10 (b) The proper organisation of marketing and the efficient and economic distribution and stabilisation of prices; the ultimate aim being to reduce the margin between the price to

(1) C S Richards, 'Planning and Control in Agriculture: A Rejoinder,' SAJE 6 (1938), pp.427 - 428, p.427.

the consumer and the price to the producer.' (1)

This was clearly an afterthought, however, and whatever these extremely vague policy objectives may mean, it is clear that they do not constitute a binding commitment. Consequently, marketing boards cannot be held accountable to them. They are free to operate in terms of other objectives if they wish.

1.1.11 Conventional economic theory prescribes State intervention in cases of market failure, but clearly, these institutions go far beyond that.

1.1.12 In South Africa in 1977, government spending amounted to 19,4% of GNP, an increase of 221% over the last 7 years. (2) But this figure alone does not give a true indication of the rôle and influence of the State. Public corporations and marketing boards, for example, issue their own budget statements. Their behaviour is crucially important in understanding how the South African economy works. These bodies are endowed with apparently high degrees of monopoly power, but are not directly publically accountable. Can we predict how they will behave? Specifically, how does it behave if an organisation is established, endowed with monopoly powers and if subject to very few constraints except for admonitions of good behaviour, a system of very general surveillance and vaguely defined goals? Does the conventional monopoly model yield accurate predictions in this situation? The question is becoming more important as organisations of this type proliferate.

1.1.13 We need to not only explain the behaviour of these bureaucratic organisations. A satisfactory theory should be able to show why growth of the government sector has been a feature of free enterprise systems. Though the expansion of the public sector has become apparent in the last thirty years, 'the growth of

(1) Committee of the Cabinet appointed to deal with matters concerning the cost of living. Report No. 1, Agricultural Prices and Control Boards (1938), p. 7.

(2) SA Reserve Bank Quarterly Bulletin, September 1978.

government is neither a postwar nor a post-Keynesian experience. It developed over many decades and stretches over the history of the United States. I conjecture that this pattern extends beyond the United States.' (1) It is not our task here to explain the growth of these organisations. But in examining their behaviour, it is necessary that this enquiry should be seen against the broad issues of institutional behaviour. In general, what theory best explains the actions of these large public bodies - conflict, compromise or conspiracy?

1.1.14 Are we to view them as being fundamentally foreign importation into the free enterprise economy - a drag on efficiency and an inhibiting factor to economic growth? In short, an aberration from the normal run of things; because it must be admitted, this is how conventional economic theory must view them. Or are they a necessary part of the market system, either to hold the ring for private enterprise or to provide the necessary stability for the operation of a capitalist economy?

1.1.15 In the past, the theory of monopoly has been invoked to illustrate the operations of the marketing boards. The theory would seem to be a reasonable explanatory tool. One of our tasks will be to analyse the predictive power of the monopoly model in the context of marketing board operations. I^f the monopoly model ^x does not work, then we need another framework to explain behaviour. We need to explain how these organisations arise and how they will behave.

1.1.16 Clearly, these are general questions which have application beyond the sphere of agricultural control policies. There are various reasons, however, for choosing to investigate agriculture. The boards have been functioning for long enough to enable us to pass general judgements on their performance. There is also

(1) K Brunner, 'Reflections on the Political Economy of Government,' Carnegie-Mellon University (mimeo) p.5.

evidence that all is not well with the present structure of agricultural marketing. (1) Broadly speaking, the current policy is to encourage a greater degree of centralisation. This may, of course, be wise. No one can really seriously dispute the desirability of 'co-ordination' as a general principle. No reasonable man is in favour of chaos. But to what end is there to be co-ordination and to what cost?

1.1.17 We cannot attempt to deal with all these problems in this thesis. Instead, specific problems are defined and the tools of orthodox economics applied in an attempt to understand the nature of the forces at work in these areas. Few solutions are offered, though it may be that the analysis offered here will serve to clarify certain areas of debate in South Africa.

1.2 THESIS OUTLINE

1.2.1 Chapter 2 provides a brief factual outline of agriculture in South Africa and the form of marketing boards in operation. Chapter 3 discusses subsidies. Distributional effects of the present subsidy arrangements are examined. Chapter 4 discusses the question of market stabilisation from a theoretical standpoint. It is frequently argued that State intervention is justified in the case of agricultural markets because of their inherent instability. The case for stabilisation is investigated. Difficulties, both theoretical and practical, stand in the way of such market intervention being successful.

1.2.2 In Chapter 5, an empirical examination of marketing board policies is reported. Four marketing boards were chosen, with output representing about 50% by value of total agricultural output in South Africa. The results of the study are not conclusive, but seem effectively to refute the argument that marketing boards have responded only to the interests of producers. Chapter 6 sets out a further empirical study. The possibility of co-ordination is discussed. A method for specifying price response models is suggested and estimation for various crops carried out.

(1) See for example the Report of the Commission of Enquiry into the Marketing Act, (Act No. 59 of 1968), RP39/1976.

The results throw some doubt on the possibility of centralised price co-ordination as a realistic policy option.

1.2.3 In Chapter 7, official policies are reviewed, particularly in respect of subsidisation and centralisation. It is argued that the advice offered to policy makers by a variety of commissions has been misguided.

1.2.4 Chapter 8 attempts to reconcile the various findings. The Theory of Regulation is introduced in an attempt to explain the constant pressure towards greater centralisation together with the apparent failure of the marketing boards to use their powers in the interests of producer members. Agricultural policy in South Africa, it is argued, is a function of overriding political constraints. No economic justification can be found for the policies adopted.

CHAPTER TWO

SOUTH AFRICAN AGRICULTURE - THE PRESENT STRUCTURE

2.1 INTRODUCTION

2.1.1 The structure of the agricultural industry in South Africa is the outcome of a complex interaction of political, economic and historical forces. Combined with the wide climatic variations which exist in different areas of the country, these forces explain the remarkable heterogeneity of South African agriculture. Diversity is, perhaps, the most outstanding feature of farming enterprises in South Africa. Variations in land ownership arrangements and in techniques of production are among the most obvious manifestations of this diversity. In addition, varying distance from markets has also been an important influence in determining the types of farming operations carried out in different parts of the country.

2.1.2 In analysing South African agriculture a distinction is usually drawn between the subsistence sector and the market-oriented sector; between those farmers whose production is planned to meet their own consumption needs and those who market their produce. In practice, the division between subsistence agriculture and market agriculture occurs almost exclusively along racial lines, with approximately 1,1 million Black farmers engaged in mainly subsistence farming in the Homelands while the White commercial farmers, who number approximately 80 000, produce about 95 per cent by value of total recorded agricultural output. On analytical grounds the distinction between subsistence and market-oriented agriculture is important because the economic forces and constraints operating in the two sectors (such as availability of credit and responsiveness to price changes) may be different. Land tenure systems are different and this alone must be counted as a major variable in explaining the differing economic performance of the farmers in the two sectors. Furthermore, since Blacks and Whites do not enter urban labour markets on the same terms, it follows that the opportunity

advantageous to form central organisations to bargain in areas of common interest. Under conditions where complementary production factors or consumers are relatively immobile, such organisations confer on producers, as a group, greater bargaining power than they would have had as individuals. For example, by negotiating as a unit, farmers may, under restricted conditions, achieve a degree of monopoly power in the sale of their produce, or monopsony power in the factor markets.

2.2.2 Whether this is a practical possibility is, in most situations, very questionable. The requirement that factors of production or customers be immobile is seldom met in practice, especially in the long run.

'Taken by and large co-operators are long on practice and short on theory. The contrast is marked as against such inveterate theorists as the socialist and the single taxer. The latter are well drilled in the reasons for the faith that is in them, albeit they have been able to produce scanty actual achievements against the organised opposition of constituted governments. On the other hand, any small group of persons may enter on business ventures after the co-operative pattern long before they are in a position to answer the highest catechism of co-operative doctrine.' (1)

2.2.3 There is no doubt, however, that by providing information regarding market conditions as well as centralised marketing facilities, co-operative organisations are able to reduce transaction costs, whilst a pooling of risks provides a more stable basis for obtaining credit and entering into long-term contracts.

2.2.4 This was the basis for the agricultural co-operative movement which was initiated in Natal in 1904 and in the Cape Province a year later. The rapid development of the co-operative movement, however, commenced after the passing of the Co-operative Societies Act of 1922, which repealed all previous legislation and became the basis for future policies. Apart from establishing uniformity across all four provinces, the Act included the important

(1) E G Nourse, 'Economic Philosophy of Co-operation,' A E R 12 (1922).

provision for limited liability. By 1924, 105 of these limited liability co-operatives had been established. (1)

2.2.5 An important amendment to the 1922 legislation was the introduction in 1925 of the principle of 'compulsory co-operation,' which involved something more than mere protection of the joint interests of co-operative members. As summed up by the 1934 Commission to enquire into co-operation and agricultural credit:

'The object of compulsory co-operation is
...to gain control of the production so
as to attain control of price.' (2)

In other words, comprehensive monopoly power was aimed at. It was not, however, achieved. The co-operatives were never able to achieve the total control necessary for monopoly power, nor were they able to insulate the agricultural sector against the economic and natural disasters of the 1930s.

2.2.6 This was hardly surprising.

'Remember, the aim of co-operative marketing is not to fix prices - that can't be done unless you have absolute control of an industry. The aim is to control flow of supply as to time, place and quantity so that you have something to say about conditions that affect price values.' (3)

- (1) D S Schmidt, 'Ko-operasiewese,' Department of Agricultural Economics and Marketing. 'Die Staat se Bydrae tot Landbou-ekonomiese Dienste en Navorsing in Suid-Afrika 1925 - 75.' Symposium held in Pretoria, 17 October 1975.
- (2) Commission to Enquire into Co-operation and Agricultural Credit, UG 16/1934, p.14.
- (3) A Sapiro, An Analysis of Marketing, Fundamental Principles of Co-operation, Chicago, Am. Farm. Bur. Fed. Address delivered 11 December 1923, Fifth Annual Meeting, Am. Farm. Bur. Fed. Reprinted in F V Waugh, Readings on Agricultural Marketing, (Ames, Iowa: Iowa State College Press, 1954), pp. 384-386, p.385.

The conditions necessary for co-operatives to manipulate markets are, in general, absent: Customers generally do have choices and factors of production are relatively mobile in agriculture, especially in the long run. It was, therefore, entirely predictable that co-operatives should have failed in their monopolistic objectives.

2.2.7 The decade before the Second World War proved to be a difficult period for agriculture. Drought and disease combined with low world prices to produce a slump both prolonged and indiscriminate in its effects. Many White farmers were forced off the land and the system of co-operatives was shown to be quite unable to cope with so great an economic dislocation. In response to this state of affairs, the 1934 Commission to Enquire into Co-operation and Agricultural Credit, set up to examine the situation, had little comfort to offer. An examination of the failures of co-operatives suggested to the Commission no weakness in the principle of co-operatives, but rather the natural consequences of business risks, a conclusion which seems rather complacent in view of the fact that 233 of the 639 co-operatives registered up to June 1933 had, in fact, suffered liquidation. Despite these failures the Commission supported the principle of co-operation though not the principle of 'compulsory co-operation' embodied in the 1925 Amendment. The Report of the Commission was also categorical in its objection to producer-dominated marketing organisations.

2.2.8 The Marketing Act of 1937, though passed as a result of what was perceived to be the failure of the co-operative system to stabilise and maintain agricultural incomes, did not, in fact, weaken or replace the co-operatives. In fact, co-operative societies grew in numbers, influence and diversity of operation. (1)

(1) Co-operatives benefited from the Control Board system in two ways; ^Y
 'In the first place, excluding the case of export products, it was relieved of the worries caused by price levels and price fluctuations. A large section of the farmers erroneously thought, and still think, that the movement is capable of controlling prices fully; and the fact that it proved, and must needs prove, incapable of doing this as a voluntary movement, retarded its growth.

In the second place, the co-operatives came to occupy the principle position among the agents of the Control Boardsit afforded them

2.2.12 The economic costs arising from the activities of co-operatives would be difficult to measure. To the extent that business is discouraged from entering fields where co-operatives are already established and (very importantly) where they might be established in the future, economic costs are high. To the extent that co-operatives reduce transport and information costs and perform an insurance function by bearing risks, economic efficiency is encouraged. But even in this rôle it is not justifiable that that they receive favourable tax treatment. (1)

2.3. THE STRUCTURE AT PRESENT

2.3.1 a) The Ministry of Agriculture is divided into three departments:

- i) Agricultural Technical Services
- ii) Agricultural Economics and Marketing
- iii) Agricultural Credit and Land Tenure

The Department of Agricultural Economics and Marketing is of particular interest to us. It is responsible for the determination of agricultural policy, the maintenance of the system of organised marketing and the stabilisation of prices through the system of control boards. (2) Advice on these matters is furnished by the National Marketing Board. In addition, the department is expected to provide services to co-operatives, assistance to farmers during emergencies and various other functions.

2.3.2 The department consists of a Secretariat, the Economic Services Branch, the National Marketing Board, the office of the Registrar of Co-operative Societies and the Divisions of Administrative Services, Inspection Services, Agricultural Production Economics and Agricultural Marketing Research. The administration of the Marketing Act is, however, probably its most important function.

(1) In addition, co-operatives have other advantages.

'If both a co-op and an ordinary firm operate in a given area, the position of the former is further strengthened by the fact that it may receive the produce of non-members, whereas the ordinary firm cannot collect that of members of the co-operative.'

RP 78/1967, p.42.

(2) This section is taken substantially from Agriculture in South Africa 1976, (Johannesburg: Chris van Rensburg Publications, 1976) and the South African Yearbook.

2.3.3 b) The National Marketing Council, consisting of a Chairman and four members appointed by the State President, concerns itself with all aspects associated with the implementation of the Marketing Act. It is required to supervise the activities of existing Marketing Boards and in particular, to offer advice on the implementation of new marketing schemes.

2.3.4 c) The South African Agricultural Union (SAAU) is a federation of the various farmers' associations. At the base of the structure are the farmers' associations and above that, various levels of administrative bodies at provincial and national level, in each case consisting of an executive committee, advisory committees and commodity committees. At both provincial and national level there is a congress and a general council which functions as an extension of congress. As the only national body, the SAAU claims to be the spokesman for the farming community. The SAAU has no individual farmer members. It consists of 19 affiliated bodies. These are the four provincial agricultural unions and the South West African agricultural union, nine central commodity co-operatives, a union of the three wool co-operatives, the Federated Agricultural Co-operative of SA Ltd and three specialist associations - the Wool Growers' Association, the Sugar Growers' Association and the Poultry Association of South Africa.

2.3.5 There are more than 2 000 farmers' associations. Over 75% of all farmers are members of these associations. The regional and district agricultural unions form the link between the farmers' associations and the provincial agricultural union.

2.3.6 d) The Land and Agricultural Bank of South Africa was established in 1912. It functions in terms of Act No. 13, 1944 as amended. It is an autonomous institution, responsible to Parliament through the Minister of Finance. The Board and the General Manager are appointed by the State President. The Bank was established specifically to provide credit for farmers in South Africa (and later, South West Africa). It advances money to farmers and, in particular, provides credit to agricultural co-operatives, to control boards and statutory agricultural institutions. However, loans of various

types are granted both to individual farmers and to agricultural co-operatives.

e) Co-operative Societies can be divided into two groups:

- i) Agricultural Co-operatives
- ii) Trading Co-operatives

i) Agricultural co-operatives are restricted by law⁽¹⁾ to specific objectives, viz the marketing of agricultural produce and livestock in processed and unprocessed form, the manufacture and supply of farming requisites, the rendering of certain services such as ploughing and spraying and the provision of insurance to farmers. In addition, agricultural co-ops act as agents for control boards in handling, distributing and storing various agricultural products. They are estimated to handle about 75% of all agricultural products and livestock offered for sale. Co-operatives function as intermediaries between farmers and the Land Bank in extending credit to farmers.

2.3.8 There are 331 agricultural co-ops. These include two federal and 29 central co-operatives.

2.3.9 ii) In addition, there are 200 trading co-operatives. Of these, 122 are 'consumer' co-ops and 52 are 'home industry' co-ops. Unlike the agricultural co-ops, they are not restricted to specific objectives and they do not have the authority to dispose of agricultural produce to their members.

2.3.10 f) Marketing Control Boards - South African marketing policy is characterised by a system of control boards. The 1937 Marketing Act (Act No. 26, 1937) laid down the procedures by which marketing boards could be established and the legal framework

(1) The Co-operative Societies Act No.29, 1939, as amended.

within which they would operate. A comprehensive array of powers is listed in the Act which might be made available to individual marketing boards. To represent specific interest groups, Producers' Advisory and Consumers' Advisory Councils were set up, while the National Marketing Council was given both investigative and advisory functions to control the whole operation. Provision was made in the Act for members of marketing boards to represent a variety of interests, but a producer majority was a legal requirement.

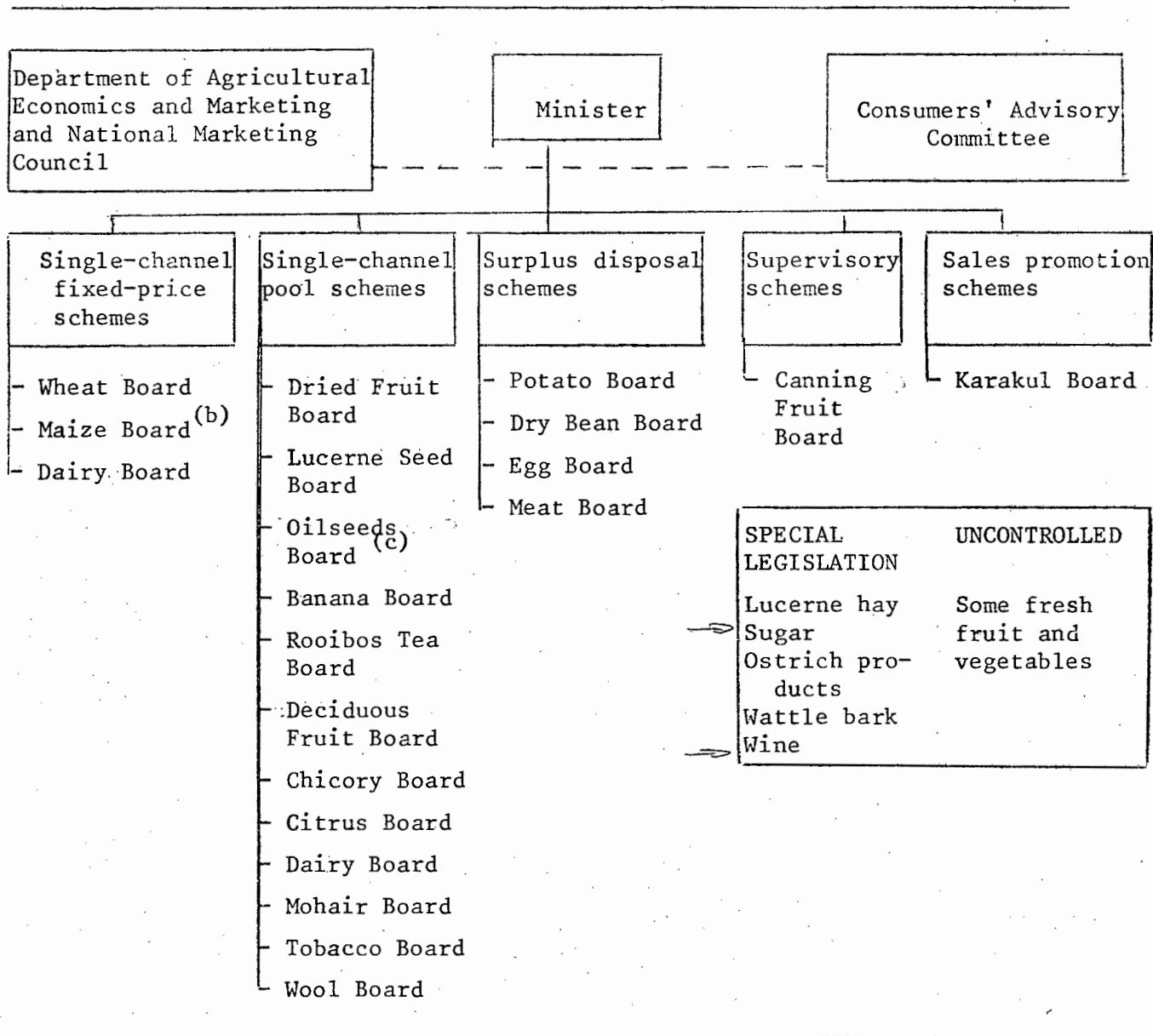
2.3.11 In 1968, the original Marketing Act was repealed and replaced by Act No. 59, 1968. The principle provisions, however, remain the same. In terms of this Act, about 82% by value of total agricultural output is handled by the various boards. Bearing in mind the other important crops such as sugar and which are handled in terms of their own specific legislation ⁽¹⁾ in closely controlled organisations, it is clear that agriculture in South Africa is dominated by central controlling bodies. Certain categories of vegetables are virtually the only products sold on a free market.

2.3.12 Though all function in terms of the same legislation, the powers and methods of operation of the boards differ considerably.

2.3.13 These differences are primarily a function of the nature of the product. Maize, for example, is an annual crop which is relatively cheap to store and transport. It is, therefore, bought by the Board, at a predetermined price from farmers through a system of agents (mainly co-operatives) and either sold locally, exported or channeled into a buffer stock. In the case of meat, the situation is different. Storage and transport are relatively costly, whilst the flow of cattle to abattoirs is continuous throughout the year, though with seasonal variations. After a brief attempt to operate a fixed price scheme, the attempt was

(1) See Table 1.1, p.18.

TABLE 1.1: THE SOUTH AFRICAN AGRICULTURAL CONTROL SYSTEM ACCORDING TO TYPE OF SCHEME (a)



(a) As at 1 July 1972

(b) Including: buckwheat (pool scheme) and grain sorghum (surplus disposal scheme)

(c) Including soya beans (surplus disposal scheme).

Source: C M du Toit, 'Agricultural Marketing Management under the Control Board System,' Agrekon, 11 (1975), pp. 14 - 19.

was abandoned in favour of a floor price scheme, whereby the Meat Board intervenes in the market if the floor falls below a redetermined level. The form of market intervention practised by the Meat Board is slightly more sophisticated than this account would suggest. The Board operates a system of 'floor prices' accompanied by 'support prices'. The floor price establishes an absolute level below which prices are not allowed to fall. Above this, prices may fluctuate freely, but may not fall by more than a certain rate per day or per week. Should this occur, the support price becomes operative to damp the decline. (1)

2.3.14 In addition to these technical differences in control, it is important to note that products differ in other respects. In the case of wool, for example, South Africa is a relatively small exporter by world standards, and hence, the Wool Board has no real influence over the average price received for its product. In addition, only a small fraction of the output is purchased for local processing, so that no matter what policies the Wool Board chooses to follow, it is a price taker. The Maize Board is, in principle, in a better position to influence average price since a significant proportion of the crop is consumed locally. By restricting imports and manipulating the quantity of its product available locally, it has, at least in theory, the ability to determine its own revenue within limits. (2)

2.4 ASPECTS OF MARKETING POLICY

2.4.1 Because of the immense variety of forms of agricultural enterprise to be found in South Africa and the variety of different marketing arrangements, it is difficult to make general statements or to formulate general rules. It does seem, however, that there are three topics that merit attention at this stage:

(1) See 'The Meat Board' issued by the Meat Board. 1974, p.10.

(2) This is discussed in more detail in Chapter 3.

a) Specialisation

Agriculture in South Africa, in common with trends in other countries, reflects a growing tendency towards specialisation. This trend should not be over-emphasised. (1)
Nevertheless, a number of factors can be suggested which reinforce this trend towards specialisation.

- 2.4.3 i) Technological change, represented by availability of specialised equipment which allows farmers to reap the benefits of economies of scale.
- 2.4.4 ii) Cheaper transportation has probably played a rôle here as well. Whereas a small isolated community will not be specialised in production, with improved transportation and communication it is profitable to specialise. Improved transport, in fact, widens the market and, of course, division of labour is determined by the extent of the market.
- 2.4.5 iii) Marketing boards also serve to encourage specialisation. Mixed farming can be seen as a response to risk, ie - the farmer is faced with the possibility of drought, disease, fluctuating prices, etc. It is, therefore, rational for him to spread his risks to the extent that he is a risk averter, by farming different crops. Disease may destroy his crops, but it will not affect his cattle.
- 2.4.6 iv) Price variation is one form of uncertainty. If the farmer does not know what the price will be the following year, he may spread the risk by planting a variety of crops. If the price of one falls, the other

(1) An indication of the extent of specialisation in South African agriculture can be obtained from the matrix in Appendix I. It would appear that though there is a relatively high degree of specialisation in certain regions, this is not the general rule.

may not. Marketing boards, insofar as they stabilise prices and remove a certain amount of risk, will lead to increased specialisation. There are two forces operating here:

2.4.7 In South Africa where some prices are guaranteed but others are not, there will be a tendency for output to shift in favour of those crops whose prices are guaranteed. Even if on average prices remain the same over time, output will nevertheless rise in the case of those crops whose prices are guaranteed. Equivalently, output of non-controlled crops is likely to fall and prices in consequence rise.

2.4.8 Even if all prices are guaranteed, there will still be a shift in production towards specialisation. Farmers would then tend to become more specialised in those products in which they had a comparative advantage.

2.4.9 It is clear that, per se, increased specialisation has advantages. These are to be explained in terms of economies of scale and comparative advantage, both of which constitute a net gain to society. It is equally clear, however, that increased specialisation may impose costs on society which may not be reflected in the calculations of the individual farmer. In the first place, it is important to stress that all that has happened by guaranteeing prices is that risks have been transferred from the farmer to the marketing board and, ultimately, the consumer or tax payer.

2.4.10 Also, there is the environmental argument. For example, disease may spread more rapidly in an area where only one crop is grown. In many cases, also, the risk is being transferred from the farmer to the tax payer in the form of government support and to the consumer in the form of higher prices. These two groups, in effect, may be underwriting the risks of the farming sector.

2.4.11 The extent to which government intervention in agriculture has encouraged the tendency towards specialisation can only be guessed at, but it would seem that the trend towards specialisation, with its associated costs and benefits, has been given further impetus by government actions.

b) Quality Control

2.4.12 Grading and quality control has been a feature of control board activity. This they were entitled to do in terms of 1937 Marketing Act, "with the approval of the Minister from time to time to prohibit any producer from selling the regulated product in question which he has produced, except such classes, grade, quantity or percentage thereof as the Board has determined or except for such purposes as the Board has defined." (1) The effect has been that in the case of many products, standards have been established and often been rigidly enforced. This has often been welcomed. For example, ".....the institution of compulsory grading for many of our farm products can be regarded as the most constructive achievement of the system of regulated marketing." (2)

2.4.13 Yet these sentiments cannot be wholeheartedly endorsed. During the Marketing Act debate in 1937, precisely this question was raised.

2.4.14 Grading involves costs - costs which are borne by both consumers and by producers. By enforcing high quality standards, the quantity of goods reaching the market is reduced and higher prices are required to enable farmers to cover their costs. The meat on sale may be of a relatively high quality, but there may be little of it. It is clear that it is likely to be the poorer consumer who is most affected by this.

2.4.15 Also, by enforcing quality standards, producers may be kept out of the market. Products may have to be destroyed, simply because they do not reach the required standards. Again, it may

(1) Act No. 26, 1937, 20(e).

(2) Van Biljon (1974) p.24.

often be the Black subsistence farmer or smallholder who is most affected by this.

2.4.16 Despite this, there is a common tendency to regard high quality as desirable, per se. Thus the fact that South Africa's sugar is rated the best in the world⁽¹⁾ is not necessarily a good thing. It may have been achieved at high cost.

2.4.17 Grading, of course, provides customers with information. In this respect, it reduces information costs and may be justified. But it may also be used as a means of reducing competition, with heavy costs on marginal producers and marginal consumers. For these reasons it should be viewed with suspicion.

c) Costs of the Boards

2.4.18 During financial year 1973/74, the operating costs of the boards were about R10m.⁽²⁾ This amounts to approximately 0,3% of the value of products handled by the boards. Employment was slightly below 3 000.

2.4.19 In evaluating these figures, one should obviously not interpret these figures as being the net cost to the society of the Marketing Boards. Many of these costs (distribution, grading, etc.) would be borne under a free market system. Indeed, the possibility must be noted that costs under a free market system would be greater than under the marketing board system. It would certainly be more difficult to calculate these costs under a free market system.

2.4.20 Nor should these figures be interpreted as the total direct costs of the marketing board system. Major costs such as factor subsidies and price supports cannot be ignored. These are considered in Chapter 4.

(1) Financial Mail, special supplement on Sugar, 14 June 1974, p.37.

(2) See Appendix 2.

2.5 MAJOR PRODUCTS

2.5.1 Information concerning major agricultural field crops production is included below. These products are analysed in more detail in Chapter 5.

2.5.2 a) Maize is South Africa's most important field crop. It represents approximately 22 % by value of total agricultural output and is the largest single agricultural export product. It is produced over a wide area, principally in the Southern Transvaal and Northern Orange Free State. Under the influence of better production techniques, increased mechanisation and new hybrids, production has increased rapidly since the the early 1950s. The Maize Board consists of 21 members, comprising producers of maize and grain sorghum (12), consumers (2), maize and grain sorghum dealers (2), maize and grain sorghum millers (2), stockfeeders (1), exporters (1) and a representative of the Department of Agricultural Economics and Marketing.

2.5.3 The producer price of maize is fixed annually by the Board with the approval of the Minister of Agriculture. The Board also determines the selling price (ie - the price paid to the Board by millers and other users further down the production chain). In determining these prices, it is intended that the Board will take account of the volume of the current harvest in relation to local demand, changes in production, handling and storage costs, export possibilities and prices, the level of the stabilisation fund and other relevant economic conditions. In 1960, the Board ceased to exercise control on prices charged by merchants for maize and maize products and since May 1971, has not controlled milling prices for maize, though it has the right to reintroduce price control at any time. In addition, the Board enforces grading regulations and is responsible for handling export arrangements. Exports are usually sold by a tender arrangement, although the Board does not consider itself bound to follow this procedure.

2.5.4 The Maize Board operates a single-channel fixed price scheme. The country is divided into three areas. ⁽¹⁾ In area A, where about 95% of output is produced, farmers are required to sell to agents of the Board at prices fixed by the Board. In area B, producers are similarly required to sell to agents of the Board, at a price at least as high as the price fixed in area A. The Board appoints its own agents (usually co-operatives) and requires the registration of all millers and other maize processors. In area C, producers are free to sell the produce as they choose.

2.5.5 An important feature of the Board's activity is the management of the stabilisation fund. This is maintained by a levy on producers and consumers and contributions from the State. ⁽²⁾

2.5.6 The evidence in Figure 7 ⁽³⁾ suggests the importance of the link between world and local prices. During the late 1960s, when a divergence appeared between local and world prices, the stabilisation fund shows a rapid decline. The later recovery in the early 1970s can be attributed to the rapid rise in world prices above local prices. Thus the stabilisation fund may be seen to provide the mechanism which links world and local prices. ⁽⁴⁾

2.5.7 As exports increase as a proportion of the local output, this link with world prices can be expected to become increasingly important. Any attempt to hold local producer prices at a level significantly different from world prices is likely to induce great

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- (1) For a comprehensive account of maize marketing arrangements, see R N Brits, 'The Marketing of South African Maize', SAJE 37(1969), pp198-218.
- (2) The question of State subsidies is discussed in more detail in Chapter 4.
- (3) See p.198.
- (4) The reason for the close link between world and local prices is discussed in more detail in Chapter 8.

instability in the stabilisation fund.

2.5.8 b) Wheat. Until recently, wheat cultivation was confined to the Southwestern Cape region. However, with the introduction of new cultivars, production has expanded rapidly in the Orange Free State. Smaller quantities are produced in the Transvaal and Natal.

2.5.9 Following World War II, South Africa became a net importer of wheat, mainly as a result of increased demand. In most years of the last decade, however, local production has exceeded consumption. A certain amount of imports still occur, however, due to quality differences between local and foreign wheat. South Africa's self-sufficiency in wheat cannot be attributed only to technological advances. Production has, in addition, been encouraged by the policy of maintaining relatively high producer prices. (1)

2.5.10 In addition to wheat, the Wheat Board is responsible for the purchase and distribution of other winter cereals (barley, oats and rye). Like the Maize Board, the Wheat Board operates on a single-channel, fixed price basis, using co-operatives principally as handling agents. In addition, through a system of registration the Board is able to exert a high measure of control over the milling and baking sectors of the industry. Winter cereals may only be imported by the Board or upon the Board's authority. Recently, the method of handling imports has changed, but the Board is still able to exert full control over the quantity of cereals reaching the local market. It cannot, however, control amounts held back by farmers for seed, feed or household use.

2.5.11 The wheat industry is characterised by a high level of control. It was one of the earliest boards to be established (1938) and in 1949, its powers were extended to include the three other crops. In addition to fixing producer and consumer prices (with ministerial approval) the Board enforces a network of other

(1) See Fig.6a, p.197.

regulations relating to quality and the number of bakers and millers. Further down the production line, the various grades of flour and bread, as well as prices, are controlled. In addition, the selling price of bread (a politically sensitive item) is subsidised and subject to price control.

2.5.12 c) Oil seeds. Following a shortage during the Second World War, a government sponsored campaign was launched in 1946 to encourage local production. As a result, South Africa is now self-sufficient in vegetable oil products and is, in fact, a net exporter. This change was achieved by a combination of financial inducements and technological improvements, despite the fact that climatically South Africa is not obviously a suitable country for the cultivation of these crops.

2.5.13 An Oil Seeds Control Board, consisting of 16 members (members represent consumers and oil seed processors, plus two advisory members) was established in 1952. As with most other boards, grading regulations were established and enforced by the Board. The Board operates on a pool system. All groundnuts and sunflower seeds are sold via the Board through a system of agents appointed by the Board. These agents are responsible for handling, grading and storing the products. Producers receive an initial payment (a 'voorskot') on delivery and the remainder (an 'agterskot') after products have been sold. Almost all sunflower seeds are sold locally. In contrast, a significant proportion of groundnuts are exported, either as hand selected eating or unselected as oil or oilcake. Sales are handled either by the Board or through local or overseas dealers.

2.5.14 Production, which occurs mainly in the Southern and Western Transvaal regions, is highly mechanised. Increased production of sunflower seed has been particularly marked in the 1970s. Since the price of sunflower seeds received by producers does not seem to have risen faster than the price of its close substitute in production, maize, the increased production may be

attributable to technological changes. A new variety of foreign cultivars was introduced in 1965 and by 1970/71 was responsible for 60% of entire sunflower production. Nevertheless, production of both groundnuts and sunflower seeds is characterised by a degree of instability. Since the area planted has been growing steadily, the output variations are due probably to climatic factors.

2.5.15 These products are in some way typical of South African agriculture. Production is encouraged for reasons of self-sufficiency. They are tightly controlled in both the economic and technical sphere and grading regulations are strictly enforced. The contradiction between self-sufficiency (which would require maximum production at least cost) and high quality (which reduces production) has not been officially considered or discussed.

CHAPTER THREE

STABILISATION - THEORY AND PRACTICE

3.1 INTRODUCTION

3.1.1 The problem of market stabilisation policy is central to most debates in the area of agricultural economics. The issue is complex, involving as it does, technical questions of market dynamics and the conditions necessary for stability on the theoretical side; it is also of practical importance because of its obvious and immediate relevance to real world policy makers.

3.1.2 It is the object of this chapter to consider aspects of stabilisation policy - theoretical as well as practical - both in a general framework and with particular reference to South Africa. Many of the topics discussed here are not new, but are worthy of careful consideration because, it will be argued, many of the commonly held beliefs in this area are open to serious question. Many of the models which are used to 'explain' problems or 'justify' policies of market intervention are based on such a narrow range of assumptions and exist in such a peculiar world of partial equilibrium that, in fact, no meaningful conclusions can be drawn from them about the real world. The 'cobweb' theorem which we discuss in some detail below is an example of this. Equally, some of the recent work in the field of stabilisation theory, though more sophisticated, is subject to much the same objections as earlier work.

3.1.3 As a first step, we shall consider the theory of agricultural market instability in general and, in particular, the cobweb theorem in its simple form as well as more sophisticated versions. We shall consider whether these arguments provide satisfactory explanations for the behaviour of agricultural markets. We shall then consider the more fundamental question of whether market instability is, in fact, undesirable. Finally, some of the practical problems of income and price stabilisation policy will be discussed.

3.2 CAUSES OF AGRICULTURAL MARKET INSTABILITY

3.2.1 A characteristic of agriculture is that prices and incomes tend to fluctuate over wide ranges within fairly short periods of time. This is not to suggest that price fluctuations do not occur in other sectors, but, it is argued, price instability tends to be greater and less predictable in the case of agriculture. In part, this is due to the seasonal nature of the industry. In the case of vegetables and meat in South Africa, clear evidence exists of seasonal variations in price. ⁽¹⁾ To the extent that these variations can be predicted with some degree of certainty, they do not constitute a serious problem, since both consumer and producer can make plans accordingly. More serious, however, are those fluctuations in price which are not readily predictable. There is no single explanation for these fluctuations, but the most important causes are considered to be:

3.2.2 a) Weather and Natural Hazards. The importance of this factor can be gauged from the observation that in the period 1960 - 74, yield per acre in the South African maize industry fluctuated from trend by an average of 16% per annum and wheat by 11% per annum. ⁽²⁾ This variation is attributable almost entirely to unpredicted factors such as weather variability, although other influences such as variations in the use of fertilizer may also have played a part. The fact that these variations cannot generally be forecast at the time when the production decision is made, means that the farmer operates in a situation of uncertainty.

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- (1) J Ardendorf, Ekonomiese Neigings, die Produksie, Verbruik en Pryse van Vleis in die Unie van Suid-Afrika (D.Comm. Thesis, University of Pretoria, 1958), describes this behaviour in the case of meat. See also Figs. 1 & 3, pp.191 and 193.
- (2) Similar behaviour is reported by W L Niewoudt, 'Risk and Uncertainty in Agriculture,' Agrekon 11 (2) (1972), pp.20-25, p.21.

In the absence of speculation, buffer stocks held by producers or storage by consumers, these unplanned variations of output are likely to be directly reflected in variations in price.

3.2.3 b) Speculation. Fluctuations in commodity markets, particularly in international markets, are often attributed to the activities of speculators. In fact, speculative behaviour may influence markets in two ways:

i) Stabilising - when the price falls, speculators buy stocks anticipating a future rise in price. This action itself tends to push the price up. As the price rises, speculators sell, forcing the price down again. It is equally possible, however, to advance an alternative scenario:

ii) Destabilising - as price falls, speculators sell, anticipating that it may fall even faster. The same type of behaviour may be observed in an upward direction. As prices rise, speculators may buy stock anticipating a further rise in price, which is likely to follow as a natural consequence of their own actions.

3.2.4 c) Low price elasticities of demand and supply. In part, price and income fluctuations in agriculture may be the result of low elasticities of supply and demand for agricultural products. It is argued that although in the long run price elasticities of supply may be fairly high in agriculture (ie - given time, farmers will respond to changes in price by changing output), in the short run this is not so. Once a crop has been harvested it may be regarded as fixed and supply is unresponsive to price changes. Furthermore, food being a necessity, demand for agricultural products is likely to be price inelastic. It is this combination of a steep demand curve and a steep supply curve (which shifts considerably and unpredictably due to variations in weather, etc.) which is said to cause wide price and accompanying income variations.

3.2.5 Although these arguments are frequently advanced to explain behaviour in the agricultural sector, they do not form a satisfactory basis for a discussion of real world agricultural marketing policy. In dealing with the question of price variability, there are essentially two problems to discuss.

3.2.6 The first, and the easiest, concerns the occurrence of two separate prices for the same product in different markets at the same point in time. Economic theory has two explanations to offer here. The first is the discriminating monopolist model.⁽¹⁾ It pays a monopolist, if he can separate his markets, to charge different prices in each market if the price elasticities of demand are different. Technically speaking, he will maximise profit by charging a higher price in the market where demand is less elastic. The second explanation is more relevant to agriculture and can be explained in terms of the 'crankhandle' model,⁽²⁾ whereby differences in price are to be explained in terms of transport costs.⁽³⁾ A comparison of prices between the Bloemfontein and Kimberley markets, for example, reveals occasional large differences in prices for the same commodity. Transport costs would appear to be the most satisfactory explanation for the phenomenon. The monopolistic argument is not tenable, since vendors in these markets are, generally, price takers.⁽⁴⁾

- (1) See George J Stigler, The Theory of Price (New York: MacMillan, 1952), pp.214 - 218.
- (2) See Kenneth E Boulding, Economic Analysis Vol. I, 4th ed. (New York: Harper & Row, 1955), p.211.
- (3) Different prices at the same point in time may also be explained by a lack of information. This really reduces to a special case of the transport cost argument and in any event is of little importance in this context because information on agricultural market prices is normally readily available at minimal cost.
- (4) It has been suggested that the price behaviour of municipal markets is significantly affected by actions of 'rings' of purchasers. There is, it seems, no evidence of a similar level of organisation on the part of producers. See Report of the Commission of Enquiry into Agriculture, Third (Final) Report, RP 19/1972, p.151.

3.2.7 The second problem requires more careful attention. It relates to the problem of the existence of different prices for the same commodity, or group of commodities, in the same market at two different points in time. The market for vegetables provides an appropriate example of this behaviour. These variations may be due, theoretically, either to shifts in supply or in demand schedules. Since the demand for vegetables as a whole is likely to be reasonably stable, it would appear that shifts in supply are the most likely cause. ⁽¹⁾ Much of the price variability in Figures 1 and 2 can be attributed to the seasonal nature of vegetable production. It would seem that there is a cyclical regularity in the price cycle which repeats itself every growing season. The period of the cycle will be a reflection of the growing period or, in the case of meat, of the growing period of the fodder inputs, compounded with the growing period of cattle, while the amplitude of the cycle can be expected to reflect numerous factors - the possibility of imports from markets in a different seasonal cycle, the elasticity of demand and the costs of storage of the commodity. The more elastic the demand, the lower the costs of storage, the less the amplitude in price fluctuations. The lower the costs of imports, also, the less will be the amplitude of the cycle. Technical progress, while reducing storage and transport costs and thereby extending the market, can be expected to reduce price variability over an extended time period.

3.2.8 Secondly, we are concerned with a cycle which has a frequency of more than one growing period. The most commonly used model of instability in agriculture is the cobweb model, which is often cited as an explanation of price instability in the agricultural sector. ⁽²⁾ We then consider whether it does, in fact, constitute a satisfactory explanation.

(1) See Figs. 1 & 2, pp. 191 and 192.

(2) For an explanation of the simple cobweb model, see Appendix 5.

3.3 THE TIME-LAG EXPLANATION

3.3.1 Although Ezekeil is often given credit as the originator of the cobweb theorem, the roots of this concept can be traced back a good deal earlier into economic literature. In a general sense, Robertson ⁽¹⁾ pointed out that time provides an important explanation of economic cycles. Moore, ⁽²⁾ forecasting the yield and price of cotton, produced evidence that, though the current price of cotton was determined by the current crop, the volume of the current crop was influenced by the previous year's price. He did not place this idea in an analytical framework, however. Nevertheless, these two writers highlighted what are, in fact, the two most important elements in the theory of market dynamics:

- i) Time, which combined with production inflexibilities ensures that the flow of supply onto the market is not a constant one, and
- ii) Expectations, whereby farmers adjust their production decisions according to what they expect the price to be.

3.3.2 Other contributors to the theory which predate Ezekeil are Ricci, ⁽³⁾ Tinbergen, ⁽⁴⁾ Leontief ⁽⁵⁾ and Kaldor. ⁽⁶⁾ Ezekeil's article is important more for the clarity of presentation than for the originality of its contents. A comprehensive presentation of the cobweb, complete with accompanying graphs, appears in Kaldor, who apparently first suggested the name and who attributes the theory to Ricci.

- (1) See D H Robertson, A Study of Industrial Fluctuations, (London School of Economics, 1915.)
- (2) H L Moore, Forecasting the Yield and the Price of Cotton (New York: MacMillan, 1917).
- (3) U Ricci, 'Die Synthetische Ökonomie von Henry Ludwell Moore,' Zeitschrift für Nationalökonomie, April 1930.
- (4) J Tinbergen, 'Bestimmung und Deutung van Angebotscurven Ein Biespiel,' Zeitschrift für Nationalökonomie, April 1930.
- (5) W Leontief, 'Verzögerte Angebotsanpassung und Partielles Gleichgewicht,' Zeitschrift für Nationalökonomie, December 1934.
- (6) N. Kaldor, 'A Classificatory Note on the Determinateness of Equilibrium,' Review of Economic Studies, 1 (1933/34), pp.122-136, p.134.

3.3.3 Kaldor showed that :

- i) "Where the adjustments are completely discontinuous, stability of equilibrium will depend on the relative elasticities of demand and supply." This is well known, though not strictly correct. More accurately, it is the relative slopes of the curves which determine the behaviour of price, but also,
- ii) "In the case of continuous adjustments, the question of stability will depend not on the relative elasticities, but on the relative velocities of demand and supply," so that,
- iii) "If the velocities of adjustment are greater on the demand side than on the supply side, movements will lead towards an equilibrium....."
- iv) "If the velocities of adjustment are greater on the supply side than on the demand side, movements will lead away from equilibrium....." (1)

3.3.4 This second set of conditions is interesting because it seems to have been overlooked in much of the subsequent discussion on the cobweb theorem, though analytically and practically, it is at least as important as the first set. From the point of view of agriculture, it may be that the first set of conditions (the discontinuous case) is most applicable, at least in those sectors where, for reasons of cost, stockholdings are small or non-existent, X Where there exist speculators and buffer stocks, though, it is likely that velocities of adjustment are equally important.

3.3.5 The cobweb theorem is important, as Ezekeil shows, because it puts into a convenient analytical framework the fact that once the time dimension is introduced, economic fluctuations are possible. Equilibrium is not a necessary outcome of economic activity. Ezekeil restates the theorem and extends it to the case Y of a three-year lag where essentially the same behaviour is

(1) N Kaldor, (1933/34), p.135.

observed. He also discusses the limitations of the cobweb theorem. (1)
 Firstly, it is clear that the theorem can apply only in certain specific cases:

- i) Where production is completely determined by the producers' response to price under conditions of pure competition.
- ii) Where the time needed for production requires at least one full period before production can be changed, once plans are made.
- iii) Where the price is set by the supply available.

There are other difficulties, Ezekeil explains, in relation to the simplicity of the expectations functions which require that:

$$P_{t+1}^* = P_t$$

ie. observed price at time t = expected price at time $t + 1$

3.3.6 The fact is that in practice there may well be considerable downward flexibility of production (one can always destroy one's own crop) and in addition, unpredictable weather may disrupt the smooth working of the cobweb. There are in addition production rigidities.

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 "Analyses of acreage response for various crops shows that there is a limit to the percent farmers will increase their acreage in a single year, so that even with a one-year response period, several years of successive increases in acreage may be required before very high prices are reflected in high production." (2)

(1) M Ezekeil, 'The Cobweb Theorem,' QJE 52 (1938), pp.255-280, pp.272 - 274.

(2) M Ezekeil (1938) p.257.

This is an important practical point which Nerlove discusses at some length. (1)

3.3.7 In addition, as Ezekeil clearly saw, there is a strong assumption that the product is isolated - supply alone sets the price which raises the question of substitutes and complements - the ceteris paribus assumption must be strictly applied.

3.3.8 Perhaps the most perceptive insight in Ezekeil's article appears right at the end:

".....it appears that even on those areas of the economic system where reasonably effective pure competition still prevails, cobweb cycles may prevent the system from reaching its most effective utilisation of resources. Where competition is absent or monopolistic, we must study the other ways in which production and price are controlled; where pure competition is present, we must examine the mechanism and sequence of price and production reactions to determine whether they do work effectively towards an optimum adjustment." (2)

It is on these problems that a good deal of the most recent work has been focussed. (3)

3.3.9 In practical terms, although some empirical evidence has been found to support the cobweb theorem, (4) the attacks on the realism of the theorem have been devastating. Lachman discussed the question of the cobweb theorem in relation to the holding of stocks. He argues that for the cobweb to operate as predicted, it requires the strict assumption that "producers are

- (1) M Nerlove, 'Adaptive Expectations and Cobweb Phenomena,' QJE 72, (1958), pp.227 - 240. A more sophisticated model of farmers' response to note has recently been developed by R E Just. (Giannini Foundation Paper No. 458).
- (2) M Ezekeil (1938) p.280.
- (3) See for example J M Wolgin, 'Resource Allocation and Risk: A Case Study of Smallholder Agriculture in Kenya,' AJAE 57 (1975) and D Blandford and J M Currie, 'Price Uncertainty - The Case for Government Intervention,' J of Agric. Econ. 26 (1975), pp.37 - 51.
- (4) See G W Dean and E O Heady, 'Changes in Supply Response and Elasticity for Hogs' JFE 40 (1958), pp.845 - 860.

willing to sell their products at any price." (1) If there is at any point a preference for holding goods then supply is not totally inelastic. Lachman's argument, though he denies it, appears to revolve around the question of foresight and expectations. For unless some assumption is made about foresight, the motives for holding goods become obscure. Thus his criticism seems to amount, ultimately, to a criticism of the naive forecasting assumptions implied by the cobweb theorem.

3.3.10 Buchanan (2) sets out to consider the necessary assumptions for the cobweb theorem to operate - particularly in relation to the supply curve - and uncovers further difficulties. The cobweb theorem involves the assumption that the supply curve is completely reversible along its whole length. This implies that for each firm, cost outlays in any one period are incapable of yielding valuable services in production beyond that period. This, in turn, implies that each entrepreneur must re-combine factors of production completely afresh in planning his next 'year's' output on the assumption that the present price will hold. Arguing that in fact price = average cost for each producer, (ie - on the assumption of normal profits) in a competitive situation he then shows that producers will always lose more in periods of low prices than they would gain in periods of high prices. Over time they will, in other words, never succeed in breaking even except, under certain circumstances, in the convergent case. Thus the possibility of perpetual oscillation rests ultimately on the additional assumption that there is always a group of new producers willing to venture and lose their capital in each pair of periods. In practice, it seems that neither perpetual oscillation nor divergence could long persist.

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- (1) D Lachman, 'Commodity Prices and Equilibrium,' Review of Economic Studies 3, (1935/36), pp. 230 - 234, p.232.
- (2) N S Buchanan, 'A Reconsideration of the Cobweb Theorem,' JPE 47, (1939), pp.150 - 173.

3.3.11 Akerman,⁽¹⁾ using a rather more complicated graphical analysis, argues that in practice there is likely to be a relatively inelastic supply curve in the short run, becoming more elastic in the long run. Utilising the concept of stock holdings he shows that the divergent case though possible, is much less likely than the naive cobweb theorem would lead one to expect.

3.3.12 In another graphical analysis, Waugh⁽²⁾ considers the case where supply and demand schedules are not straight lines but 'S'-shaped and shows that market stability is more likely in this case than in the straight line case. He also considers the effects of price floors and ceilings and develops a simple model showing that when exports are possible, the cobweb can always be stable, the export market functioning as a 'safety valve' for the internal market - an example of considerable interest to South African agriculture where it would seem to be applicable in certain cases, eg - maize. Despite its obvious weaknesses, the naive cobweb model has focussed attention on two important aspects of market dynamics.

3.4 STOCKS, UNCERTAINTY AND RISK

3.4.1 The naive price expectation model:

$$P_t^* = P_{t+1}$$

would seem to embody certain assumptions regarding stocks. Producers act as though the price next year were known with certainty. Stock holding does not seem to be rational in this situation since given the expectation that price received next year will be the same as price received this year, holding stocks becomes a loss-making activity if we allow for storage costs. (3)

- (1) G Akerman, 'The Cobweb Theorem: A Reconsideration,' QJE 71 (1957), pp. 151 - 160.
- (2) F V Waugh, 'Cobweb Models,' Journal of Farm Economics 46 (1964), pp. 732 - 50.
- (3) "In general, future trading can be understood only as a response to the trading problem of a heterogenous cash market with social and individual uncertainty, where specialisation is necessary to keep the cost of making transactions and of holding inventories to a minimum," H S Houthakker, 'The Scope and Limits of Futures Trading,' in M Abramovits, et al. (eds) The Allocation of Economic Resources (Stanford University Press, 1959).

3.4.2 Hooten ⁽¹⁾ explicitly introduces the question of risk. The effect of risk is to make the supply schedule steeper, he argues, because even with the same weighted average price, more would be produced if price fluctuations had been smaller in the past (or if price were guaranteed) than would be produced if price fluctuations (taken as indicative of risk) had been greater. This is due to supposed risk aversion on the part of producers. Similarly, he argues, speculation causes the demand curve to be flatter due to the existence of stocks. A rise in price can cause demand to fall rapidly as consumers draw on their stocks. ⁽²⁾ In the case of a falling price, demand increases quickly in anticipation of a price rise - the normal behaviour of speculators, in fact. Cochran ⁽³⁾ makes the same point regarding the effect of risk on the supply schedule, as do Blandford and Currie. ⁽⁴⁾ These two forces, tending to make the S schedule steeper and the D schedule flatter, make the possibility of a stable system more likely.

3.4.3 Hooten does not succeed in his rather sensational claim of refuting the cobweb theorem, though he does make the case strongly that in practice the divergent case is unlikely due to inbuilt equilibrating mechanisms in the economic system - an obvious deduction, in fact. He does conclude, however, with an interesting comment about price guarantees in agriculture.

See also L Telser, 'Futures Trading and the Storage of Cotton and Wheat,' JPE 66 (1958), pp.233 - 255.

"In a competitive industry in an uncertain world, a firm maximising expected net revenue holds an amount of stock such that the net marginal cost of holding these stocks equals the expected change in their price during the time they are held." (p.233).

- (1) J Hooten, 'Risk and the Cobweb,' EJ 60 (1950), pp.69-80.
- (2) This would seem to imply simply that stocks are held by the ultimate consumer rather than by speculators or producers.
- (3) W W Cochran, 'Conceptualising the Supply Relation in Agriculture,' AJAE 57 (1955), pp.1161-1176.
- (4) D Blandford and J M Currie (1975).

"By reducing risk, the cost of production is decreased and the supply schedule is inevitably shifted[✓] to the right (ie - it gets flatter)[✗]. This makes the divergent case, of course, more likely to occur." (1)

3.5 EXPECTATIONS

3.5.1 A feature of the cobweb theorem is that price expectations on the part of both producers and consumers are always wrong and neither party learns from the experience. As one might expect, this behaviour does not appear to approximate reality. Heady and Kaldor⁽²⁾ conducted an empirical investigation of price expectations among farmers and found them to be remarkably accurate on average, though substantial differences did exist between farmers. Also, significantly, price expectations did affect output decisions. This empirical evidence fails to support the assumption of the cobweb model which requires that production decisions are related to current price.

3.5.2 It is in the area of expectations that the most sophisticated mathematical models have been developed. Grunberg and Modigliani⁽³⁾ approach the cobweb model from an unusual perspective, using it to discuss a more general problem of economic dynamics.

"The fact that human beings react to the expectations of future events seems to create difficulties for the social scientist. It has been claimed that, in reacting to the published prediction of future events, individuals influence the course of events and thereby falsify the prediction." (4)

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- (1) It depends, however, on whether increased risk can be portrayed as a parallel shift or whether the curve actually gets flatter - in which case, the divergent case certainly is more likely. There does not seem to be any reason to favour the latter prediction.
- (2) E O Heady and D R Kaldor, 'Expectations and Errors in Forecasting Agricultural Prices,' JPE 62 (1954), pp.34 - 47.
- (3) E Grunberg and F Modigliani, 'The Predictability of Social Events,' JPE 62 (1954), pp.465 - 478.
- (4) E Grunberg and F Modigliani, (1954) p.465.

Using a cobweb type model, Grunberg and Modigliani show that accurate public forecasting is indeed possible "under conditions normally fulfilled in the real world." (1) In fact, they show that:

"The response of agents to the publication of a prediction may actually increase predictive ability. The fore-caster may, for instance, have knowledge of how agents react to given expectations but have little information on the determination of those expectations. To the extent that expectations are determined by public prediction, such prediction then supplies the forecaster with the missing information." (2)

3.5.3 Devletoglou (3) identifies three related problems relating to the stability of equilibrium:

- i) Is correct public forecasting possible?
- ii) Is correct public forecasting desirable?
- iii) Can adequate information for correct public forecasting be secured?

Devletoglou focuses on the second problem and using a simple cobweb model with the added assumption that "supply at any period is a function of a weighted average of the public forecast and the price of the previous period," he shows that convergent price trends are far more likely to occur. Thus accurate public forecasting, while it does not necessarily "change an unstable situation into a stable one, reduces considerably the divergence from the equilibrium position at any point in time." (4)

3.5.4 Devletoglou argues that Buchanan, Hooten, Akerman and Nerlove criticise not the inherent logic of the cobweb theorem, but rather try to show the existence of some stabilising mechanism

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- (1) E Grunberg and F Modigliani (1954), p.475.
 - (2) E Grunberg and F Modigliani (1954), p.476.
 - (3) E A Devletoglou, 'Correct Public Prediction and the Stability of Equilibrium,' JPE 69 (1961), pp.142 - 161.
 - (4) E. A Devletoglou (1961), p.149.

inherent in the cobweb model that makes that makes the convergent case, if not certain, at least much more plausible. He gives a useful summary and concludes that public forecasting, if accurate, is desirable as a damping factor.

3.5.5 Rothschild ⁽¹⁾ carries this discussion further in the direction of greater realism and considers what will happen if forecasts are not perfectly accurate. He shows very simply that,

"Even if forecasts are not quite correct they will exert an equally strong damping effect on the original cobweb cycle as correct forecasts - so that less than perfect forecasting stabilises extreme situations just as efficiently as correct forecasting. But when the equilibrium zone is approached, its effects are slightly destabilising." ⁽²⁾

3.5.6 Kemp ⁽³⁾ sets out to show that:

- i) The announcement of a forecast does not necessarily validate or tend to validate the forecast.
- ii) Accurate forecasting may be impossible.
- iii) Even perfectly accurate forecasting, if it were possible, may add to the instability of the economy.

↳ His article, drew comment from Chiang, Grunberg and Modigliani, ⁽⁴⁾ but his conclusions appear to stand despite their criticism. His conclusions, like those of others, however, appear to be closely linked to the model he has chosen to specify.

- (1) K W Rothschild, 'Cobweb Cycles and Partially Correct Forecasting,' JPE 72 (1964), pp. 300-305.
- (2) K W Rothschild (1964), p.302.
- (3) M C Kemp, 'Economic Forecasting when the Subject of the Forecast is Influenced by the Forecast,' AER 52 (1962), pp.492-496.
- (4) See AER 53 (1963), pp.730-740.

3.5.7 Nerlove ⁽¹⁾ also considers expectations. He introduces the concept of adaptive expectations into the cobweb model. ⁽²⁾ Devised from a formulation by Hicks, ⁽³⁾ Nerlove specifies an expectations function:

$$P^*_t - P_{t-1} = \beta (P^*_{t-1} - P_{t-1}) \quad 0 < \beta \leq 1$$

where P_t is the expected price in period t

β is the coefficient of expectation

He shows that under the expectations assumption, stability is much more likely than in the case of the naive model. Examination of empirical evidence by Nerlove suggests that the markets for cotton and corn appear to be stable while the market for wheat is unstable though, as Nerlove points out, this instability may only occur over a certain range of prices.

3.5.8 Shepherd ⁽⁴⁾ highlights the important fact of the cross elasticities of demand as a crucial variable in agriculture. It may be worth noting that the cobweb model can be extended comparatively easily from the case of one price to two prices ⁽⁵⁾ - a model which is rather more relevant to the real world.

3.5.9 It is clear from this survey of the relevant literature that the cobweb does not emerge as a very satisfactory model. The expectations hypothesis on which it is based is extremely naive, the supply function needs to be drawn on strong assumptions to operate as predicted and we must have a closed economy. (It is also based on the strange assumption that, in agriculture, intended

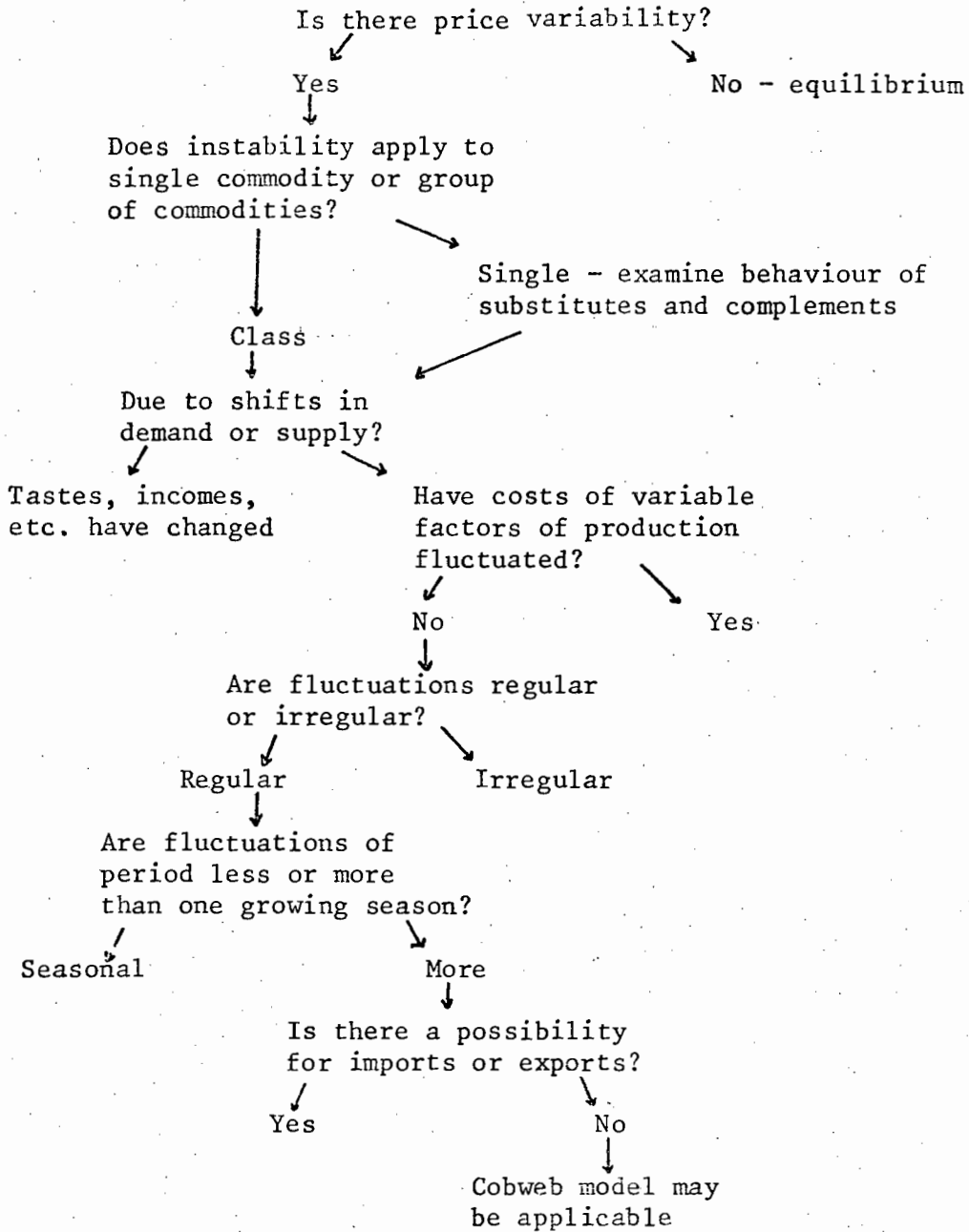
- (1) M Nerlove, 'Adaptive Expectations and Cobweb Phenomena,' QJE 72 (1958), pp.227-240.
- (2) See Appendix 7.
- (3) J Hicks, Value and Capital (Oxford: Clarendon Press, 1939), p.205.
- (4) G S Shepherd, Agricultural Price Analysis (Ames, Iowa, 4th ed.) 1957.
- (5) See Appendix 5.

output = actual output, which is certainly not the case in practice, particularly in agriculture). Significantly, apart from the theoretical weaknesses and the strict assumption associated with the cobweb model itself, almost every development of the model suggests that the stable case is more likely than the simple model would suggest. It is purely an illustrative device which can serve to show the importance of time and expectations on economic decision making.

3.5.10 There is a tendency in economic literature to use the cobweb theorem as indicative of instability in the agricultural sector. This creates the impression that the agricultural sector is in some sense unique - yet time and expectations are equally important features in other sectors of the economy. Also because of the fact that intended output usually is not equal to actual output in agriculture, it is peculiarly inappropriate when applied to this sector. It is also, as a matter of simple observation, not true. Neither agricultural markets, nor any others, fluctuate over infinitely wide price ranges. Nor do they tend to stability and stay there. An understanding of their behaviour requires a far more sophisticated approach to the problem than the cobweb offers. (1)

(1) For recent steps in this direction, see D J Smythe, 'Effect of Public Price Forecasts on Market Price Variation: A Stochastic Cobweb Example,' AJAE 55 (1973), pp.83 - 88.

3.5.11 As further illustration of the argument that the cobweb theorem is a special case, the following 'decision tree' may be useful:



3.5.12 It would seem to be a fair conclusion, therefore, that the cobweb theorem can provide, at best, a limited understanding of the behaviour of agricultural markets. It should also be noted that it is inconsistent with most of the other explanations of agricultural instability. The assumption that intended output equals actual output is clearly not consistent with the argument that weather causes output variation. Similarly, the divergent case of the cobweb depends on the assumption of a relatively elastic supply curve - an assumption contradicted both by the 'inelastic explanation' and by the allegedly destabilising activities of speculators. Indeed, the existence of speculators calls into question the possibility of defining stable supply and demand schedules at all. A further weakness of the model is that producers and consumers are depicted as passive participants in the market - an assumption contradicted by empirical evidence.

3.6 PRICE STABILISATION SCHEMES

3.6.1 In the previous section it was argued that agricultural markets are not unique. Much of our reasoning regarding the behaviour of these markets is based on arguments which are either generalisations to the real world of partial equilibrium models or else arguments which, on examination, prove to be mutually contradictory. It must, nevertheless, be accepted that the arguments in favour of price stabilisation schemes are perceived by some economists to carry weight. In this section we shall consider the application of a certain type of price stabilisation scheme. The discussion will again be carried out at a theoretical level, but it is suggested that, as in the cobweb case, certain general principles may be deduced. It is contended that the successful operation of a price stabilisation scheme is likely to prove more difficult than may be imagined.

3.6.2 Numerous attempts have been made at stabilisation, particularly in underdeveloped countries, where the effect of market fluctuations have, possibly, more serious consequences than for Western nations owing to the dependence of some of these countries on primary export commodities subject to world prices.

As McBean ⁽¹⁾ has pointed out, however, one of the main problems of stabilisation policy is to decide what should be the object of stabilisation - export prices, producer prices, money incomes, real incomes, outputs, etc. At the simplest possible level this dilemma can be illustrated diagrammatically.

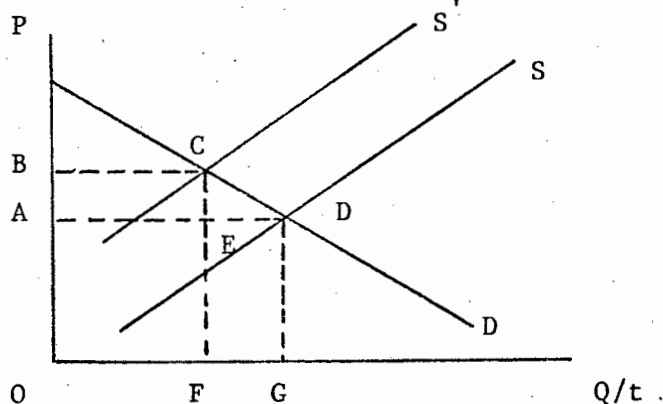


Fig. 3.1

Assume the long run equilibrium price of OA and the quantity supplied OG. A bad harvest may push the supply curve leftward to S' so that producer incomes change from OADG to OBCF, ie - the fall in income EDGF is compensated by the rise in price, leading to an increase in income BCEA (in parenthesis we note the automatic income stabilisation mechanism of the price system, whereby a reduction in supply 'automatically' compensates producers by a rise in price. It is not perfect, however, since the compensation BCEF may be more than enough or less than enough to compensate for the loss of income EDGF, depending on the elasticity of demand). A rigid price fixing marketing scheme, however, would maintain the price at the long run level, ie - OA and income would fall to OAEF. Price stability, in other words, is achieved at the cost of increased income instability. The reverse, of course, may also hold true.

3.6.3 Bauer and Paish ⁽²⁾ list numerous stabilisation schemes which have been attempted, usually without much success. Many of these attempts may be criticised on theoretical grounds ⁽³⁾ or

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- (1) A I McBean, Export Instability and Economic Development, (Allen and Unwin, 1966).
- (2) P T Bauer and F W Paish, 'The Reduction of Fluctuations in the Incomes of Primary Producers,' EJ 62 (1952), pp.750 - 780.
- (3) For example, it has been argued that the International Wheat Agreement

have proved unworkable in practice - as illustrated by attempts to stabilise the price of coarse wool in New Zealand. ⁽¹⁾

3.6.4 Even after the objectives of the scheme have been agreed, practical problems arise. As Bauer and Paish have pointed out, the major problem relates to the difficulty of maintaining contact with trend - the implementation of the scheme becomes, in other words, a forecasting problem. As a solution to this problem, they devised a smoothing formula which would, in certain circumstances, provide a relatively stable producers' price. This formula has recently engaged the attention of Anderson who has suggested that the use of the formula may, in practice, increase the degree of instability. ⁽²⁾

3.7 A FLOOR/CEILING PRICE SCHEME

3.7.1 The price stabilisation scheme considered here is the conventional and often proposed one ⁽³⁾ in which a national or international 'controlling body' acts to stabilise price through the market mechanism. Under buffer stocks and financial reserves, the 'controlling body' enters the market as a buyer to maintain

of 1949 tended to destabilise the free market price. See H G Johnson, 'The Destabilising Effect of International Commodity Agreements on the Price of Primary Products,' EJ 60 (1950), pp.626 - 629.

- (1) See New Zealand Wool Board and New Zealand Wool Commission. First Report of the Wool Marketing Study Group, Wellington, 1967.
- (2) G H Anderson, 'Income Stabilisation for Primary Producers: An Empirical Evaluation of the Bauer - Paish Proposal,' SAJE 38 (1970), pp.35 - 49.
- (3) See, for example, International Monetary Fund and International Bank for Reconstruction and Development, Joint Staff Study on Price Stabilisation, 1969, pp.157 - 158.

a floor, or as a seller to protect a ceiling price level. (1)

In certain cases, the object may simply be to reduce the amplitude of cyclical price swings. In others (the 'full stability' case) it may be to maintain definite floor and ceiling boundaries to the market price. (2)

3.7.2 The 'full stability' scheme is illustrated below:

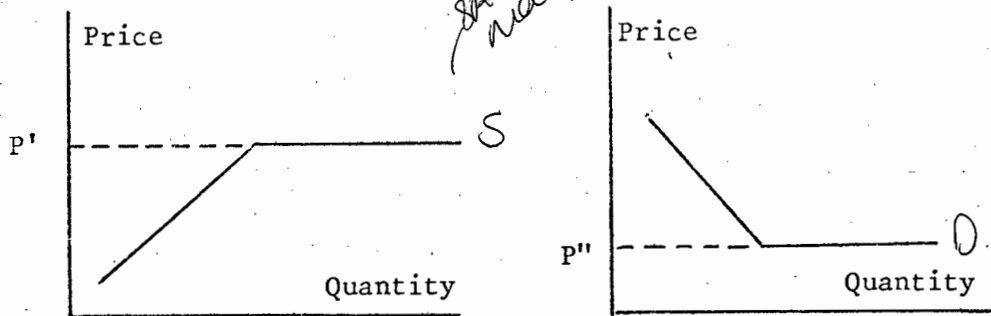


Fig. 3.2

Ceiling and floor prices are set at P' and P'' respectively by the 'controlling body.' We avoid the difficult question of how these levels are arrived at, but assume they represent a balanced ~~the~~ medium-term view of future price trends. Problems associated with the setting of floor and ceiling levels are considered later. At P' the 'controlling body' enters the market as a seller with infinite stocks and the supply curve becomes perfectly elastic at this price. Similarly, at P'' the 'controlling body' enters the market as a buyer with infinite financial resources and the demand curve is perfectly elastic at this lower price.

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- (1) This appears to be similar to the scheme which van Waasdijk is advocating when he argues for the use of price ranges rather than fixed prices as a basis for marketing policy. See T van Waasdijk, 'Agricultural Prices and Price Policy,' SAJE 22 (1954), pp.160 - 173.
- (2) The Joint Staff Study on Price Stabilisation, *op. cit.* makes a distinction that is important between stabilisation relative to some external price and stabilisation that is 'internal', i.e. designed merely to even out fluctuations over time, with the average price taken as given.

practical terms, of course, it may be difficult to find a suitable price as a basis for stabilisation. The problems of commodity price forecasting are well known - and even if one could determine and measure the relevant parameters, as Brown has warned,⁽¹⁾ the mere fact of the imposition of a market control system may alter these parameters. The schemes simply suggest a subsidy in one of the farmer's costs - that of risk. They offer nothing more than that. The current state of the debate has been well expressed by Stabler:

"One observation, however, can be made with certainty: the economic rationale for instituting agricultural policies is very difficult to establish if one subscribes to a free market view of the industry. Indeed, very few, if any, economists have taken such a purist approach; but even allowing for a modified view which sees agriculture as being parallel to that for assisting certain regions, some of the arguments of an economic nature appear to be very dubious." (2)

3.8.7 There appear to be no economic grounds for believing that agriculture is a special case. Many of the models and arguments advanced in support of this contention are inadequate or mutually contradictory. It is not obvious that stable prices are a satisfactory policy objective, and even if they were, theoretical reasons can be advanced to suggest that such a policy would be difficult to implement. Practical experience seems to support this view.

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- (1) C P Brown, Primary Commodity Control (OUP, 1975), p.74 and R E Just et al, 'The Distribution of Welfare Gains from International Price Stabilisation under Distortions,' AJAE 59 (1977), pp.652 - 661 make a similar point.
- (2) M J Stabler, Agricultural Economics and Rural Land Use (London: MacMillan, 1975), p.51.

CHAPTER FOUR

SUBSIDIES IN AGRICULTURE

4.1 INTRODUCTION

4.1.1 The question of government subsidisation of commercial agriculture has been an area of continuous debate and controversy in South Africa. In part, this is because of a failure to maintain a clear distinction between the objectives of stabilisation and subsidisation. It is as well to reiterate the importance of this distinction.

4.1.2 Perhaps a more fundamental reason, though, lies in the nature of the problem itself. Aside from the fact that the issue of subsidies frequently generates emotional responses, and it is difficult to approach the problem of agricultural subsidies from an entirely disinterested standpoint (at some time or another we all buy food), it is a fact that considerable analytical and empirical difficulties are involved in any discussion of this area. These hazards have been described by Prest who, after considerable research reports:

"Before reading this mass of literature, I was under the delusion that I knew what a subsidy was; now I am no longer so sure."⁽¹⁾

In addition to the simple problem of definition, Prest's discussion illustrates the practical difficulties involved in measurement of subsidies. If economists encounter these difficulties at such a fundamental level, it is only to be expected that within the political arena, subsidies should be a fertile minefield of misinformation, confusion and half-truths.

4.1.3 The objective of this chapter is to consider the question of subsidies as rigorously as possible within a conventional analytical framework. As usual, it will prove easier

(1) A R Prest, How Much Subsidy? Institute of Economic Affairs, Occasional Papers, p.11.

to criticise other people's contributions than to advance original ideas of one's own.

4.2 MEASUREMENT

4.2.1 To reduce confusion to a minimum, it seems best to define, as precisely as possible, what is meant by the term subsidy: A subsidy is "a payment to individuals or business by a government for which it receives no products or services in return."⁽¹⁾

4.2.2 Despite the problems alluded to above regarding the difficulty of measuring the costs of subsidies, various attempts have been made in the case of South African agriculture.⁽²⁾

C S Richards, after a thorough examination of the data arrived at a figure of about R15m, made up as in Table 4.1.⁽³⁾

4.2.3 Another estimate appears in a Report of the Industry and Agricultural Requirements Commission⁽⁴⁾ which estimates the cost of "price raising measures" for 1939-40 as follows:

	Rand '000
sugar	4 600
wheat	2 800
maize	2 650
butter & cheese	2 320
leaf tobacco	900
	<hr/>
TOTAL	13 270

(1) Dictionary of Economics, McGraw Hill, 2nd ed.

(2) It should not be imagined that South Africa is unique in its policy of subsidising the commercial agricultural sector. Similar policies are followed in all developed countries. For example in 1969 the U S government paid out R2,85 billion in subsidies to United States farmers under the price support programme alone.

(3) See p. 61. . C S Richards, 'Tariffs, quotas and the excess cost of agriculture in South Africa,' S A J E 3, (1935), pp.365-403, p.381.

(4) Third Interim Report of the Industrial and Agricultural Requirements Commission, U G 40/1941, p.35.

TABLE 4.1

SUMMARY OF EXCESS NATIONAL COSTS FOR 1933

Commodity	Amount of Subsidy	Amount of contribution by Government to write off (a) excess advance on Maize Pool in 1931-32, including interest, etc., and (b) deficit on Wheat Pool, 1931/32.	Amount of Excess Costs to Consumers on Internal Consumption of locally produced commodity.	Amount of Loss on Exports (Quota).	Total
	R'000	R'000	R'000	R'000	R'000
- Eggs	62	-	-	-	62
- Wool	2 250	-	-	-	2 250
Mohair	132	-	-	-	132
Citrus	244	-	-	-	244
Grapes					
Pine-apples	232	-	-	-	232
Deciduous Fruit					
- Maize	86	1 120	204	428	1 838
- Wheat	-	240	3 530	-	3 770
Sugar	-	-	2 408	1 424	3 832
Butter	Subsidy included in Loss on Export	-	888	410	1 298
Cheese	10	-	356	66	432
- Meat	100	-	-	-	100
Misc. Items	442	-	-	-	442
Rebates on Railway Rates on Agricultural produce, 1933/34	-	-	-	-	314
TOTAL	3 558	1 360	7 386	2 328	14 946

4.2.4 Of this total it was estimated that approximately R10m went to farmers, the rest to manufacturers. In addition, "direct government assistance" accounted for an additional income transfer of R5m, giving a total of R15m accruing to farmers. In addition, allowance should be made for special railway rates applying to farm produce and requisites.

4.2.5. The methods employed to calculate the total cost of subsidies differ between the two sources. The fact that they both arrive at a figure of R15m is largely coincidental. As will be emphasised below, the concept of "excess cost" is quite different from the "burden on consumers", so there is no reason why the estimates should be at all similar. Nevertheless, these exercises have served, perhaps, to illustrate the formidable difficulties associated with this type of quantification exercise if we are to attempt to arrive at some hard figures to illustrate relative benefits and burdens. How does one, for example, incorporate the fact that "agriculturalists have to purchase many manufactured products at prices increased considerably above world levels because of industrial tariff protection."⁽¹⁾ Even the most favourable conclusion must be that these exercises are, at best, a partial analysis.

4.2.6. Even if we could arrive at some agreed figures, moreover, it is unlikely that differences of opinion would vanish. In contrast to Richards' strongly worded article,⁽²⁾ we note that on the basis of the same total cost figure of R15m, "The Council is not critical of the total amount of assistance granted to farmers."⁽³⁾ There is little possibility however, of agree-

(1) Social and Economic Planning Council, 'The Future of Farming in South Africa,' U G 10/1945, p. 6.

(2) C S Richards, (1935).

(3) U G 10/1945, p.6.

3.7.3 If the price level is accurately set, the stocks built up over a period of abnormally low prices will be sold on the market in a period of abnormally high prices. Ideally, a small profit margin should be made to cover administration, storage and interest costs. Immediately, however, certain practical problems arise:

3.7.4 Stock and Price Levels - The availability of financial resources, the size of buffer stocks held and the choice of floor and ceiling price levels are, in fact, inextricably linked together. This problem is worth pursuing further since it will lead to the conclusion that the imposition of floor and ceiling levels is more complex than might be supposed. The actual situation can be diagrammatically illustrated:

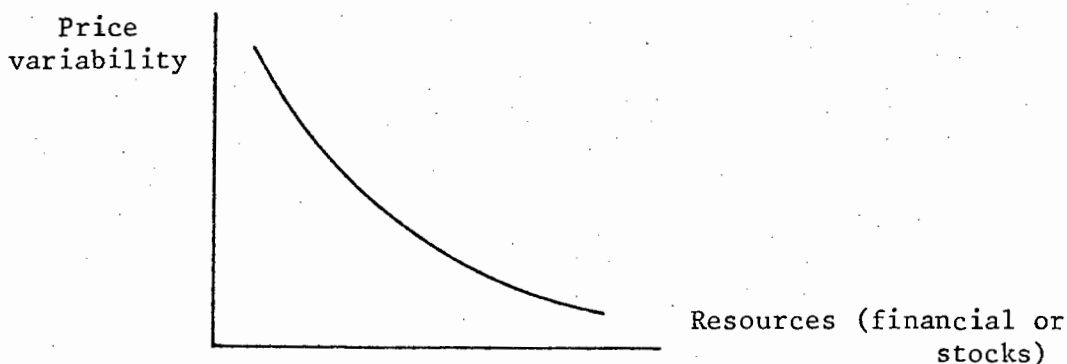


Fig. 3.3

In the extreme case, with infinite financial resources, the 'controlling body' can reduce price variability to zero. Conversely, with small resources, the degree of control that can be exercised, is correspondingly small. The choice is clearly between a greater or lesser degree of stability. This can be taken a step further as follows:

Suppose price boundaries are set at P' and P'' . Then should the equilibrium price rise to P^* , sufficient stocks must be available to sell Q^* on the market. (Figure 3.4). If the 'controlling body' wish to be 99% sure of avoiding a stock-out, they must be 99% sure that price will not rise above P' given stocks of Q^* . Clearly, the closer P is to P' the greater the stocks that must be held. (1)

(1) The practical problems associated with determining the appropriate difference $P' - P''$ are discussed by Law:

"If floors and ceilings are set, they must be set (a) narrow enough to provide stability, (b) wide enough to

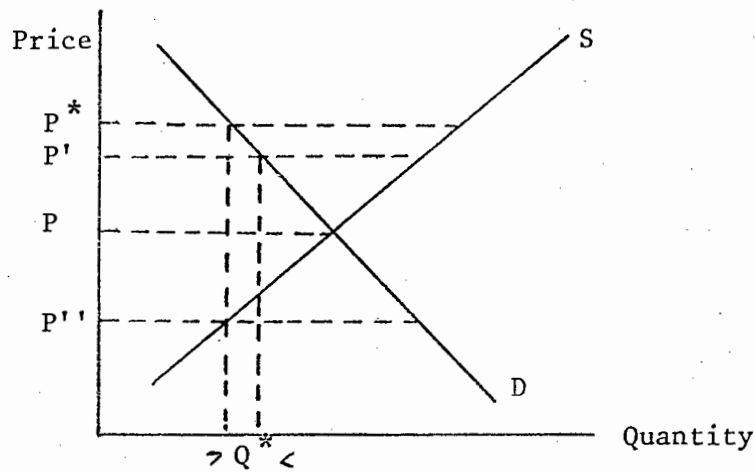


Fig. 3.4

3.7.5 We now examine the statement made above that stocks bought = stocks sold. It appears that, in general, the forecast price is the arithmetic mean of free market prices and if the scheme successfully maintains price between P' and P'' , this requirement will not be met.

Consider the simple model:

$$x_s = a + bP \quad a < 0, \quad b > 0$$

$$x_d = c + dP \quad c > 0, \quad d < 0$$

Suppose that equilibrium price falls below the floor price P'' to PL . (Fig. 3.5).

$$\text{Then } a + bPL = c + dPL$$

$$\text{So } PL = (c - a) / (b - d)$$

It is necessary to buy sufficient stock until price has risen by ΔP_1 to P'' .

$$\begin{aligned} \text{So } P'' &= PL + \Delta P_1 = (c - a) / (b - d) + \Delta P_1 \\ &= (c - a) / (b - d) + 1/b \Delta Q \end{aligned}$$

prevent excessive accumulation or shortages, (c) flexible enough to keep in touch with realistic equilibrium levels."

A D Law, International Commodity Agreements, (Lexington: D C Heath, 1975), p.71. Law argues that only scanty evidence is available to suggest that international commodity agreements have improved price stability. In some cases they have increased price fluctuations. (p.75).

To maintain the ceiling level P' , it is necessary to sell stock,

$$\text{so } P' = P_H - \Delta P_2 = (c-a)/(b-d) - 1/d \Delta Q$$

$$\text{since } \Delta P_1 = \Delta P_2$$

(Since we have assumed that the price forecasting is on average correct and price variation is systematically distributed about \bar{P}), it follows that the requirement that amount bought = amount sold is that $-b = d$, ie, that the absolute value of the slopes of the supply and demand schedules be the same. Unless this unique condition holds, it will be necessary to set asymmetrical floor and ceiling limits. If the D curve is more elastic than the S curve, P'' must be closer to \bar{P} than P' and vice versa.

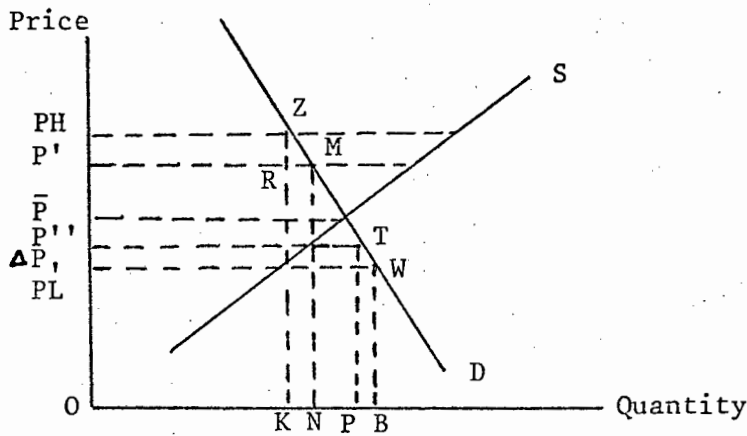


Fig. 3.5

3.7.6 It can also be shown (1) that even though price \bar{P} is the arithmetic average P_H and P_L , farmers might well have to accept a reduction in revenue under the floor/ceiling price scheme proposed here. Because under a free market arrangement, total revenue over two periods would be $OP_H ZK + OP_L WB$. There is no guarantee that the revenue received under the scheme ($OP'RK + OP''TP$) is as large. It may well be smaller.

(1) Following G Hallett, The Economics of Agricultural Policy (Oxford, 1971) pp.198-199.

3.7.7 The success of the scheme thus depends on a fairly accurate knowledge of the parameters involved. For example:

Say $a = -8$, $c = 10$, $b = 2$, $d = -1$ and $x_s = f(P_{t-1})$

then $\bar{P} = 6$ (= average long term price level)

Assuming an initial price of 4, then the free market price will be 4, 10, -2, 22, -26, 70' in successive periods, ie - the price will deviate by successively greater amounts about the mean value of 6. The 'controlling body' can stabilise prices quite easily about this long term mean. A floor price of 4 and a ceiling price of 8 can be maintained indefinitely provided the 'controlling body' is prepared to buy and sell two units in successive periods. Similarly, floor and ceiling prices of 3 and 9 respectively can be maintained provided the 'controlling body' is prepared to buy and sell three units in successive periods.

3.7.8 The problem arises, however, if $\bar{\bar{P}}$, the intended or imagined long term price, differs from \bar{P} , the actual long term price, ie $\bar{\bar{P}} \neq \bar{P}$. This could arise if, for example, for political reasons or ignorance of the actual values of a , b , c and d and the 'controlling body' attempted to stabilise price at a level greater than \bar{P} .

3.7.9 Say $\bar{\bar{P}} = 7,5$ and floor and ceiling prices of 5 and 10 respectively are set. Then, using the parameter values above, the free market price would be the same, viz: 4, 10, -2, 22 etc., assuming an initial price of 4. However, in this case, the 'controlling body' could maintain the price within the chosen limits only by buying 1, 0, 8, 0, 8, 0, 8 in successive periods. Stocks, in other words, would grow continuously unless the 'controlling body' ran out of funds. ⁽¹⁾

3.7.10 The introduction of the scheme, therefore, implies an ability to provide accurate price forecasts - a condition which in the case of a wide variety of commodities is not likely to be met.

(1) Clearly, this is a closed economy model.

3.8 IS MARKET INSTABILITY UNDESIRABLE?

3.8.1 Even if one accepts the argument that agricultural markets are uniquely unstable, the question must nevertheless be posed whether or not this instability is undesirable, because although freely moving prices are in theory the rationing and allocating mechanism of the economy, it can be argued that extreme fluctuations may, in practice, lead to higher costs to both producers and consumers.⁽¹⁾ At the intuitive level, therefore, it is generally agreed that stable prices are desirable, although Caine⁽²⁾ has expressed doubts that this is a general rule and Friedman⁽³⁾ has argued, in connection with the well-known Bauer-Paish price stabilisation formula, against interference in the free market mechanism. The majority viewpoint, however, is that stable prices are desirable as a goal. With the exception of Friedman, this reasoning remains essentially pragmatic rather than analytical, however. It has proved to be remarkably difficult to show that price stabilisation, even if possible in practice, constitutes a net gain for society. The topic continues to generate discussion. The real question, however, is not whether or not stable prices are desirable. It is more important to ask: How much are we prepared to pay to achieve a certain level of price stability? It is only in this context that the issue can be meaningfully discussed.

3.8.2 In a well known article, Waugh argued that price instability can, in fact, constitute a net gain to consumers.⁽⁴⁾

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- (1) J K Galbraith, A Theory of Price Control (Harvard University Press, 1952).
- (2) S Caine, 'Instability of Producer Incomes: A Protest and a Proposal,' EJ 64 (1954), pp.610 - 614.
- (3) M Friedman, 'A Reduction of Fluctuations in the Incomes of Primary Producers: A Critical Comment,' EJ 64 (1954), pp.698 - 703.
- (4) F V Waugh, 'Does the Consumer Benefit from Price Instability?' QJE 58 (1944), pp.602-614.

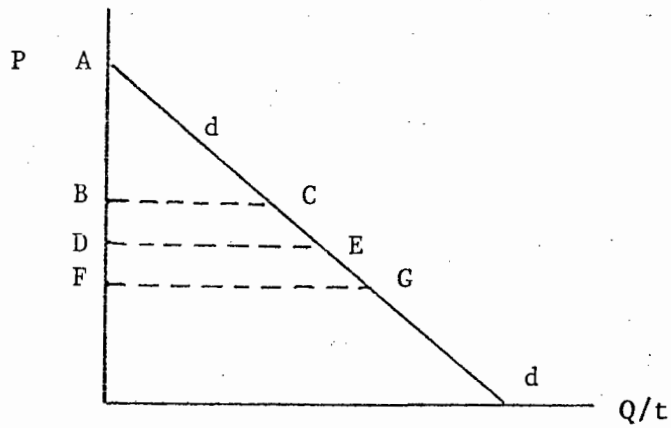


Fig. 3.6

Consider straight line demand curve dd . The triangular area above the price line is consumers' surplus. Now suppose the price is stabilised at D which is the arithmetic mean of the actual prices in two periods, which would have been B and F respectively. Now under the price stabilisation scheme, total consumer surplus would be $2 \times \triangle ADE$. If, on the other hand, there had been no stabilisation scheme, total consumer surplus over the two periods of the analysis would have been $\triangle ABC + \triangle AFG$ which is larger. Hence, the stabilisation scheme causes a net loss of consumer surplus.

3.8.3 The argument, however, is inconclusive. It may equally well be argued that the area under the demand curve constitutes total utility. If this area is sliced vertically instead of horizontally, a comparison of triangles leads to the reverse conclusion - price stability leads to an increase in total utility. ⁽¹⁾ This simple illustration serves to indicate the rather unsatisfactory nature of the debate on the price stabilisation question.

3.8.4 The recent literature on the subject has, however, presented an apparently strong case for price stabilisation. ⁽²⁾ We will consider this below and argue that, in fact, the case for stabilisation remains as inconclusive as before. The recent articles,

(1) See K L Robinson, 'Unstable Farm Prices: Economic Consequences and Policy Options,' AJAE 57 (1975), pp. 769-777.

(2) See for example J M Wolgin (1975), D Blandford and J M Currie (1975), S J Turnovsky, 'Price Expectations and the Welfare Gains from Price Stabilisation,' AJAE 56 (1974).

while using a mathematical presentation, can be explained simply, (though less rigorously, as follows:

3.8.5 The farmer acts in a world of less than perfect information. This lack of information is, in fact, a constraint on his activities. One area in which this lack of information is particularly noticeable is the question of product price - a variable of considerable importance in his production decisions. Because of this, he may choose not to maximise expected profits but, being a risk averter, may choose some way to allocate his scarce resources to ensure himself greater security, though at the expense of profits. This constitutes a net loss to society since resources are not being used in the 'optimum' way. (1) As a practical example, consider a farmer in a prime maize growing area in an imaginary country where price is subject to considerable fluctuation. The resources at his disposal are (by definition) technically most suited to growing maize. However, he fears that the maize price may be very low next year. He, therefore, decides to spread his risk. Instead of maximising his output of maize, he allocates certain of his resources in other directions - he may choose to save or to allocate his limited resources to the production of wheat or cattle. Mixed farming, in other words, may be a response to risk. A guaranteed price would remove this risk, lead to greater specialisation, economies of scale and, consequently, greater output.

3.8.6 The argument is superficially convincing. In fact it is fallacious. In practice, of course, output price is only one of a variety of prices which the farmer is concerned about - although admittedly an important one. Stabilising one price will not necessarily lead to a significant change in his production decisions. More damagingly, price variability is only one of a variety of risks - disease, drought, etc. So again, a stable price may not have much effect on his decisions. Further, in

(1) Ex post the marginal conditions are not met.

ment on total figures. (1)

4.2.7 It is worth noting that both C S Richards and the Industrial and Agricultural Requirements Commission use world prices as a basis for comparison to determine the excess burden to consumers and benefit to producers. Now world prices are an important benchmark, especially if we accept the assumption that South Africa is generally a price taker in world markets. Indeed, world prices are used in Chapter 6 as a basis for determining how marketing boards were using their monopolistic powers. This, it seems, is a valid use of world prices and while world prices may be a useful basis to measure wealth transfers, they do not provide a satisfactory basis to measure net social burdens. (2) Richards does not confine his concept of 'excess national cost' very clearly, but there does appear to be a fundamental confusion here between the two sets of figures provided above and what is generally considered to be the social cost arising from a subsidy.

4.2.8 In fact, as will be suggested below, (3) both sets of figures substantially over-estimate the net social burden of subsidies. It is doubtful whether accurate estimates of relative burdens can be computed, (4) but even if one could obtain satisfactory measures in terms of 'consumer surplus,' it would not tell us a great deal about the net welfare effects of a subsidy policy. Distributional effects are important. (5)

- (1) For example, the Third Interim Report of the Industrial and Agricultural Requirements Commission (UG40/1941, p.34) records a sum of over R2m spent on research, precautionary measures, administration and the dissemination of information. This is a clear example of government assistance to agriculture, but clearly, the benefits are more widely spread. How are we to apportion this sum? R Horwitz, Political Economy of South Africa (London: Weidenfeld and Nicholson, 1967) has placed considerable emphasis on the advantages accruing to commercial agriculture from the South African Railways rating policy.
- (2) The reason for this is set out on pp.67-68.
- (3) See p.68.
- (4) "...tariffs, import quotas and special preferences for domestic producers have important price increasing impacts which are only partly measurable." International Encyclopaedia of the Social Sciences, XV, p.365.
- (5) Distributional effects are discussed on pp.69-80.

TABLE 4.2

TOTAL STATE FINANCIAL AID TO THE AGRICULTURAL INDUSTRY

Nature of aid*	R1 000						Percentage of total
	1965/66	1966/67	1967/68	1968/69	1969/70	Average	
Drought	4 094,6	7 584,3	2 434,1	2 120,0	1 838,4	3 614,3	7,64
Flood damage	122,6	43,6	554,9	65,9	12,1	159,8	,34
Utilisation of resources	6 625,4	6 044,2	7 402,1	7 109,9	8 889,2	7 214,2	15,25
Cost of factors of production	26 961,8	28 087,9	35 134,1	36 369,6	37 377,6	32 986,2	69,72
Assistance to industries	857,0	882,0	6 250,4	3 665,7	4 840,0	3 299,0	6,97
Improvement of herds & flocks	65,9	28,7	33,8	44,8	51,6	37,2	,08
Total	38 688,3	42 670,7	52 809,4	49 375,8	53 008,9	47 310,6	100,00
Price stabilisation	37 778,4	51 288,8	55 073,3	56 092,5	55 234,1	51 093,4	-
Grand Total	76 466,7	93 959,5	107 882,7	105 468,3	108 243,0	98 404,1	-

4.2.9 The Report of the Commission of Inquiry into Agriculture provides more up to date data on subsidies.⁽¹⁾ Again, they are calculated on a different basis from Richards' and include only direct payments. Richards' 'loss on export' category for example is not included. It is clear that of the various categories of subsidy described, only three are large enough to be important, viz. fertiliser subsidies, price stabilisation and customs and excise duties. It is worth noting that the first and third of these relate to input prices, the second to the prices of outputs - an important distinction from an analytical and practical point of view. We shall return to discuss these issues later.⁽²⁾

4.2.1 Having established some of the rather limited information on subsidies as they relate to South African agriculture, we turn to consider the theory of subsidies, and the predictions which the theory yields.

(1) Third (Final) Report of the Commission of Enquiry into Agriculture, RP19/1972, p.119. A useful summary of this Report is contained in J P O'Donnell and F J van Eeden, 'Staatsondersteuning aan die Landboubedryf,' Department of Agricultural Economics and Marketing, 1971.

(2) See pp.65-68.

4.3 THE THEORY OF SUBSIDIES

4.3.1 While the principle of subsidies may be clear enough, and the definition⁽¹⁾ generally accepted, the theory very soon runs into difficulties.

"Subsidies exist in the shadowland of economics, where transactions are decided by government decree rather than by free choice of buyers and sellers in the market place. Their forms and objectives vary greatly ... There is no developed theory of subsidies ... The transfers are effected through the coercive powers of the state."⁽²⁾

Nevertheless, the theory does yield useful predictions.⁽³⁾

4.3.2 (i) Input subsidies. Nieuwoudt has presented the classic case for subsidies on the input side as follows:⁽⁴⁾

"... social prosperity can be raised if a factor, the value of which is not realised by farmers, is subsidised ... On the other hand, prosperity can be reduced by a subsidy if the farmer already realises the value of the production factor and uses it at more or less the optimum levels."

Nieuwoudt quotes, as an example, the case of a fertiliser subsidy.

(1) See p. 60.

(2) 'Subsidies' International Encyclopaedia of the Social Sciences, XV, p.365.

(3) A thorough treatment of subsidies is contained in Corden (1974). He shows that theoretically a subsidy is the first best method of correcting marginal divergences. However, often, in practice "... one must compare a tariff, which is certainly second best or worse, with a subsidy financial in a second best way," pp. 54-55. In practice therefore, tariffs are often imposed in preference to subsidies because "explicit taxation imposes psychic costs which implicit taxation does not," p.55.

W M Corden, Trade Policy and Economic Welfare (Oxford: Clarendon Press, 1974), p.55).

(4) W L Nieuwoudt, 'Factor subsidies and certain policy implications', Agrekon, 11 (3), July 1972, pp. 5-8.

4.3.3 The argument appears to be quite sound - it is after all simply a way of arriving at the optimum point of marginal equivalences. It can be compared with the example given by Corden (1) of a subsidy in a dual economy where a subsidy is used to divert labour from the subsistence sector to the modern sector. In the subsistence sector, marginal product is assumed to be low or zero. Workers however remain there because in a tribal situation they receive not the marginal but the average product due to communal sharing arrangements. A subsidy, which increases wages in the modern sector and thereby attracts workers from the subsistence sector, therefore leads to an increase in net output.

4.3.4. Superficially, these arguments both appear to be the same, and in a technical sense they are - in both cases the price of one of the inputs is reduced to the employer with a resulting increase in use of that factor. In actual fact, the examples are quite different. Corden's example is theoretically sound, since it is based on the prime assumption of rational human behaviour. Nieuwoudt's is not and is consequently unsatisfactory. The reason is as follows: In Corden's example, the worker is assumed to be receiving the average product in the subsistence sector. It is rational for him to stay there unless the returns in the manufacturing sector are higher to him, i.e. underlying this argument is the assumption of rational response to economic incentives.

4.3.5. In Nieuwoudt's case, the situation is rather different. If the farmer were to use more fertiliser, the marginal returns would exceed the marginal cost. Why does he not do so? Because he does not realise the value of the input - and presumably the government does. There is here a case for information or

(1) W M Corden (1974), pp. 123-129.

education. There is no case for a subsidy which would simply reward the farmer for his ignorance.⁽¹⁾ If Nieuwoudt's subsidy were applied, the farmer would gain twice. Not only would he gain because at the old price the extra returns would exceed the extra cost - but all the fertiliser he buys would be cheaper than before. A further disturbing aspect to this argument in favour of a subsidy is that well-informed farmers (in the fertiliser sense) would rationally use more than the social optimum as defined by market prices. The du Plessis Committee appears to appreciate this problem. -16

"The subsidy on fertilisers might have the disadvantage of encouraging farmers to plough marginal land and raise crops on them (sic) ... the subsidy might also lead to crops being grown outside their natural cultivation areas."⁽²⁾

Thus it appears that a divergence of marginal relations is a necessary but not a sufficient condition for the appropriate use of an input subsidy.

4.3.6 (ii) Output subsidies. The classic model in this area is usually attributed to Wallace.⁽³⁾

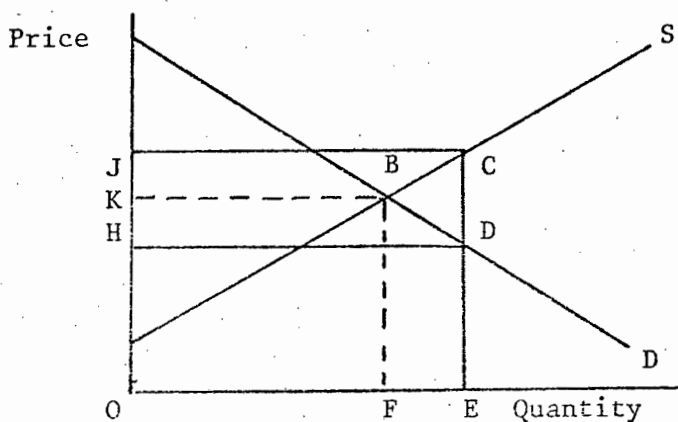


Fig. 4.1.

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- (1) See Appendix 4.
- (2) R P 19/1972, pp. 111-112. The suggestion that subsidies may lead to the use (and misuse) of original land is discussed below, pp. 77-79.
- (3) T D Wallace, 'Measures of Social Cost of Agricultural Programs,' J F E 44 (1962), pp.580-594.

4.3.7 It relates to the subsidisation not of factor inputs but of output prices. Instead of a price of FB in Fig 4.1 and quantity OF, which is the free market equilibrium position, producers are paid a higher price, OJ, and in consequence produce a larger quantity, OE, absorbing more productive resources, and the amount OE sells at the lower price of OH. Thus, producers receive a higher price than they would under a free market arrangement and consumers pay less. There is, however, a net social loss, BCD, because resources are being drawn away from more productive uses. It can then be shown⁽¹⁾ that the social cost triangle can be derived as

$$\Delta BCD = \frac{1}{2} P_1 Q_1 T^2 E \left(1 + \frac{E}{\eta} \right)$$

where $P_1 Q_1$ = equilibrium under competition

η = absolute value of elasticity of demand

E = absolute value of elasticity of supply

T^2 = square of the percentage increase in the

"fair" price (OJ) over the price that

would exist in the absence of the programme

4.3.8. Though the net social cost is given by BCD, the total transfer of income is given by JCDH, which is the wealth transfer from taxpayers to producers. Whether there is a valid case for a subsidy or not, the fact is that the amount paid out in the subsidy, though it does accurately reflect wealth transfer, does not provide a satisfactory measure of social cost. To measure this requires, at least, a knowledge of demand and supply elasticities - a far more stringent requirement.⁽²⁾

(1) See Appendix 7.

(2) It should be noted that in South Africa this argument applies to the "price stabilisation" subsidies which account for 52% of total government expenditure on subsidies. In the case of input subsidies, similarly, total expenditure does not provide a satisfactory measure of net social cost. In the absence of State assistance presumably private enterprise would provide at least some of these services (e.g. loans for pasture improvement). The net cost of the subsidy is then the difference between the cost to the State and what the farmer would have to pay private enterprise for a similar service. This sum may of course be negative.

4.4 DISTRIBUTION EFFECTS - THEORY

4.4.1 Subsidisation involves giving preferential treatment to a certain factor (e.g. labour), a certain product (e.g. maize) or a certain sector (e.g. agriculture). Very often the effects are subtle and difficult to measure. For example, an increase in land rates in urban areas amounts, in broad terms, to a subsidisation of agriculture since it attracts capital to agriculture where returns are now (slightly) relatively higher than before. It is clear, however, that to compute the magnitude of this effect would be an enormously complicated task.

4.4.2 In other cases, it may not even be clear where in principle the burden lies. For example, it might be argued that in a case where the Chamber of Mines recruits black workers in white farming areas, the farmers lose their able-bodied workers, but continue to support the families who remain on the farms. Influx control presumably prevents the families from joining the breadwinner in town. In this case, it might be argued, the State is imposing a negative subsidy (a tax) on white agriculture. On the other hand, it can be argued that the presence of the families ensures that the worker returns to work on the same farm, so that in fact the farmer is merely paying a low price for the guarantee of a future labour supply. It simply depends on how one chooses to present the situation. It is clear, however, that the imposition of subsidies will generally alter the relative returns of the various factor inputs. This may, in fact, be the primary objective of the policy. Alternatively, it may be an unexpected side effect. ⁽¹⁾

4.4.3 The most important prediction of theory as regards returns to factors of production is that, if the price of a

(1) We are concerned with distribution as between factors of production. The question of the distributive effects between different groups of consumers will be considered in a later section, pp.81-83.

product is raised by a subsidy:

"... One would expect that the prices with the least elastic supplies would rise most. Since labour is more elastic in supply than is land, land values would be increased more than the price of labour. If the supply of farm labour were perfectly elastic the farm wage would remain unchanged." (1)

Thus it is clear that a product subsidy is not neutral as regards returns to factors. It is worth noting however that if we make the rather extreme assumption that the supply of land (and hence the supply of aggregate agricultural output) is perfectly price inelastic, we find that net social costs are reduced to zero. Wallace's triangle disappears and we have simply a transfer of wealth from tax payers to land owners equivalent to JCBK.

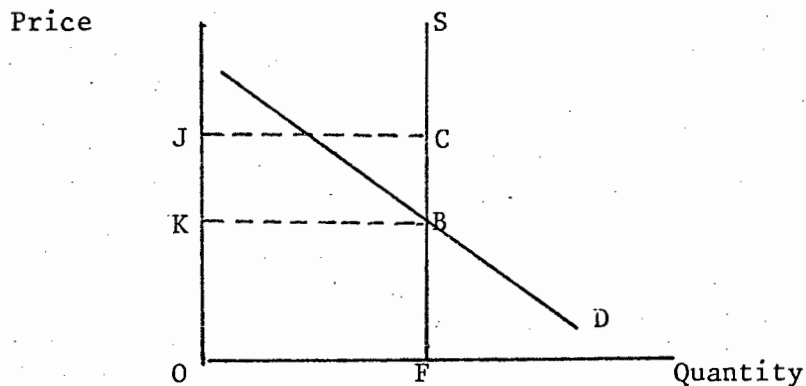


Fig. 4.2.

4.4.4 In this case, therefore, a subsidy becomes merely a means of achieving a different distribution of wealth. It has no effect on output. (2)

4.4.5 If the object of the subsidy is to affect the distribution of earnings by factors:

- (1) J F Floyd, 'The effects of farm price supports on the returns to land and labour in agriculture,' J F E 173(1965), p.153. This has implications for the method of cost-plus pricing commonly used to set the price of agricultural products in South Africa. See Appendix 3.
- (2) See C S Shoup, Public Finance (Chicago: Aldine, 1969), p.161.

"A subsidy intended to increase factor rewards in a certain industry, enacted because the industry is depressed or enjoys unusual political influence, will be the more effective, the less the industry responds to the subsidy by increasing output ... The required inelasticity of the supply curve need exist only for output in excess of the amount being produced before the subsidy was granted. But this condition is the more likely to be fulfilled, the more inelastic is the supply immediately below the initial output, since no prior reason exists for a sudden change in slope at that point. The subsidy will therefore be most useful in an industry that employs specialised factors that cannot be easily increased in number when demand rises owing to the subsidy. Even such an industry will employ certain kinds of factors that are in fairly elastic supply to the industry: they will not gain appreciably by the subsidy." (1)

4.4.6 Shoup continues:

"If the industry's supply curve is very elastic in a free market, the subsidy can be made helpful for factors (and not helpful to consumers) by government control of output. The supply curve beyond the initial, no-subsidy equilibrium point can thus be made artificially inelastic. Farm programs commonly employ this technique." (2)

4.4.7 It is worth noting that whether the motivation for the subsidy is to increase output or whether it is to alter relative returns to factors, these distribution effects occur irrespective. It is also clear that if we are to examine in any detail the effect of subsidies in South Africa, we need to know something about the elasticities of supply, both on the output as well as the input side.

4.5 DISTRIBUTION IN SOUTH AFRICA

4.5.1 It is clear that one of the primary motivations for

(1) C S Shoup, op. cit., p.161. Empirical evidence of this is given on pp. 73-80.

(2) C S Shoup, op. cit., p.161.

a subsidy policy in South Africa has been the desire to be self-sufficient in food,⁽¹⁾ even at a cost to other sectors of the economy. In order to achieve this output, "The Council ... believes that it must be the aim of State policy to see that farmers and workers receive a fair and reasonable share of the national income."⁽²⁾ As will be explained below (pp.75-76), the implications of this statement are rather disturbing. The Report makes clear that the main method of achieving this was to be by price-fixing. There is no suggestion in the Report of a conflict of interest between farmers and farm workers, although of course increased returns to one group does not necessarily imply increased returns to the other group. Thus it is suggested that the objective of higher prices is to increase output by increasing returns to factors of production. But let us disentangle these influences. Will increasing prices lead to increased output?

4.5.2 If we are discussing aggregate agricultural output, which seems to be what we are discussing when we talk about the nation feeding itself, then the relevant concept to consider is the aggregate agricultural supply function.

4.5.3 Empirical evidence suggests that in many countries the aggregate agricultural supply function is price inelastic⁽³⁾ and attempts have been made to explain why this should be so.⁽⁴⁾ Griliches notes that elasticity appears to have been rising with the passage of time and "Moreover, I believe that if we were to measure our prices better, we would find that there is much more of a price response in agriculture than is commonly assumed."⁽⁵⁾

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- (1) See for example U G 10/1945, p.4.
 (2) U G 10/1945, p.17.
 (3) See Z Griliches, 'Estimates of the aggregate United States supply function,' J F E 42(1960), pp.282-93.
 (4) See for example Gale D Johnson, 'The nature of the supply function for agricultural products,' A E R 140(1950), pp.539-64.
 (5) Z Griliches (1960), p.293.

Nieuwoudt has found that in the case of the South African aggregate agricultural supply function, elasticity is rather high (0,38 in the short term and 1,34 in the long term)⁽¹⁾ which suggests that increasing overall agricultural prices are, in the long run, lead to a more than proportional rise in agricultural output, as resources are drawn from other sectors of the economy into agriculture. Agricultural output rises whereas output in other sectors of the economy falls.

4.5.4 Two problems worthy of consideration follow from this:

(i) What happens if the prices of some products are increased but not others;

(ii) What is the effect on returns to factors of production?

The first of these problems is dealt with in Chapter 6. We turn now to consider the returns to factors of production.

4.5.5 Returns to Factors. (a) Land. It is fairly clear that the price of land in South Africa has responded in the direction predicted by theory.⁽²⁾

TABLE 4.1.

Comparison of land prices and product prices

(1958/9 - 1960/1 = 100)

Summer cereals		Winter cereals		Beef		Wool	
LP	PP	LP	PP	LP	PP	LP	PP
338	186	290	161	355	339	170	181

Note: Threeyear average 1973/4 - 1975/6 LP = Land prices PP = Product prices
 Source: Department of Agricultural Economics and Marketing, Abstract of Agricultural Statistics, 1977, Pretoria.

(1) W L Nieuwoudt, 'Die Aanbodelastisiteit van die Suid-Afrikaanse Landbou,' S A J E, 40(1972), pp. 249-253.

(2) See C S Shoup, op. cit., p.155.

There appears to be a correlation between the price of the product and the value of the land producing it, which also suggests that land is not highly substitutable between these major end uses. (1)

4.5.6 The question of land prices and rural land use has been a frequent topic for discussion, and while there appears to be general agreement that the price of land is closely related to the price of the product, it is the results of this increase in price that arouse controversy. While it is clear that existing landholders benefit "... Higher land values induced by high output prices are of no value to the individual who enters agriculture after the adjustment in land values has occurred." (2) "In the abstract," argues Johnson, "there is neither more nor less justification for increases in the return to land than to any other input ..." (3) Thus not only are existing land owners the only ones to benefit, but, it can be argued that:

"Distribution of farm subsidies and price support payments by income class have presumably been regressive, analogous to progressive taxation, if the income classes taken are those that existed before the farm programs were enacted. The farm owners in that period of distress were probably disproportionately in the low income classes of the entire population in those countries that adopted farm programs. Within the farmowning group, however, the subsidies and payments have probably always been progressive by income. At the present time, a measurement of regressivity or progressivity has limited meaning, insofar as present farm owners have had to pay for the farm benefits in the price of land they have purchased." (4)

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- (1) This topic is discussed in more detail in Chapter 6.
- (2) Gale D Johnson, World Agriculture in Disarray, (St. Martin, 1973).
- (3) Gale D Johnson, op. cit., p.183.
- (4) C S Shoup, op. cit., p.196. See also Floyd (1965), p.158 and D Paarlberg, "Contributions to the new frontier to agricultural reform," J F E 44(5) (1962) pp29-37. B C Swerling, 'Income protection for farmers: a possible approach,' J P E 67 (1959), pp.173-186 has also argued that in the U S A at least, price supports probably involve an essentially regressive redistribution of income:
 "It is frequently assumed that to move from high level price supports to freer market prices is to sacrifice social equity for economic efficiency, and therefore price supports are favoured by those whose inclination

4.5.7 Apart from the probable regressive effect of price subsidies, there are two further aspects to this rise in land prices which deserve consideration. The first is the argument that the price of land is somehow above its "true production value." The second is the question of marginal land use resulting from high product prices.

4.5.8 (i) The "true value" of land. Various unsatisfactory explanations have been advanced for high land prices. As was shown in the Table 4.1, not all land prices appear to have risen faster than the prices of the output from that land. But where they have, it is quite consistent with the explanation that the price of land is a function of the price of the output of that land. The argument would go as follows:

4.5.9 The effect of a subsidy on consumer prices is to widen the gap between returns and variable costs, thus providing a stimulus to production. As pointed out above, however, ⁽¹⁾ most of this increase is internalised as economic rent on the land (which is the least price elastic factor input). Thus the rate of return in the industry instantly returns to its competitive level. The price of the output may be higher than it was before, but now the price of those resources specific to that product has risen to take up the slack. It must therefore be concluded that a one-off subsidy for a particular crop, though it may have an effect on output, will not in the long term cause output to increase, except at the margin, at the expense of something else. The relatively high elasticity of aggregate supply ⁽²⁾ gives a measure of the transfer of resources and loss of output in other sectors resulting from the policy of subsidy.

is to favour the disadvantaged ... (but) it is certainly not the poor in agriculture who benefit from the present programs,' (p. 175).

(1) See p.71.

(2) Nieuwoudt (1972).

4.5.10 The same argument follows in the case of a subsidy on agricultural prices in general, though of course here the substitution effect within agriculture is absent if the ratios of product prices are held constant. In the long run, therefore, output is re-established at slightly more than the old output levels, though the costs of inputs have risen. It is here that an important distinction must be drawn between a policy designed to increase agricultural output and one designed to increase returns to factors of production. In the former case, a one-off subsidy may be sufficient to achieve the objective. If however the intention is to increase returns to factors, a policy of continuously increasing subsidies will be necessary. Increased returns to factors are only possible if price increases are unexpected. Otherwise increased returns are simply internalised in the rent on the least elastic factors. The only way to ensure that the effect of subsidisation is not dissipated in the form of higher fixed costs, and that factor returns continue to be artificially raised, is necessary for the subsidy to increase by larger and larger amounts so that, like a drug addict, the agricultural sector needs continually larger shots to keep going. Even this is not enough, though, since once these regular increases of subsidy are expected and anticipated, they are discounted by the market. Land prices rise more rapidly than product prices. To have a stimulating effect on output, in the long run, therefore, subsidies must always be larger than anticipated - a rather explosive requirement. (1)

4.5.11 Note that a rise in the price of wheat (for example) will cause an increase in wheat output, but a net increase in output is possible only if there were unemployed resources (e.g. unused land) that could be brought under cultivation.

(1) Though it is postulated here that output prices are the primary determinant of land prices, they are clearly not the only influence. During the 1960's for example, land was perceived by some to be a satisfactory long term hedge against inflation. As a consequence, demand and so prices increased.

Otherwise resources already employed are simply transferred from other uses, where they were earning a higher return.

4.5.12 Thus it seems that returns to land can adequately be accounted for as a derived demand for the product of the land, even though we may have to use expected rather than present or past product prices as the explanatory variable.

4.5.13 (ii) The use of marginal land. It was suggested in the previous section that an output price subsidy might result in previously unused (or under(utlilised) land being brought under cultivation. It has been argued that South African agricultural prices: -16

"are out of alignment with those in most other important agricultural exporting countries, as a result of control and tariff protection .. Thus cereal production has been extended to marginal areas with ruinous effect on the soil." (1)

This argument seems to have gained some currency though it is difficult to determine when this particular explanation of land misuse was first advanced. The Drought Investigation Commission, for example, (2) makes no mention of prices as an explanation for soil erosion, but stresses rather bad farming methods. The Industrial and Agricultural Requirements Commission reports: "At present improper pasture management is resulting in an almost general deterioration of natural grazing, culminating in further denudation and moisture loss." (3) Again there is no mention of price as an important variable.

4.5.14 Richards made the fairly obvious point that as a result of artificially high prices "Cultivation of land for unwanted products ... is being extended to more and more marginal land with

(1) U G 10/1945, p.26.

(2) Interim Report of the Drought Investigation Commission, U G 20/1922.

(3) U G 40/1941, p.11.

higher costs of production"⁽¹⁾ but this does not necessarily cause erosion, while the Reconstruction Committee puts the following interesting argument:

"The whole question of land abuse is closely linked up with economic considerations. The farmer is the active and direct agent responsible for the maltreatment of our agricultural resources, but it would be most unfair to charge him with sole responsibility a fundamental difficulty is the fact that the man on the land has been caught in the vortex of an economic system not of his making, which in a large degree compels him to exploit the agricultural resources in order to enable him to meet his commitments and at the same time to maintain a reasonable standard of living ..."⁽²⁾

4.5.15 It is not clear what this 'vortex' is, nor why agriculture should be unique in this regard, but the argument is nevertheless interesting, because in contradiction to Richards, it suggests that times of economic hardship encourage the farmer to overutilise his resources. Thus it would appear that when prices are too high, land abuse results because farmers are encouraged to misuse their land. When prices are too low, also, to "maintain a reasonable standard of living" abuse of the land also results. Now it may be that periods of both high prices and low prices are associated with different types of land abuse. In other words, both explanations are correct, but for different reasons. It also seems quite plausible that in times of hardship, given the pressing need to provide for his family and other commitments, the farmer's time perspective may be sufficiently foreshortened for him to delay investment and live off his capital (i.e. to 'run down' his land).

4.5.16 It is more difficult, though, to sustain the argument

(1) C S Richards (1935), p. 402.

(2) Reconstruction of Agriculture 1944-45, Report of the Reconstruction Committee of the Department of Agriculture and Forestry, 1943, p.7.

yes

that high product prices lead to land abuse. In a business environment, rising prices generally lead to increased investment, not the reverse. It would be strange if farmers were any less rational. Since, as has been argued above, the value of land is a function of the value of the output of that land, it follows that when prices rise the value of land also rises. It therefore becomes even less sensible to misuse one's land. ⁽¹⁾ The exception to this would appear to be the case where prices are high but expected to fall in the future. Then it may be considered rational to increase output considerably, the extra return being more than sufficient to compensate for the reduction in quality of the soil. However, this would appear to be only a short-term possibility.

4.5.17 The other plausible explanation for the coincidence of land abuse and high prices is simply lack of education and lack of information on good farming techniques. If this is the case, then high prices cannot be advanced as a cause of unsatisfactory farming methods. Ignorance is independent of price level.

4.5.18 Returns to Factors. (b) Labour. It is clear that elasticities of supply are an important determinant in establishing variations in factor rewards in response to a subsidy. It is also clear that rewards in the form of cash wages of unskilled labour have been very low in South Africa; certainly much lower than urban wages. The obvious explanation for this is to be found in the barriers to mobility of rural black labour. ⁽²⁾ Nevertheless

(1) Investment in irrigation schemes when prices rise is an example of a response to rising land values. It becomes sensible to use one's land more intensively.

(2) Two qualifications should be noted here. Farm workers receive a high proportion of their wages in the form of payments in kind, which are difficult to quantify; and it is as well to note the point made by Stabler:

'It could be argued that agricultural incomes are low, not because the rate of migration is too slow, but because the earnings accurately reflect the level of skill and ability of these human resources in agriculture.'

low wages and barriers to out-migration tell us nothing unfortunately about the elasticity of supply of labour in commercial agriculture. Intuitively, one would imagine that elasticity has been fairly high, but more definite evidence is needed. The difficulty, of course, is the paucity of satisfactory data in this area. In the case of the sugar industry, however, we have something like a test case. The evidence ⁽¹⁾ appears to be reasonably conclusive that even a large recruiter such as the sugar industry is a price taker in the labour market. It seems therefore safe to argue that, at least for most sectors of South African commercial agriculture, supply elasticity has been very high.

4.5.19 If this is so, then it can be concluded that the benefit from price subsidies to output has in no way served to raise the level of wages of agricultural labourers. The benefits have accrued largely to owners of other factor inputs (principally land, but also manufacturers of capital equipment). The du Plessis Commission was correct to argue that price policy offers no solution to the problem of the uneven distribution of agricultural incomes. ⁽²⁾

4.6 CONCLUSION. ARE THE SUBSIDIES JUSTIFIED?

4.6.1 We discussed ⁽³⁾ above the rather limited conditions under which a subsidy is technically justified. Since subsidies are frequently employed as policy tools in the real world, not only in agriculture, it is clear that politicians find other justifications for applying them. Howarth has outlined four broad arguments for agricultural support as political, strategic, social and economic. ⁽⁴⁾

(M J Stabler, Agricultural Economics and Rural Land Use, (London: Macmillan, 1975), p.36.)

- (1) See Tony Ardington, 'Factors affecting wages and employment in sugar farming' in Farm Labour in South Africa, ed. by Francis Wilson, Alide Kooy and Delia Hendrie (Cape Town: David Philip, 1977), pp. 154-165.
- (2) R P 19/1972, p.32.
- (3) See p. 66.
- (4) R W Howarth, 'Market Pricing in Agriculture' in Essays in the Theory and Practice of Pricing, Institute of Economic Affairs.

Virtually any kind of policy can be subsumed under these headings, however. Prest's list of categories is rather more useful. "Economic theory offers five main, if very general, justifications for subsidies: externality correction, 'merit' wants, increasing returns, growth promotion, and income redistribution." In addition, he argues "one may have to countenance subsidies for second best reasons (for example, commuter rail subsidies, because of failure to impose urban congestion taxes on road traffic)." (1)

4.6.2 To add to this list of supposed justifications for subsidies, we may include the following:

- "(a) to fight inflation;
- (b) to assist an industry to enable it to hold its own in a certain economic structure; and
- (c) to assist the consumers to enable them to obtain the products concerned at prices lower than they would have under the free operation of economic factors." (2)

4.6.3 As further food for thought, another list may be suggested:

- "(i) national security considerations, including preparedness for future wars;
- (ii) government commitments to aid industry or local groups that cannot cope with difficulties they have encountered;
- (iii) responses to pressures created by lobbying and other political activities of self-seeking groups." (3)

4.6.4 Whether all of these last categories can be classified

(1) Prest, op. cit., p.35.

(2) Report of the National Marketing Council on the Control Boards under the Marketing Act 1950/1-1963/4, RP 40/1965, p.32.

(3) 'Subsidies', International Encyclopaedia of the Social Sciences, XV, p.365.

as 'justifications' is perhaps open to question. It would be a brave (or foolish) politician who would publicly justify his decisions on grounds of lobbying. It is also clear that many of these reasons for subsidy go far beyond the rigorous economic specification. Prest's listing in particular requires consideration.

4.6.5 Externality correction, though not providing a sufficient case for a subsidy, as we have shown above, is nevertheless often used as justification. It does not seem to have much application to South African agricultural subsidies, however. It is clear that farmers are seen as a special case by policy makers, ⁽¹⁾ so the merit wants argument is perhaps applicable. It is difficult to reconcile an 'increasing returns' justification with a policy of maintaining a substantial rural population. It is clear that policy has been to encourage the growth of commercial agriculture (as it has been in other sectors of the economy) and it is also clear that a certain amount of income redistribution has taken place.

4.6.6 This form of watertight categorisation is of course essentially a naive exercise, however. Policies usually encompass a variety of often conflicting objectives. If the object had been a simple one of benefiting white farmers, one must conclude that it has been badly designed for the purpose. While a subsidy on the price of the product gives a one-off gain to existing land owners (and at the same time causes considerable pain to new farmers attempting to acquire land unless capital markets are perfect) it nevertheless represents a continuing benefit to consumers in the form of lower prices for that product. In the case of the major crops, there have been no output restrictions so it cannot be argued that government subsidies have been designed to benefit only producers. Subsidies can at best offer short term benefit to farmers.

(1) See p.125.

4.6.7 While it can be shown with some degree of precision that farm labourers have not benefited from the agricultural subsidisation policy (except insofar as more jobs may have been created in agriculture), it is difficult to see how they could possibly have been harmed by it. After considering a variety of subsidisation schemes, Floyd has concluded that "the greatest gain to the person who owns only labour would occur when prices are supported and output is not controlled" (1) as is broadly the case in South Africa. Merle Lipton's argument (2) that the absence of job reservation in agriculture shows the political influence of agricultural employers (which is, of course, correct) can equally be well presented as representing an advantage to agricultural workers.

4.6.8 If it is to be argued (as it was after the 1977 budget) that the reduction of certain food subsidies represents a burden to consumers (in particular black consumers) then the other side of the coin must be accepted as well, that the remaining subsidies represent a benefit to them.

4.6.9 As was suggested at the beginning of this chapter, we have here an endless area for debate with little prospect of a fruitful outcome. In the absence of a sound economic case, agricultural subsidies must be seen purely as a political response. Whilst the motivations of politicians in doing so can be understood, their actions cannot be applauded. Perhaps the most helpful advice an economist can offer is to utter a warning against extending them any further. (3)

(1) Floyd (1965), p.157.

(2) Merle Lipton, 'White Farming in South Africa,' Journal of Commonwealth and Comparative Politics, XII(I) (1974), p.44.

(3) Prest, op. cit., p.36 explains why subsidies, once imposed, are difficult to remove. In consequence, they have a ratchet-like effect.

CHAPTER FIVE

MARKETING BOARD PERFORMANCE

5.1 INTRODUCTION

5.1.1 Marketing Boards, their structure and activities, are a highly controversial feature of the South African economy. An examination of their performance would seem to be a necessary precondition for an evaluation of their policies.

5.1.2 It is commonly believed that marketing boards function almost entirely in the interests of the producer. ⁽¹⁾ This opinion is given added weight by the fact that producers have a voting majority on all the boards, so that there is potentially an opportunity for producers to further their own interests at the expense of the consumer. This chapter cannot attempt to analyse the behaviour of all marketing boards, but focuses instead on the actions of some of the larger ones. In addition, interest is centered on the pricing policies of these boards. Other activities, such as market promotion and scientific research are ignored. Probably the most important decisions which the control boards make relate to the price to be paid to the producer for his product and the price which the consumer must pay. The first of these because it determines revenue of farmers and, in the long run, future output. The latter because the determination of price also fixes the quantity consumed locally, and thus the volume available for export (if any), or how much must be imported to satisfy market demand.

5.1.3 It is worth noting that these decisions are made in a situation of some uncertainty. Though, for example, maize and, more recently, wheat prices are determined shortly before har-

(1) "In the industries in which it is applied, the Marketing Act gives rise to monopolistic conditions. This is especially so where there is one-channel marketing or where the control board regulates the processing of a commodity or where both these things apply."

vest when estimates are fairly accurate. The possibility of, for example, bad weather cannot be ruled out. Also, of course, the activities of farmers are determined by many other prices and structural constraints. Of these, the board only has direct control over one, though possibly the most important, namely product price. It seems worthwhile to note the distinction between:

- (i) the policies which boards announce themselves to be following;
- (ii) the policies which they actually intend to follow;
- (iii) the policies which they actually do follow.

5.1.4 For example: A board may claim to be acting in the interests of both consumers and producers. In fact, it may intend to raise producer prices as high as possible. In the end, however, it may achieve neither of these objectives. A high price may lead to increased production which would necessitate a future reduction in price or export at a 'loss'.

5.1.5 It is question (iii) which we shall be concerned to answer in this chapter. We want to know what policies the boards have in fact followed because this is after all basic to any attempt to justify or criticise their behaviour. In this respect, we are in the position of attempting to decipher a code. We know what public decisions have been made by the boards, though we cannot be sure what motives or objectives led to those decisions. The problem is to examine these output signals and decide what policies have actually been followed. This may be a complex task because the signals coming from the boards are likely to be fuzzy.

Government policy for, say, maximising exports to relieve balance of payments problems may conflict with marketing board policies to maximise producer revenue. Compromises are likely.

5.1.6 Analytically, however, it is helpful to identify three major policy options open to marketing boards in general:

- (i) total revenue maximisation;
- (ii) total revenue stabilisation; ✓
- (iii) price/quantity stabilisation on the local market (to protect producers and consumers against market fluctuations). ✓

5.1.7 These three policies are not necessarily mutually exclusive, though often they will conflict. In practice, it is unlikely that all three policies will coincide.

5.1.8 The models below are intended to illustrate these three policy options. They refer particularly to a situation, which commonly occurs in South Africa, where the local market absorbs a reasonable proportion of output and a world market exists. They do not therefore have great relevance to the wool industry, for example, since most of this product is exported.

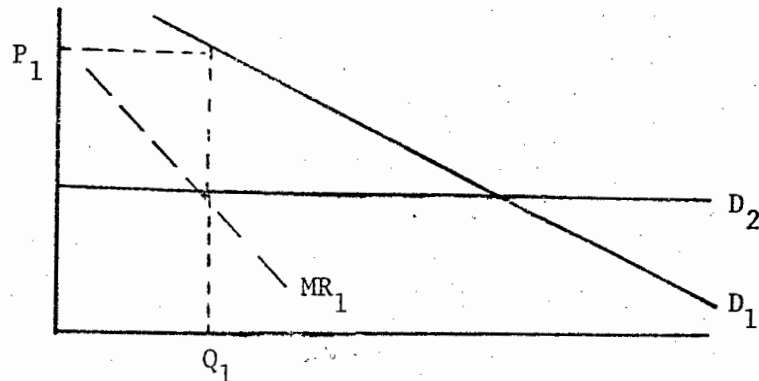
5.2 POLICY PRESCRIPTIONS

5.2.1 Below we consider each of these possible policies separately.

5.2.2 (a) Total revenue maximisation: Consider the case of a product (eg. maize) where output is large and the board has the power to control exports and limit imports. Given the objective of revenue maximisation, how would the board behave? In this situation, the board is in the position of a discriminating monopolist. It will usually be optimal to sell in both markets, but at a higher price in the less elastic market.

In practice, South Africa may be regarded as a price taker in most international markets, though the model which follows does not depend on this assumption. The situation can be illustrated as follows: (1)

Figure 5.1



5.2.3 Let D_2 be the international price line. It is horizontal because the board is assumed to be a price taker on world markets. Let D_1 and MR_1 be the local demand and marginal revenue curves respectively. The board is required to dispose of its stock Q , where Q is greater than Q_1 . It will pay the board to sell Q_1 locally at price P_1 and sell the rest abroad. In other words, the local price will always be above the world price. The board will never sell more than Q_1 on the local market.

	<u>Local Market</u>	<u>World Market</u>
Demand	$P_1 = a + bQ_1 \quad b < 0, a > 0$	$P_2 = \text{constant}, > 0$
Total revenue	$TR_1 = Q_1 a + bQ_1^2$	$TR_2 = P_2 Q_2$ where $Q_1 + Q_2 = Q$ = total stocks

- (1) Note: We are not concerned with profit maximisation here since the board is not concerned in the production decision. The board receives the crop and is then responsible for its distribution, locally and abroad, in such a way that revenue to producers is maximised.

$$\begin{aligned} TR &= TR_1 + TR_2 \\ &= P_2 Q - P_2 Q_1 + aQ_1 + bQ_1^2 \end{aligned}$$

Maximising total revenue:

$$\begin{aligned} \frac{dTR}{dQ_1} &= -P_2 + a + 2bQ_1 \\ &= 0 \text{ (for extremum)} \end{aligned}$$

$$\text{so } Q_1 = \frac{P_2 - a}{2b} \quad |a| > |P_2|$$

5.2.4 Thus as P_2 rises, Q_1 must fall, other things constant. It will never be rational for the board to import under these circumstances. Instead of straight line demand curves, we may consider the constant elasticity case.

Local Market

World Market

$$\text{Demand curve } P_1 = aQ_1^b \quad b < 0, a > 0 \quad P_2 = \text{constant}, > 0$$

Total revenue

$$TR_1 = aQ_1^{b+1}$$

$$TR_2 = P_2 Q_2$$

$$\text{where } Q_1 + Q_2 = 0$$

= total stock

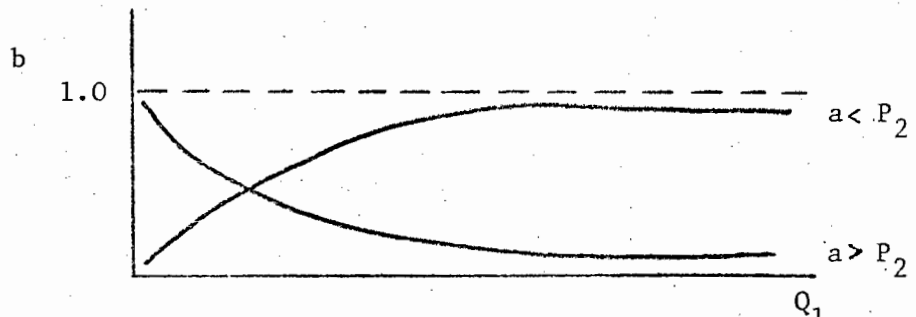
$$\begin{aligned} TR &= TR_1 + TR_2 \\ &= P_2 Q_2 + aQ_1^{b+1} \\ &= P_2 Q - P_2 Q_1 + aQ_1^{b+1} \end{aligned}$$

$$\begin{aligned} \frac{dTR}{dQ_1} &= -P_2 + a(b+1) Q_1^b \\ &= 0 \text{ for extremum} \end{aligned}$$

$$\text{so } Q_1 = \left(\frac{P_2}{a(b+1)} \right)^{1/b} \quad |b| < 1$$

5.2.5 Again, as P_2 rises, Q_1 must fall if a revenue maximising policy is to be preserved. However, relations are more complicated than in the case of a linear demand curve. If

$b > 1$, none will be sold locally. If demand is relatively inelastic, the relation between quantity sold and elasticity of demand on the local market is as follows:



5.2.6 It will never be rational for the board to import. In both cases, therefore, an increase in world prices is associated with an increase in the proportion of the crop exported. In the case of straight line demand curves, then, the following behaviour is indicative of total revenue maximisation: Local price above world price; local price increases as world price increases; quantity exported increases as world price increases; total revenue increases as world price increases; volume of exports varies directly with local output and world price. (1)

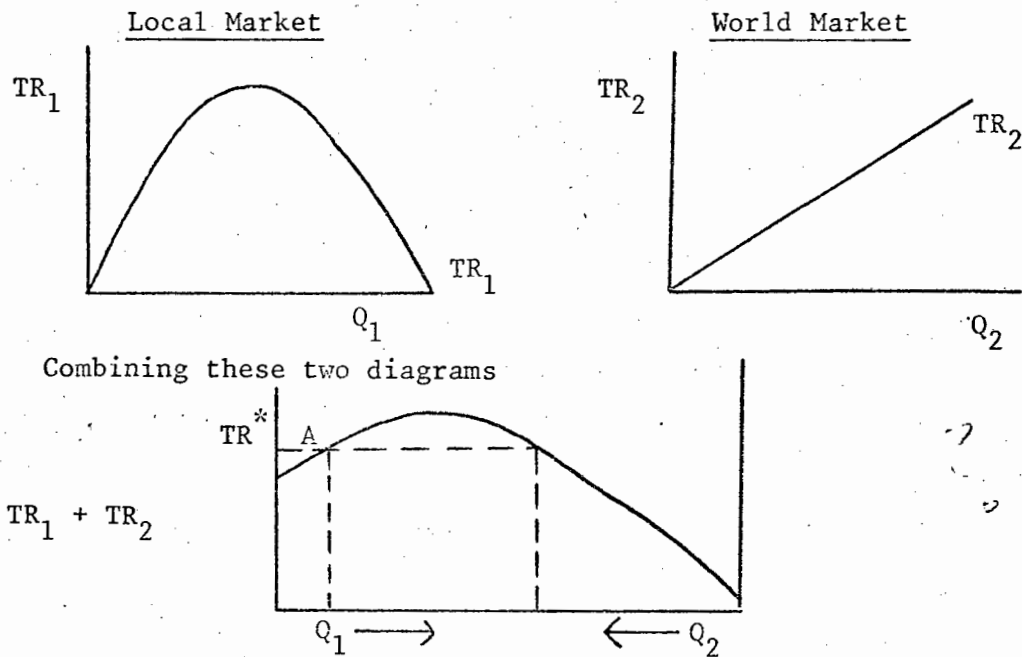
5.2.7 In the case of constant elasticity demand curves, a policy consistent with total revenue maximisation is: nothing sold locally at all if demand is relatively elastic; quantity sold locally inversely related to world price if demand is relatively inelastic, hence local price will increase as world price increases; total revenue increases as world price increases. In both cases, world price = marginal revenue on local market. (1)

5.2.8 (b) Total revenue stabilisation: The rectangular hyperbola model is the device usually used to illustrate revenue stabilisation policies in agriculture. It is a rather futile device. To operate this particular scheme effectively requires knowledge of long-term average revenue in any particular sector, otherwise how can one know where to draw the hyperbola? But if this knowledge

(1) See Table 5.2, p.100.

was available there would be no need to use the model. It would be possible to stabilise price (and revenue) at that point where the supply schedule intersects demand. The use of the rectangular model therefore presupposes a good deal of knowledge about market conditions. But if we had sufficient knowledge to operate this scheme, we would probably have sufficient knowledge to operate a better one. This model should therefore be dispensed with except as an expository device at the undergraduate level.

5.2.9 A further shortcoming of the rectangular hyperbola model is that it assumes a closed economy. Fortunately, we do not live in a closed economy and therefore need to consider the matter further. We consider only the case of straight line demand curves. Graphically, we have the following situation:



5.2.10 There are thus two possible levels of Q_1 consistent with a certain level of total revenue. An increase in world price (which implies a steeper TR_2 line) may then be accompanied by either an increase or a decrease in Q_1 . If the initial point is at A, an increase in world price is associated with a decrease in Q_1 and vice versa. Similarly, an increase in output (which is shown by a lateral expansion of the 'box' diagram) may be accompanied by an increase or a decrease in Q_1 . There is thus no reason

to expect a particular relationship between local and world prices.⁽¹⁾

5.2.11 Local price/quantity stabilisation. This final case is the simplest. Both local price and quantity sold remain fairly stable. Local price will be unrelated to world price. Quantity sold on the local market will be unrelated to total output. Total revenue will be directly related to world price and will vary with local output. Volume of exports will vary directly with local output and will be unrelated to world price.

5.2.12 These criteria for evaluating marketing board policies are summarised in Table 5.2.⁽²⁾

5.3 THE EMPIRICAL EVIDENCE

5.3.1 Which of the various possible policies have the marketing boards followed? While the theoretical models discussed in the previous section are interesting exercises, they are of course simplifications of the real world. Though they provide a useful background for examining real world policies, they are partial analyses. In this section, however, we are concerned with the real world. We shall examine a graphical presentation⁽³⁾ of certain evidence and then consider more conclusive quantitative data.

5.3.2 Figure 1: It is clear that there is a strong suggestion that prices in different categories of products behave in different

(1) In the case of the constant elasticity demand curve, the situation is rather more complicated. Mathematically, the situation can be represented as follows:

$$TR = P_2Q - P_2Q = aQ_1^{b+1}$$

Again, there would seem to be no readily predictable relationship between local price and world price or between output and local price.

(2) See p.100.

(3) See pp.191-200.

ways. The price index for vegetables behaves in a consistently less stable manner than is the case with summer cereals. A similar pattern is observed in the case of consumer prices. Figures 2 & 3 : These illustrate seasonal trends. There are clear differences in behaviour between the various product categories. Summer cereals are extremely stable due to the fixed price scheme, whilst meat and particularly vegetables follow a less stable seasonal path. (1)

5.3.3 There exist clear differences in behaviour between the various product categories. It could be argued that this validates the argument that the market for agricultural commodities is subject to inherent instabilities. Vegetables, where control is least, show the greatest price fluctuations. Grains, where control is greatest, fluctuate the least. It might therefore be argued very superficially that the case which can be substantiated is that control reduces price fluctuations and stabilises inherently unstable markets.

5.3.4 This reasoning is unsatisfactory, however, because it fails to take account of the different characteristics of the various products. It is significant that those markets which show the most instability are also those where the crop is most perishable. As far as vegetables are concerned, they are highly seasonal, expensive to store and expensive to transport. Grains are easily stored and can be relatively cheaply transported in bulk. Because of this, large-scale transportation is feasible between hemispheres, further reducing seasonal fluctuations. The market for meat has features from both these extremes. Meat is both perishable and relatively expensive to transport. However, the seasonal factor is reduced because animals can be slaughtered at any time of the year. Meat can be stored frozen or on the hoof.

(1) This evidence accords with W L Nieuwoudt, 'Risk and Uncertainty in Agriculture,' Agrekon, 11 (2) (1972), pp. 20-25.

5.3.5 While it is true that the different products are subject to different marketing arrangements, it is not clear that the prices of field crops are more stable than vegetable prices because of the form of price fixing adopted. It may be that due to the nature of the products, this behaviour would be observed even under free market arrangements.

5.3.6 A number of price comparison studies are available. Wilson, using wholesale prices, has suggested that Marketing Boards may have achieved some success in stabilising prices.⁽¹⁾ Similarly, Nieuwoudt has shown that the production of grain crops has been more stable over the period 1946-67 than over the period 1918-39 and argues: "Apparently, the Marketing Act has achieved a greater stability not only in respect of prices but also in respect of production."⁽²⁾

5.3.7 There can be little doubt that agricultural prices generally have been more stable in the post-war period and this may be reflected in production. The problem is to what extent this stability can be attributed to marketing boards. In comparing the decades before and after the Second World War, we are, after all, comparing very different worlds. We may note that the prices of input factors, as Nieuwoudt shows, have been far more stable in post-war years and also, as Nieuwoudt himself argues, the prices of inputs are crucially important in determining production decisions.⁽³⁾ This fact alone, therefore, could account in large measure for more stable production patterns and consequently prices.

5.3.8 An alternative method to investigate the problem is to compare grain markets where price is rigidly controlled with grain markets where prices are not controlled, but simply reflect the forces of supply and demand.

(1) F Wilson, Farming 1866 - 1966, in The Oxford History of South Africa, ed. by Monica Wilson & Leonard Thompson (Oxford: Clarendon Press 1971, Ch. 3).

(2) See W L Nieuwoudt (1972), p.22.

(3) See W L Nieuwoudt (1972), p.22.

5.3.9 Figures 5 - 9 illustrate this comparison. South African producer prices are compared with United States wholesale prices which are taken as proxy for 'world prices' for various crops. In the case of most products during the post-war period, it would seem that the world price behaves in very much the same way as the local producer price. In the case of grain sorghum, the South African producer price shows considerably more fluctuation than the world price. This visual impression is confirmed by quantitative evidence below.

5.4 THE PERFORMANCE OF THE BOARDS

5.4.1 The behaviour of 10 products is considered. Together these account for about 50 per cent by value of total agricultural output in South Africa. The relationship between different variables associated with the three suggested policies are examined.⁽¹⁾ It is assumed that South African agriculture is a price taker in world markets. Transport costs and quality differences are assumed away. It is also assumed (though this does not affect subsequent conclusions) that the local market is ruled by straight line rather than constant elasticity demand curves. The performance of the boards is summarised in Table 5.3.⁽²⁾

5.4.2 A policy of total revenue maximisation requires that local price (P_1) should be above world price (P_2). This occurs significantly often in the case of wheat, grain sorghum, lamb, oats and rye. With the exception of grain sorghum, however, these products are all imported, which is not consistent with revenue maximisation behaviour.⁽³⁾ As further evidence, Col. 3, indicates that there is no product where local price has consistently moved with world price (not even grain sorghum). It seems therefore that total revenue maximisation must be rejected as an explanation of Marketing Board policy. Similarly, total revenue stabilisation can be rejected.

(1) See Table 5.2, p.100. This Table summarises the earlier discussion, pp.86-91.

(2) See p.101.

(3) Unless the products are imported and sold by the Boards themselves.

Total revenue has not been stable. In most years, for most products, total revenue moved in sympathy with total output, Q. (Col. 6), a behavioural pattern consistent with price stabilisation.

5.4.3 It would seem therefore that we are obliged to accept the third alternative. The evidence in favour of this conclusion is reasonably persuasive. It is the only one of the three policy options which allows imports and five of the ten products studied are usually imported. In addition, P_1 appears to be uncorrelated with P_2 as required, Col. 3. Col. 7 which shows P_1 deflated by the South African consumer price index suggests that real prices on the local market have been extraordinarily stable for most products. Further evidence can be presented in support of this.

5.4.4

TABLE 5.1

ANNUAL DEVIATIONS FROM TIME TREND

(average % error of residuals)

<u>Product</u>	<u>Prices</u>	<u>Total Revenue</u>
Maize	3,21	21,61
Grain sorghum	12,60	40,51
Groundnuts	3,25	21,61
Sunflowers	6,53	30,40
Lucerne	7,53	23,14
Wheat	3,24	17,31
Oats	4,06	16,30
Rye	2,50	24,66
Barley	3,50	28,61

5.4.5 Producer prices of the various crops were divided by the producer price index of all field crops. This ratio was set against a time trend. Table 5.1 sets out the resulting residuals. It is clear that total revenue shows considerable deviations on a year-to-year basis. It would seem, therefore, that we are obliged to accept the price/quantity explanation of marketing board behaviour as the most satisfactory

of the three. The weight of evidence seems therefore to point to the conclusion that, by and large, the effect of the marketing boards has been to stabilise local price.

5.4.6 It is, however, open to an alternative interpretation. In the case of the two most important products in Table 5.3, - beef and maize, which together account for one third by value of total agricultural output, local prices have been remarkably close to world prices. (Table 5.3, Col. 5). Comparisons of local and world prices are also set out in Figures 5 - 9. Had these marketing boards not existed, it is reasonable to argue that local prices would have been little different. This argument can be pressed a little harder. Barley prices have been remarkably close to world prices, whilst port and groundnut prices have been consistently below world prices. In the case of three winter cereals, grain sorghum and lamb local prices have been consistently below world prices. In the case of three winter cereals, grain sorghum and lamb local prices have been consistently above world prices. Quality differences may be invoked to explain lamb price differentials, but this does not seem satisfactory in the case of the other products.

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5.4.7 Clearly there is something to be explained here. Is it coincidental that for a quarter of a century the meat and maize control boards have deviated by less than 10% from world prices? It is necessary to pose the question: Why did these boards choose not to use the impressive array of marketing powers at their disposal?

5.4.8 A possible explanation in the case of maize may be that, though the Maize Board reflects the interests of producers, on the consumption side customers have been equally well organised. Maize is usually sold either to processors or to other farmers as feed. This 'countervailing power' type explanation is not, however, satisfactory on closer analysis. It may explain stable prices, but fails to explain the remarkably close coincidence between world price and local price. It cannot be applied readily to the beef market where consumers would appear to be far less well organised. Nor do we have any means to explain why, although equipped with similar powers, at least on paper, the Wheat Board has been able to maintain the prices of its products substantially above world price levels.

5.4.9 The most plausible explanation for the success of the Wheat Board in achieving relatively high producer prices relates to specific factors of an extra-economic nature: "It is a well-known fact that South Africa is by no means suitable for the production of wheat and that it is impossible for the South African wheat farmer to compete on the basis of world wheat prices."⁽¹⁾ Yet wheat production has been encouraged. "From the purely economic point of view, therefore, it seems very doubtful whether wheat farming is to be justified. From the national point of view, however, it is desirable that the country should be partly, if not entirely, self-supporting in respect of wheat."⁽²⁾ This self-sufficiency argument underlies much official thinking on agricultural problems.

5.4.10 This is a specific explanation for a specific crop, however, and brings us very little closer to an explanation of the behaviour of the boards in general. The answer to this wider question may lie in an area of literature not directly related to agricultural economics - the theory of regulation.

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- (1) W J Pretorius, An Economic Study of the Wheat Industry in the Union, Dept. of Agriculture & Forestry, Bulletin No 141, 1935, p.5.
- (2) Bulletin No. 141, p.5.

5.5 THE THEORY OF REGULATION⁽¹⁾

5.5.1 Downs⁽²⁾ has suggested that monopoly theory yields useful predictions only because of specific ownership arrangements. The conventional textbook theory needs to be more carefully spelled out. Implicit in the theory is the assumption that the decision maker also owns the fixed factors. The property rights situation, in other words, is closely defined.

5.5.2 In the case of marketing boards, however, we have an obvious case of the separation of ownership from control. The people who make the price decision are not the same as those who make the production decision and, crucially, there is no direct relationship between the decision and the rewards accruing to the decision maker. Although a high producer price may be important to producer board members, it is unlikely to be their only objective. Other factors are also important. As, for example, the desire to avoid adverse public criticism.

5.5.3 If therefore, economic theory fails to provide a satisfactory explanation for the behaviour of marketing boards, it is because 'economic theories of government .. universally fail to assign any motives to the men in government.'⁽³⁾ This is an important failing, increasingly recognised as government activity expands to occupy an ever widening area of economic activity. What is needed is a theory to explain the behaviour of government regulatory agencies in a satisfactory and empirically refutable way.

5.5.4 To understand the behaviour of marketing boards better, it is necessary to consider the problems faced by each board in making its pricing decision. Output is a function of numerous

- (1) The Theory of Regulation is discussed more fully in Chapter 8.
 (2) A Downs, An Economic Theory of Democracy, (New York: Harper & Row, 1957)
 (3) A Downs, op. cit., p.283.

factors of which only the price of that product is directly under the control of the board. Weather, costs, natural hazards and the decisions of individual farmers are not. Most importantly, the prices of substitutes (and even complements) in production are frequently beyond their control. Further, with the exception of vegetables, which significantly are not controlled, few agricultural products are sold directly to the consumer. Most undergo further processing or are sold to other farmers (as cattle feed, etc.). Though consumers may be a diffuse, disorganised group, the food processing industry is probably reasonably powerful. This means that if continuous clashes are to be avoided, some modus vivendi needs to be established.

5.6 CONCLUSION

5.6.1 Given the complexities of the factors involved, costs of obtaining information and of reaching agreement on a suitable price are likely to be high. Some rule of thumb is necessary which is defensible both to various political interest groups on political and economic grounds. The world price fulfills this requirement and explains the behaviour of maize and beef markets. In the case of wheat, however, political factors are overriding and monopoly power has been used to secure relatively high producer prices. The South African experience can therefore be interpreted as illustrative of the relative powerlessness of marketing boards to achieve significant variations in market prices unless supported by political interest groups.

TABLE 5.2.

MARKETING BOARD POLICIES

Variables	P O L I C I E S		
	P_1, Q_1 Stabilisation	TR Stabilisation	TR Maximisation
P_2	$z P_1, Q_1$	+ P_1 if $P_2 > MR_1$ - P_1 if $P_2 < MR_1$	= MR_1 < P_1 + P_1
Q_2	Stable	- P_2 if $P_2 > MR_1$ + P_2 if $P_2 < MR_1$	- P_2
Q	$z P_1, Q_1$	+ P_1 if $P_2 > MR_1$ - P_1 if $P_2 < MR_1$	+ Q_2
TR	+ Q + P_2	Stable	+ P_2 $z Q_1$ + Q
Imports	If $Q > Q$	Never	Never
Exports	If $Q < Q$	Possible	Possible

Key: P_1, Q_1 Local price and quantity;
 MR_1 Marginal revenue on local market;
 P_2, Q_2 World price and quantity sold overseas;
 $Q_1 + Q_2 = Q$ Total local production;
+ Positively correlated;
- Negatively correlated;
 z Uncorrelated.

Thus, for a policy of total revenue maximisation, we would expect world price to be equal to marginal revenue on the local market, and less than local price but positively correlated with it.

TABLE 5.3

MARKETING BOARD BEHAVIOUR

Board	Product	Value as % of total agricultural output (1974/5)	No. of years $P_1 > P_2$	No. of years $P_1 + P_2$	Net importer (M) or exporter (X)	Average deviation of P_1 from P_2 (%)	No. of years $Q + TR$	Real P_1/S_{P1}
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
<u>Meat</u>	Lamb	5,0	23/24*	13/23	M	+ 41,7	16/23	86,99/14,30
	Beef	11,6	16/25	15/24	X	+ 4,7	20/23*	63,84/13,17
	Pork	2,6	1/24	16/23	X	- 13,6	13/23	59,56/4,36
<u>Maize</u>	Maizè	22,2	10/25	11/24	X	- 7,5	23/24*	6,24/0,63
	Grain Sorgh.	1,0	22/25*	12/24	X	+ 31,0	22/24*	8,24/2,36
<u>Wheat</u>	Wheat	6,0	21/25*	7/25	M	+ 37,4	24/24*	12,19/1,32
	Oats	2,7	20/25*	5/24	M	+ 23,7	24/25*	7,97/1,01
	Rye	0,0	19/25*	7/22	M	+ 31,0	22/23*	7,86/0,45
	Barley	0,2	5/25	8/24	M	- 9,3	21/23*	6,89/0,99
<u>Oil Seeds</u>	Ground nuts	1,7	3/25	9/24	X	- 15,4	22/23*	20,20/3,66

* Significant at the 99% level.

In each case P_2 is export price of major trading partner or U S wholesale price.

S_{P1} Standard deviation, local price deflated by Consumer Price Index.

CHAPTER SIX

CENTRALISATION AND CONTROL

6.1 INTRODUCTION

6.1.1 The agricultural sector is considered to be uniquely unstable due to inelastic and highly variable supply functions resulting in extreme fluctuations in both agricultural prices and incomes. This instability, it is argued, leads to a wastage of resources⁽¹⁾ while at the analytical level it has been shown that under certain circumstances a net gain in welfare can accrue from a program of market intervention.⁽²⁾

6.1.2 Whether arguments of this type are sufficiently strong to justify government intervention in practice must remain an open question. For centralised intervention policies to result in a net welfare gain, a great deal of information is required about the market in question. Otherwise a likely outcome is an arbitrary redistribution of welfare rather than a net increase. What is certain, however, is that those factors which make for instability in the agricultural sector (unpredictable weather, time lags, etc.) do not simply go away when the state takes over. Indeed, it is precisely those factors which contribute to and encourage government intervention in the agricultural sector that make the task of government planning so difficult. Also, government intervention in the agricultural sector is not usually aimed at simply removing short term fluctuations but rather at achieving longer term policy objectives. This chapter examines problems

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- (1) D Blandford and J M Currie, 'Price uncertainty - the case for government intervention,' J Agric Econ 26 (1975), pp.37-51.
- (2) P B L Hazell and P L Scandizzo, 'Market intervention policies when production is risky,' A J A E 57(4) (1975), pp.641-649.

associated with certain types of centralised price control operations such as are practised in South Africa.

6.1.3 Section 6.2 considers some practical problems associated with the estimation of agricultural supply functions in a central planning situation. Section 6.3 considers these difficulties in relation to South African agriculture while Section 6.4 presents the results of an empirical study of certain crops in South Africa. A discussion of these results follows in Section 6.5.

6.2 AGRICULTURAL SUPPLY FUNCTIONS

6.2.1 The theoretical problems associated with agricultural supply functions have been extensively discussed, at least in the United States⁽¹⁾ where there also exists a considerable body of published empirical work.

6.2.2 In a formal sense, we can specify the supply relationships for an individual firm for a product, i , as

$$Q_i^* = f(P_i, P_1 \dots P_{i-1}, P_{i+1} \dots P_n, C, T, W)$$

where P_i = price of that product

$P_1 \dots P_{i-1}, P_{i+1} \dots P_n$ = prices of other related products (substitutes or complements in production)

C = costs

T = technology

W = weather

Q_i^* = intended output of product i which may differ from actual output (Q_i) due to drought, disease or other unpredictable factors.

(1) See for example E O Heady et. al. (eds.), Agricultural Supply Functions, (Ames, Iowa, 1961).

6.2.3 This list does not, of course, exhaust the relevant variables. There are in addition specific problems relating to the estimation of agricultural supply functions which cannot be ignored simply because they are difficult to quantify

6.2.4 (a) Time has long been known to play an important role in economic fluctuations.⁽¹⁾ The cobweb theorem⁽²⁾ is the most obvious illustration of this.

6.2.5 (b) Yield variability. In many sectors of the economy, it is reasonable to suppose that intended output bears a close correspondence to actual output. Thus one can expect to find a significant relationship between price and measured output. However, in the case of agriculture, we are not so fortunate. Yield per hectare varies considerably from year to year due to unpredictable variations in weather, for example, so that the relationship between price and observed output is likely to be a tenuous one at best. This is actually a measurement problem - how to determine the farmer's intentions.

6.2.6 The most obvious solution is to use area planted rather than output as indicative of the supply relationship, on the grounds that area planted reflects the volume of output the farmer intends to produce. This method, while often a distinct improvement, can be criticised on both theoretical and practical grounds. Behrman⁽³⁾ questions the use of land as an indicator of planned production because:

(i) he points out that land is only one of many

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- (1) See for example D H Robertson, A Study of Industrial Fluctuations, (London, 1915).
- (2) M Ezekiel, 'The cobweb theorem,' Q J E 52 (1938), pp.255-280, provides a clear exposition of this model. For a discussion of the cobweb theorem see Chapter 3.
- (3) J L Behrman, Supply Response in Underdeveloped Agriculture: A Case Study of Four Major Crops in Thailand, 1937-62, (Amsterdam, 1968).

inputs into agriculture so that the decision to allocate a certain area of land to the production of a specific crop is consistent with a wide range of planned outputs; and

(ii) furthermore, land is not necessarily homogeneous.

It is preferable to use an index of all inputs to be devoted to the crop, but this leads to further measurement and data availability problems.

6.2.7 At the empirical level, Barker⁽¹⁾ suggests that while yield depends principally on technology and weather, there is also sometimes a link between yield and price level. Thus area is not an ideal proxy for intended output, though it may in practice be the best available.

6.2.8 (c) Expectations. The familiar cobweb model postulates a simple expectations function.

$$P_{t-1}^* = P_t$$

where (*) indicates expected or anticipated price. Thus price expected in the next period is equal to the current price. This formulation has been subject to extensive criticism and development.⁽²⁾ Probably the most important contribution to agricultural supply estimation has come from Nerlove.⁽³⁾ It can be expressed in one form as:⁽⁴⁾

$$a_t = ABp_{t-1} + A(I-B)A^{-1} a_{t-1} + u_t - A(I-B)A^{-1} u_{t-1} \quad [1]$$

- (1) R Barker, 'The response of production to a change in rice price,' Phillippine Economic Journal 5(2)(1966), pp.260-276.
- (2) Among the numerous articles on this subject, see N S Buchanan, 'A reconsideration of the cobweb theorem,' J P E 47(1939), pp.67-81 and K W Rothschild, 'Cobweb cycles and partially correct forecasting,' J P E 72(1964), pp.300-305.
- (3) M Nerlove, The Dynamics of Supply: Estimation of Farmers Response to Price, (Baltimore, 1958). For an exposition of this model, see Appendix 8.
- (4) M Nerlove, op. cit., p.195.

where a_t = a vector of the acreages of several crops during period t

p_{t-1} = a vector of observed prices during period $t-1$

A = a matrix of the coefficients of the expected "normal" prices in each of the acreage equations for the crops under consideration

B = a diagonal matrix of the coefficients of expectation

If, however, only one price is considered to be relevant, the above expression can be written more simply⁽¹⁾ as:

$$a_t = a_0 \beta + a_1 \beta p_{t-1} + (1-\beta)a_{t-1} + u_t - (1-\beta)u_{t-1} \quad [2]$$

using Nerlove's notation. In [2] only the price of that particular product is considered relevant whereas in [1] the prices of related products are included in the expression - an important consideration from the central planning point of view.

6.3 SUPPLY FUNCTIONS IN SOUTH AFRICA

6.3.1 Agricultural marketing in South Africa is highly centralised at the individual product level. Twenty-two marketing boards have been established, which together handle some 80% of all agricultural output. Each board handles a specific product, though there are exceptions to this. The Wheat Board, for example, is also responsible for other winter cereals (barley, oats and rye), while the Maize Board handles both maize and grain sorghum. In addition, the modes of operation differ substantially between boards. Some operate floor price schemes, removing only the surplus from the market, while others (e.g. the Wheat Board) operate one-channel fixed price schemes⁽²⁾. Prices are therefore determined by the Wheat Board for all four winter cereals, and ratified by the Minister of Agriculture, advised by the National Marketing Council, which is responsible for price co-ordination with all other controlled agricultural products.

(1) M Nerlove, op. cit., p.193.

(2) The structure of South African agriculture is discussed in more detail in Chapter 2.

6.3.2 Each marketing board is therefore theoretically required to know the supply relationship for its own product, while the National Marketing Council has the more complex task of determining the interactive effects of each price determination on the output of all other products.

6.3.3 As indicated in Section 6.2, the formulation

$$Q_i^* = f(P_i)$$

is possible only on strict assumptions. In practice, the specification of a supply function is likely to be more complex than this and one is faced with the task of determining what the relevant prices are which determine the output of a particular product.

6.3.4 This may be done on the basis of institutional knowledge, but using data published in the 1972/3 South African Agricultural Census⁽¹⁾ a somewhat more rigorous approach to the problem can be devised. The Census provides a breakdown for each of 28 agricultural products of the percentage of each product (number of trees, head of cattle, total production, etc.) recorded in each of the 60 economic regions in South Africa. It is reasonable to hypothesise that those products cultivated in the same region are likely to be substitutes in production. Thus the matrix of correlation coefficients for each pair of products across each of the 60 regions provides a means of establishing which cross elasticities are likely to be relevant in specifying the supply function. Appendix I⁽²⁾ shows these correlations for 18 of the more interesting products. For example, the low correlation between wheat and sunflower seeds ($r = ,01$) is due to the fact that those economic regions where wheat is grown are quite distinct from sunflower growing regions. It is likely therefore that a change in the price of wheat will have a negligible effect on the output of sunflower seeds. On the other hand, the high correlation between maize and sunflower seed ($r = ,74$)

(1) South African Department of Statistics, Agricultural Census No. 46, Report No. 06-01-10, 1972-3.

(2) See p.169.

suggests the reverse. A change in the price of one of these products is likely to affect the output of both of them to some degree.

6.3.5 If each region of the country were crop-specific (i.e. \times if only one crop were grown in each region) the matrix would be unit diagonal. Clearly this is not so, though there are certain products for which this condition is approached, for example, ostriches. This product shows a consistently low correlation with all other inputs, ($r = -.06, -.04, -.04, -.02 \dots$), unsurprisingly since this industry is located almost entirely around the Oudtshoorn area. A supply equation

$$Q_o^* = f(P_o)$$

where Q_o^* = anticipated output of ostrich products

P_o = price of ostrich products

might therefore give a reasonably accurate indication of the supply response of this industry. By way of comparison, cattle appears to be related to numerous other outputs, ($r = -.55, .56, .21, .06, .52, .62 \dots$). Any expression of supply in the cattle sector (even ignoring the complicated relationship between dairy and beef cattle) would therefore have to include a large number of variables to be meaningful.

6.3.6 Given the many inter-relationships suggested by the matrix, it is clear that the specification $Q_i^* = f(P_i)$ is satisfactory in very few cases. Yet this is the specification implicit in the organisation of price control along individual product lines, as is commonly the case in South Africa. In practice, centralised price control requires a knowledge of the relevant cross-elasticities of supply, since any one price determination will affect the output not only of that product, but of others as well. This is the essence of the centralised price control problem.

6.4 WINTER CEREALS

6.4.1 This section describes an empirical investigation. It is

in the nature of a case study and the conclusions are tentative, but it does serve to illustrate the type of analysis which can be undertaken, in fact which must be undertaken, if agriculture is to be co-ordinated in a meaningful planned, as opposed to an ad hoc, sense.

6.4.2 The focus in this section is on winter cereals for the years 1951/2 - 1974/5. As Nerlove has pointed out, pastoral crops have an advantage as a subject of study in that output tends to be relatively homogeneous, thus reducing measurement problems. There is a strong reason for the choice of winter cereals. Referring to the matrix,⁽¹⁾ it can be seen that apart from the high correlation between wheat and other winter cereals (oats, rye and barley) of ,74, the correlation with other products is relatively low. We can therefore expect that a specification of a supply function involving only these four crops will yield meaningful results. It should be noted here, however, that though the matrix is helpful as a guide to specification of supply relationships, it is not exhaustive. It is intended as an addition to rather than a replacement of institutional knowledge.

6.4.3 Yield: To arrive at an accurate measure of planned output, area should be weighted by yield. Nerlove⁽²⁾ in fact did not apply a weight for yield changes, but over a period of some 20 years it would appear that yield would change significantly and should be examined. Yield was therefore calculated for the four relevant crops over time, and the following expressions established:

$$\text{Wheat: } Y_W = -0,176 + 0,013T$$

$$(4,52) \quad R^2 = 0,46 \quad DW = 1,77$$

(1) See Appendix 1, p.169.

(2) M Nerlove, op. cit.,

$$\text{Oats: } Y_O = 0,437 - 0,004T$$

$$(-3,02) \quad R^2 = 0,26 \quad DW = 1,44$$

$$\text{Rye: } Y_R = 0,357 - 0,004T$$

$$(-3,15) \quad R^2 = 0,28 \quad DW = 0,92$$

$$\text{Barley: } Y_B = 1,294 - 0,011T$$

$$(-3,64) \quad R^2 = 0,35 \quad DW = 1,95$$

Key: 't' values given in parentheses

Y_W, Y_O, Y_R, Y_B = yield (tons per hectare, wheat, oats, rye and barley)

T = time

6.4.4 Trends in yields are by no means clear. The low R^2 is accounted for by wide variations in weather conditions from year to year. However, the low DW statistic is more difficult to explain. The apparent decline in yield for oats, barley and rye over time is equally puzzling. It may be that as the area cultivated has increased, farmers are being pushed, in Ricardian fashion, on to marginal land with a lower yield. It is more likely, however, that we simply have a data problem here. Quantities of oats, for example, are perhaps being consumed in increasing quantities directly on farms as animal feed, without being recorded.

6.4.5 In this exercise, therefore, yield has been ignored, not because it is unimportant, but simply because we do not know what the trends in yield have actually been on a national basis. In mitigation, it might be argued that if the trends in yield have been the same for all four crops, the effects tend to cancel out and yield can be ignored anyway. This is satisfactory if we are concerned to record output rather than volume handled by the Wheat Board.

6.4.6 Prices: Clearly the absolute level of prices is not a suitable index, since it is affected directly by inflation. It is relative prices which are important. Nerlove has used the

Fisher Ideal Index⁽¹⁾ where prices are weighted by the size of crop. In this exercise, a similar procedure was adopted. The Fisher Index (Formula 353) was used weighted by area planted.

6.4.7 Area: Given that wheat, oats, barley and rye are substitutes or complements in production and no other crops are relevant, which strictly speaking is how the model should be interpreted, it is logical to regard the total land allocated to winter cereals as given. The farmer is faced with the problem of how to allocate the area of land to each of the four crops. Area is therefore expressed as

$$a_{wt} = \frac{a_{Wt}}{a_{Wt} + a_{Ot} + a_{Rt} + a_{Bt}}$$

Key: a_{Wt} = land area allocated to wheat production in year t, etc. and $a_{Wt} + a_{Ot} + a_{Rt} + a_{Bt} = 1$

i.e. the proportion of land allocated to each winter cereal crop is determined by relative prices. The total area allocated to winter cereals is determined by exogenous factors beyond the scope of the model.

6.4.8 Costs: Costs are ignored. There are various reasons for this, the weakest being that data on costs are not available on a national basis. There are, fortunately, better reasons. Since winter cereals have relatively similar production techniques, any change in costs will have, broadly speaking, similar effects on all. Also it should be stressed that the standpoint of this study is price control by marketing boards. They can normally manipulate prices directly but not costs, and consequently, we are concerned here with responsiveness to output price rather than costs.

6.4.9 Calculating the variables as explained above, we obtain the following correlation matrix:

(1) I Fisher, The Making of Index Numbers, (London, 1927).

	a_{Wt}	a_{Ot}	a_{Rt}	a_{Bt}	P_{Wt-1}	P_{Ot-1}	P_{Rt-1}	P_{Bt-1}
a_{Wt}	1,0							
a_{Ot}	-,94	1,0						
a_{Rt}	,02	-,32	1,0					
a_{Bt}	-,29	-,08	,13	1,0				
P_{Wt-1}	,39	-,21	-,46	-,28	1,0			
P_{Ot-1}	-,27	,15	,26	,31	-,87	1,0		
P_{Rt-1}	,07	-,20	,60	-,20	-,44	,03	1,0	
P_{Bt-1}	-,07	,12	-,56	,55	,32	-,13	-,62	1,0

As can be seen, the signs are generally, though not always, in the direction predicted by economic theory for substitutes in production, viz. positive own price elasticity and negative other price elasticity. All own price elasticities are of the correct sign. Since there is also evidence of correlation between the price variables, it could be expected that an attempt to estimate parameters of expression [1] would encounter difficulties due to multicollinearity. In most cases, estimation was done by Standard Ordinary Least Squares (OLS) techniques but to circumvent the problem of multicollinearity, estimates for expression [1] were also obtained by ridge regression. (1)

6.5 DISCUSSION

(2)
6.5.1 Table 6.1 sets out estimates for each of the four winter cereal crops, calculated by a variety of regression techniques. The parameter estimates in equations (a), (d), (g) and (j) were obtained by ridge regression. Equations (b), (e), (h) and (k) are Ordinary Least Squares (OLS) results for the simple Nerlove model (equation [2], p.106). Equations (c), (f), (i) and (l) were similarly calculated by OLS techniques but, following Wold

(1) Appendix 6.

(2) See p.120.

and Jureen ⁽¹⁾ the sum of the price elasticities was constrained to zero. ⁽²⁾ In the case of the latter group, the data was transformed into logarithmic form, so the price coefficients can be immediately interpreted as elasticities.

6.5.2 In all cases, in accordance with theory, own price elasticities are positive, though 't' values are generally non-significant. The explanatory power of the models is largely attributable to the lagged area term, though this effect is less marked in the case of rye. In general, the constrained OLS equations perform better than the ridge estimates. In all cases, autocorrelation (as measured by the Durbin-Watson (DW) statistic) ⁽³⁾ is reduced and the \bar{R}^2 value is higher.

6.5.3 It is interesting therefore to try a brief simulation exercise using equations (c), (f), (i) and (1). We may imagine a scenario where, in a free trade situation, world prices for wheat, oats, rye and barley had been the effective producer prices in South Africa, instead of the prices actually maintained by the Wheat Board. ⁽⁴⁾ The results of this exercise are shown in each of the figures. ⁽⁵⁾ The model suggests that the output of wheat and barley would have been considerably larger than it was, the output of oats and rye a good deal smaller.

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- (1) H Wold & L Jureen, Demand Analysis (New York: John Wiley & Sons, 1953),
- (2) For the relevant procedure, see J Johnstone, Econometric Chap. 6 Methods, 2nd ed., (New York: McGraw Hill, 1960), pp. 155-159.
- (3) Difficulties of course arise when OLS is applied to a lagged dependent variable such as this. A combination of autocorrelation and lagged dependent variables implies that OLS estimates will be inconsistent. Furthermore, the DW statistic is biased towards 2. (Johnston, (1960); p.307).
- (4) Data used were U S wholesale prices in the case of barley, oats and rye and the Australian export price in the case of wheat. Source: F A O Monthly Bulletin of Agricultural Economics and Statistics (various issues).
- (5) See Figs.12-15, pp.203-206.

6.5.4 The simulation is suggestive rather than precise and, although the simulation was constrained so that

$a_{it} = 1$, there is no reason why $0 \leq a_i \leq 1$. The values obtained have therefore been adjusted on a pro rata basis to meet this condition.

6.6 SUMMER CROPS

6.6.1 A similar exercise was carried out in the case of certain summer crops. A reasonable combination of products suggested by the matrix⁽¹⁾ is:

	MZ	GS	GT	SF
MZ	1,0			
GS	,77	1,0		
GT	,63	,41	1,0	
SF	,74	,76	,40	1,0

Key:

MZ = maize
 GS = grain sorghum
 GT = groundnuts
 SF = sunflowers

This group appears to be less self-contained than was the case with the winter cereals. We note relatively high correlations between maize and cattle (,55), pigs (,55) and hay and feed (,55) so it may be argued that in a comprehensive model, these products should also be included. To expand the model in this way would, however, be an immense undertaking, particularly in view of the difficulty of defining a suitable price variable in the case of cattle.

6.6.2 Our initial apprehension in this regard is not significantly reduced by a consideration of the correlation matrix:

(1) See Appendix 1, p.169.

	MZA _t	GSGA _t	GRTA _t	SFA _t	MZP _{t-1}	GSP _{t-1}	GTP _{t-1}	SFP _{t-1}
MZA _t	1,0							
GSGA _t	-,77	1,0						
GRTA _t	-,18	-,26	1,0					
SFA _t	-,38	-,14	,01	1,0				
MZP _{t-1}	,081	-,110	,237	-,149	1,0			
GSP _{t-1}	,242	-,061	-,068	-,308		1,0		
GTP _{t-1}	-,182	,380	-,591	,131			1,0	
SFP _{t-1}	-,462	,108	,174	,567				1,0

Key:

MZA_t = proportion of area devoted to maize cultivation in year t

MZP_{t-1} = maize price adjusted by Fisher index in year t-1. Similarly for sunflowers (SF), grain sorghum (GS) and groundnuts (GT).

This reveals that on the assumption that the four products are substitutes in production only 8 of the 16 price elasticities are of the correct sign and the magnitude of the coefficients is less than impressive. It may be noted, however, that the relation between MZ and SF areas and prices is correct and, in the case of SF area, the correlations are relatively large.

6.6.3 In a further attempt to disentangle the relationship between these products, a correlation matrix of first differences (FD) was computed:

	FDMZA _t	FDGSA _t	FDGTA _t	FDSFA _t
FDMZA _t	1,0			
FDGSA _t	,21	1,0		
FDGTA _t	,48	,08	1,0	
FDSFA _t	-,72	-,31	-,21	1,0

Key:

FDMZA_t = first differences, maize area
(year t) - (year t-1) etc.

6.6.4 Again there appears to be a strong relationship between MZ and SF. If we consider only the signs of the coefficients, it seems reasonable to suggest land is substituted between SF and the other three products, but not between MZ, GS and GT. This would suggest equations specified as follows:

- (i) MZA = f (MZP, SFP)
- (ii) GSP = f (GSP, SFP)
- (iii) GTP = f (GTP, SFP)
- (iv) SFP = f (MZP, GSP, GTP, SFP)

Key:

MZP = maize price etc.

6.6.5 Inspection of the correlation matrix reveals that the signs of the correlation coefficients are not consistent with this interpretation. All correlations have incorrect signs. However, the equations estimated for MZ and SF are less unsatisfactory.⁽¹⁾ Explanatory power is low but the price response appears to be reasonably significant in equations (a) - (d).

(1) See pp.122-123.

Equation (d) has the best established properties and yields a price elasticity of 0,981. Expanding the model to include the price relative (e) leads to a much less satisfactory model.

6.6.6 In addition, four other expressions were estimated, (f) - (i). The statistical properties of these equations are not satisfactory, though again the MZ and SF equations yield parameters of the predicted sign (except for the MZP variable). GSP

6.6.7 These equations have been estimated by the ridge regression programme without producing any significant changes. In addition, estimations were made weighting area by yield. Yield equations are as follows:

$$\begin{aligned} \text{MZ/HA} &= ,732 + ,045 \text{ TIM} \\ &\quad (4,527) \quad \bar{R}^2 = 0,459 \quad \text{DW} = 2,26 \end{aligned}$$

$$\begin{aligned} \text{GS/HA} &= ,516 + ,030 \text{ TIM} \\ &\quad (3,555) \quad \bar{R}^2 = 0,336 \quad \text{DW} = 1,40 \end{aligned}$$

$$\begin{aligned} \text{GT/HA} &= ,450 + ,014 \text{ TIM} \\ &\quad (3,045) \quad \bar{R}^2 = 0,265 \quad \text{DW} = 2,25 \end{aligned}$$

$$\begin{aligned} \text{GT/HA} &= ,398 + ,016 \text{ TIM} \\ &\quad (4,022) \quad \bar{R}^2 = ,478 \quad \text{DW} = 1,24 \end{aligned}$$

This weighting also did not improve the models.

6.7

CONCLUSION

6.7.1 In a sense, all that these equations can suggest is that farmers respond to market price signals, an unsurprising result. In fact, one can turn the argument on its head and argue that since farmers can be expected to respond to market price signals, we require a model that gives parameters of the correct sign. It is important to realise that we are testing

the model, not the theory. If the signs are wrong, it is reasonable to suppose that the specification of the model was incorrect rather than that farmers behaved economically irrationally.

6.7.2 The anticipated signs are positive for own price elasticity and negative for other price elasticities. There are, however, other possible reasons why the signs may not be in the predicted direction.

- (i) The goods may be complements in production;
- (ii) Risk - if the output of one good increases, the output of some quite 'independent' good may also increase as farmers diversify to spread their risks;
- (iii) Even if the model is correctly specified, technical estimation problems of multicollinearity may lead to incorrect signs of the parameters;
- (iv) Technical constraints on production may cause output to increase at the same time as its relative price is falling.⁽¹⁾

6.7.3 What is important in this exercise is not so much to discuss whether farmers respond to market price signals. We can assume they do, since this involves no more than the assumption of rational economic behaviour. The problem is firstly to determine whether, amidst the conflicting influences of other variables (changing costs, technology, etc.), any consistent price response can be discerned because such a response is a prerequisite for a centralised pricing policy.

6.7.4 Secondly, a centralised pricing policy demands a

(1) Richard H Day, 'Recursive programming and supply prediction,' in Readings in the Economics of Agriculture, ed. by Karl A Fox and Gale D Johnson, (London: Allen & Unwin, 1970), p.115.

reasonably accurate knowledge of the degree of response to price signals, so that alternative policies can be considered. Unless these requirements are met, price fixing can be no more than a purely haphazard adventure. There seems no reason to suppose that central planners can outguess the market.

6.7.5 On the basis of this exercise, it can be suggested that price response models can be built and some estimates of price elasticities can be made, at least for these particular crops. It does not follow from this that output can be determined with any real precision. Nor does it follow that centralised price fixing is either desirable, or better than any alternative policies.

Crop	Dependent Variable	Graph No.	Const.	Independent variables							\bar{R}^2	k	DW	β	
				a_{Wt-1}	a_{Ot-1}	a_{Rt-1}	a_{Bt-1}	P_{Wt-1}	P_{Ot-1}	P_{Rt-1}	P_{Bt-1}				
<u>WHEAT</u>															
(a)	a_{Wt}		-,493	,676				1,562	-,086	,032	,450	,49	,05		
(b)	a_{Wt}		-,497	,684 (4,30)			,013 (0,93)					,51		1,50	
(c)	a_{Wt}	I		0,789 (5,23)				0,434 (1,50)	-0,434 (1,11)	0,257 (1,35)	-0,292 (-2,00)	0,59		1,85	0,2111
<u>OATS</u>															
(d)	a_{Ot}		,480	,690				-,903	,152	-,115	,292	,51	,14		
(e)	a_{Ot}		-,082	,785 (5,82)				,004 (0,87)				,60		1,62	
(f)	a_{Ot}	II		0,803 (6,05)				-1,309 (2,14)	1,306 (1,76)	-0,850 (-2,18)	0,854 (2,868)	0,74		2,34	0,197
<u>RYE</u>															
(g)	a_{Rt}		,070		,450			-,160	,099	,070	-,072	,46	,18		
(h)	a_{Rt}		-,015		,611 (3,77)					,001 (1,74)		,55		1,40	
(i)	a_{Rt}	III			0,497 (2,08)			1,709 (1,00)	-1,055 (-0,45)	1,065 (0,97)	-1,719 (-2,10)	0,49		1,81	0,503

TABLE 6.1 (Cont) ESTIMATES OF SUPPLY FUNCTIONS FOR WINTER CEREALS - (1951/2 - 1974/5)

Crop	Dependent Variable	Graph	Const.	Independent variables						R^2	k	DW	β
				a_{Wt-1}	a_{Ot-1}	a_{Rt-1}	a_{Bt-1}	P_{Wt-1}	P_{Ot-1}				
<u>BARLEY</u>													
(j)	a_{Bt}		,284	,687	- ,486	- ,193	,033	,178	,66	0,0			
(k)	a_{Bt}		-,023	,411				,001	,34		1,99		
				(2,29)			(1,73)						
(l)	a_{Bt}	IV		0,830	-1,926	0,767	-0,033	1,191	0,69	2,07	0,170		
				(5,09)	(-2,20)	(0,68)	(-0,05)	(2,63)					

NOTES: Equations (a), (d), (g), (j) estimated by ridge regression, using equation 1

Equations (b), (e), (h), (k) estimated by O.L.S., using equation 2

Equations (c), (f), (i), (l) estimated by O.L.S. Estimates constrained

't' values given in parentheses

't' values not applicable to ridge estimates

β is the coefficient of expectation

TABLE 6.2

ESTIMATES OF SUPPLY FUNCTIONS FOR SUMMER CEREALS

- (1951/2 - 1974/5)

$$(a) \left(\frac{MZA}{SFA} \right)_t = -3,262 + 46,236 \left(\frac{MZP}{SFP} \right)_{t-1}$$

(3,399)

$$\bar{R}^2 = ,32 \quad DW = 1,171$$

$$(b) \left(\frac{MZA}{SFA} \right)_t = -3,391 + 0,217 \left(\frac{MZA}{SFA} \right)_{t-1} + 37,610 \left(\frac{MZP}{SFP} \right)_{t-1}$$

(1,132) (2,424)

$$\bar{R}^2 = 0,33 \quad DW = 1,52$$

Using Logarithmic Transformation

$$(c) \left(\frac{MZA}{SFA} \right)_t = 3,797 + 1,224 \left(\frac{MZP}{SFP} \right)_{t-1}$$

(4,01)

$$\bar{R}^2 = 0,33 \quad DW = 1,53$$

$$(d) \left(\frac{MZA}{SFA} \right)_t = 3,845 - 0,0009766 \left(\frac{MZA}{SFA} \right)_{t-1} + 0,980 \left(\frac{MZP}{SFP} \right)_{t-1}$$

(-,844) (2,121)

$$\bar{R}^2 = 0,32 \quad DW = 1,84$$

$$(e) \left(\frac{MZA}{SFA} \right)_t = ,581 + ,263 \left(\frac{MZA}{SFA} \right)_{t-1} - 0,017 \left(\frac{MZP}{GSP} \right) + 0,009 \left(\frac{MZP}{GTP} \right)_{t-1}$$

(1,176) (-0,532) (0,033)

$$+ 0,086 \left(\frac{MZP}{SFP} \right)_{t-1}$$

(1,171)

$$\bar{R}^2 = 0,119 \quad DW = 1,88$$

(Applying Ridge Regression to the above estimates does not lead to significant

$$(f) MZA_t = ,581 + ,263 MZA_{t-1} - ,017 \left(\frac{MZP}{GSP} \right)_{t-1} + ,009 \left(\frac{MZP}{GTP} \right)_{t-1} \text{ changes).}$$

(1,176) (-0,532) (0,033)

$$+ ,086 \left(\frac{MZP}{SFP} \right)_{t-1}$$

(1,171)

$$\bar{R}^2 = 0,119 \quad DW = 1,88$$

$$\begin{aligned}
 \text{(g) } GSGA_t &= 0,233 + ,347 GSGA_{t-1} - ,113 \left(\frac{MZP}{GSP} \right)_{t-1} - ,255 \left(\frac{GSP}{GTP} \right)_{t-1} \\
 &\quad (1,737) \quad (-1,779) \quad (-1,363) \\
 &\quad - ,009 \left(\frac{GSP}{SFP} \right)_{t-1} \\
 &\quad (-0,169) \\
 \bar{R}^2 &= 0,171 \quad DW = 2,19
 \end{aligned}$$

$$\begin{aligned}
 \text{(h) } GRGA_t &= 0,048 - ,225 GRGA_{t-1} + ,186 \left(\frac{MZP}{GTP} \right)_{t-1} + ,048 \left(\frac{GSP}{GTP} \right)_{t-1} \\
 &\quad (-,937) \quad (2,323) \quad (1,728) \\
 &\quad - ,022 \left(\frac{GTP}{SFP} \right)_{t-1} \\
 &\quad (-2,459) \\
 \bar{R}^2 &= ,334 \quad DW = 2,10
 \end{aligned}$$

$$\begin{aligned}
 \text{(i) } SFA_t &= 0,080 + ,055 SFA_{t-1} - ,051 \left(\frac{MZP}{SFP} \right)_{t-1} - ,007 \left(\frac{GSP}{SFP} \right)_{t-1} \\
 &\quad (,258) \quad (-,842) \quad (-,430) \\
 &\quad - ,005 \left(\frac{GTP}{SFP} \right)_{t-1} \\
 &\quad (-,229) \\
 \bar{R}^2 &= ,155 \quad DW = 1,94
 \end{aligned}$$

CHAPTER SEVEN

AGRICULTURAL POLICY IN SOUTH AFRICA - AN EVALUATION

7.1. INTRODUCTION

7.1.1 The student of South African agricultural policy is not hampered by a lack of official documentation. Information is readily available and is set out in numerous Commission Reports, government white papers and parliamentary debates. No purpose would be served by a description of these official reports, not by a recounting of historical events. ⁽¹⁾ The object here is rather to turn the spotlight of economic rigour on published official documents which form the basis for State planning and policy making in the agricultural sector. This chapter will, therefore, attempt to survey this official literature. It will be a critical survey.

7.1.2 A notable feature of the official literature is the repetitiveness of the problems, combined with a lack of perceptiveness (or willingness) to define exactly what the fundamental causes of these problems are. Most disturbing of all, perhaps, is the tendency to accept opinions as articles of faith, without submitting them to the test of strict economic analysis. In reading the Reports of Commissions of Enquiry, it is striking how, over time, while the fundamental problems remain the same, the explanations offered for these problems vary. Generally, however, the answers are designed to treat the symptoms rather than the causes. This tendency is clearly illustrated by the following:

'An argument as to the why and wherefore of over-production is not going to advance matters. The position is that there is beyond a shadow of a doubt a very serious amount of overproduction and the position has to be faced.' (2)

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- (1) For an account of this, see Francis Wilson, Farming 1866 - 1966 in The Oxford History of South Africa, ed. by Monica Wilson & Leonard Thompson (Oxford: Clarendon Press, 1971), Ch.3.
- (2) Report by Chas. W H Kohler to the Government Liquor Commission, 1931, p.6.

7.1.3 This failure to accept, investigate or admit the fundamental causes of the agricultural problems is basic to much official thinking on the subject of agricultural policy. As a result, it has been necessary to find other causes or scapegoats. If the unsatisfactory state of agriculture is not to be blamed on the farmers, then clearly the fault must lie elsewhere. ⁽¹⁾ A major theme of official discussion has, therefore, taken the form of a search for a villain.

7.1.4 Incorrect diagnosis, of course, seldom leads to correct prescription. The second major theme has, therefore, been the constant (and generally successful) pressure towards increasing centralisation and control of the agricultural sector as a means of solving problems.

7.2 VILLAIN NO. 1: FOREIGN COMPETITION

7.2.1 South Africa is, in most agricultural commodities, a price taker in world markets; as a relatively small producer in world terms, local traders are seldom in a position to influence world prices themselves. This can be a source of strength. In times of surplus, exports can be increased without the risk of driving down the world price. Conversely, however, little protection is available against violent fluctuations in world prices or against secular market changes. It is, therefore, unsurprising that at a fairly early stage the blame for farmers' problems should have been laid at the door of foreigners - in this case, the Cold Storage companies. With the new technology of cold storage it was possible to transport meat, principally from Australia, but also from the Argentine, and retail it in South Africa at below the ruling local prices. This reduction in local prices, while of obvious advantage

(1) An example of this is a statement by the Minister of Agriculture:

"One section of our community has lagged behind through no fault of its own I refer, of course, to our farmers."

Hansard Col. 945, 1 February 1937.

to consumers, was understandably unpopular with local producers. The solution in their view was a protectionist policy.

7.2.2 The issues were clearly illustrated in the following exchange before the 1905 Weeber Commission:

'Do you think that the re-imposition of the duty of 2d per lb on meat would enable the farmer to compete successfully against cold storage companies? - It would enable the small local butcher to start again and become the buyer from the farmer. At the present moment, he is almost extinct.

How is he excluded? - He has been crushed out by Cold Storage.

Have you any other scheme for protecting the farmers against cold storage companies other than the imposition of the duty? - No, but it is possible that it may yet be necessary to legislate in connection with the monopoly.

Really then, the whole thing is the Cold Storage monopoly? - That is at the bottom of the whole thing.' (1)

7.2.3 The solution suggested was, therefore, clear. The monopoly power of the cold storage companies was to be reduced or removed; the consumer was to bear the burden of the lack of competitiveness of South African agriculture.

'What would be the result of the re-imposition of 2d per lb duty on meat to the consumer? - That I am not in a position to give any evidence on; but judging from the fact that the taking off of the duty did not cheapen the price of meat to the consumer, it is not unreasonable to think that putting it on again will not raise it (2)

7.2.4 One is left to speculate on the question of who, then, was to pay the duty, since the suggestion is that the consumer would not pay a higher price, but the producer would presumably receive one. A further unusual aspect of the argument is the suggestion that the cold storage companies were using their monopoly power to reduce prices. The normal case against monopolies, of

(1) Report of the Commission to Enquire into the Advisability of Re-organising the Existing Agricultural Department, G2/1905, paras. 5481, 5482, 5484, 5485.

(2) G2/1905, para. 5487.

course, is that they tend to raise prices. The fact is, that the lower prices which cold storage companies were able to offer were a function, not of monopoly power, but of the relative efficiency of foreign meat producers and technical advances in cold storage transportation. This was clearly spelled out some years later by the Department of Agriculture:

'Formerly, when marine transport was slow, irregular and expensive, the isolated position of South Africa was sufficient guarantee against importation at low prices from overseas With the advent of faster and cheaper marine transport and less expensive methods of production in overseas countries, particularly in Australia, Canada and the United States, the position of the local producer was endangered, and it was found necessary to protect him against foreign competition.' (1)

7.2.5 Aside from pure cost considerations, however, there was the question of quality, particularly relevant in the case of wheat:

'..... dealers and millers are usually prepared to pay from sixpence to 1/- more per bag for imported wheat than for South African wheat. The reason for this is simply that the imported article is usually better graded and produces a better quality of bread.' (2)

7.2.6 The problem of foreign competition was clearly stated in 1935:

'It is a well-known fact that South Africa is by no means suitable for the production of wheat and that it is impossible for the South African wheat farmer to compete on the basis of world wheat prices.' (3)

To illustrate this, the Report provided appropriate data:

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- (1) W J Pretorius, An Economic Study of the Wheat Industry in the Union, Department of Agriculture and Forestry, Bulletin No. 141, 1935, p.5.
- (2) Bull. No. 141, p.10.
- (3) Bull. No. 141, p.5.

YIELD OF WHEAT IN THE PRINCIPAL WHEAT-PRODUCING COUNTRIES (1)

(Bags per Morgen - 1928)

Germany	21,0	France	13,8
Italy	11,8	Canada	14,9
USA	10,0	Argentina	9,7
Australia	6,8	Union of SA	5,3

7.2.7 There is, of course, fluctuation from year to year, but there is no doubt that generally speaking South Africa is at the bottom of the league. The mistake in official reasoning was to deduce from this that it was 'impossible for the South African farmer to compete on the basis of world wheat prices.' The real difficulty was not so much the competitiveness of South African farming arrangements, but rather the problem of reconciling an efficient agricultural sector with a formidable array of compelling and contradictory policy constraints. In this respect, the dilemma regarding wheat production is typical of South African official policy in general - the difficulty of reconciling economic rationality with political reality.

7.2.8 Given the fact that cheap and better quality wheat was available abroad, the possible options were:

- i) The development of a more extensive form of farming so that the individual farmer earned enough on the land to equal his alternative earnings in town. Given a political commitment to maintain a large agricultural population, this option was unlikely to seem attractive, however, since larger farms imply fewer farmers.
- ii) The imposition of tariff barriers. There are political costs here also, however, in terms of increased prices to consumers. The Department of Agriculture was aware of this difficulty.

(1) Bull. No. 141, p.5.

'It is most unlikely that the wheat farmers will be afforded any further protection, consequently land values will have to drop to a level which will place the wheat farmer economically on a sound footing.' (1)

This would imply requiring wheat farmers to accept a reduction in value of their principle capital asset - a politically unpopular, but inevitable, result of lower output prices. (2)

iii) The possibility that farmers could transfer their efforts to the production of a different crop. This obvious possibility, unfortunately, clashed with a further political objective.

'From the purely economic point of view, therefore, it seems very doubtful whether wheat farming is to be justified. From the national point of view, however, it is desirable that the country should be partly, if not entirely, self-supporting in respect of wheat.' (3)

This self-sufficiency argument underlies most official thinking on the agricultural problem.

7.2.9 Given this array of political commitments, it is clear that a way had to be found to maintain the price of wheat at a reasonably high level for producers whilst keeping it relatively low for consumers. The obvious solution was to separate the producer and consumer prices by means of a subsidy. This policy was, in fact, adopted. The justification for this subsidy was not, however, stabilisation nor a reduction in distribution costs. It was rather the result of political commitments to cheap food, high producer prices and national self-sufficiency.

(1) Bull. No. 141, p.81.

(2) Chapter 4 provides a discussion of the economic theory underlying this argument.

(3) Bull. No. 141, p.79.

7.2.10 The self-sufficiency argument has often been used (1) but seldom carried to its logical conclusion. The Report on the Distribution of Food, however, did so. Discussing maize, Sir Henry French argued:

"This is a crop in which this country should be entirely self-supporting..... The right course, I submit, is the one followed in England during the war in the case of potatoes, ie - arrange for the planting of such an acreage that even if the yield should be more than the lowest on record, there will still be enough potatoes to feed our people for twelve months. The result was that we never had a shortage of potatoes To import maize from the Argentine to fill, even to a small extent, the shortfall in the home crop, is not economical." (2)

7.2.11 The economic content of this type of argument scarcely merits comment, but taken together with other references quoted, it serves to illustrate a fundamental fallacy in much of the South African literature. The fallacy is to confuse relative and absolute price levels. If the price of wheat is raised, it is likely that farmers will respond by producing more wheat - but only at the expense of something else. Since agricultural products are usually fairly close substitutes in production, the extra wheat production will be at the expense of some other agricultural commodity. Thus, since most agricultural commodities are foodstuffs, the cause of overall self-sufficiency is not materially advanced by a high wheat price. Nor, interestingly enough, is it obvious that a rise in price of all agricultural commodities will lead to an increase in aggregate agricultural output. The evidence on this is mixed, but fundamentally the question revolves around the question of the elasticity of substitution of resources between agriculture and other sectors. Evidence from the USA suggests that the possibilities

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- (1) See for example C van der Merwe, Agricultural Policy in Economic Policy in South Africa, ed. by J A Lombard (Cape Town: Haum, 1972), Ch.5.
- (2) Report of the Commission on the Distribution of Food, UG31/1946, p.6.

for substitution are rather low, ⁽¹⁾ while in South Africa, the elasticity is somewhat higher. ⁽²⁾ Nevertheless, it is clear that little purpose is served by the arbitrary increase in the price of one commodity.

7.2.12 To summarise, therefore, the argument that South African producers were unable to face overseas competition is, on its own, unsatisfactory. They could, of course, compete, but only after significant adjustments to the industry. These were likely to involve the consolidation of farming units, a reduction in the number of farmers and a change in the output mix. Given the political parameters existing, however, the normal economic adjustment process was unacceptable - hence some alternative had to be found.

7.3 VILLAIN NO. 2: THE DISTRIBUTOR

7.3.1 By the 1930s, the case against overseas competition could no longer be used. Farmers were well protected from low price competition on the import market. ⁽³⁾ In addition, the co-operative movement was well established, based on the principle of compulsory co-operation. It was, therefore, necessary to find a villain elsewhere. A suitable candidate was not hard to find, nor original in form.

'Few are the men - they need rare natural gifts and the best of education - who can show moderation when assailed by wants and desires, few who are sober when they have a chance of making large sums of money and who are content with moderate profits. The mass of mankind are the exact opposite; their desires are unbounded, their appetite for gain unlimited. This explains the attacks on such occupations as retail business, commerce and

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- (1) Z Griliches, 'Estimates of the Aggregate US Supply Function,' JFE 42 (1960), pp.282-293.
- (2) W L Nieuwoudt, 'Die Aanbodelastisiteit van die Suid-Afrikaanse Landbou,' SAJE 40 (1972), pp.249-253.
- (3) See for example the Dairy Industry Control Act, No. 35 (1930), Clause 28.

hotel-keeping and the disrepute under which they lie.' (1)

7.3.2 In short, the distribution system had all the requirements for a satisfactory target. The gap between producer prices and consumer prices was often easy to see and apparently indicative of inefficiency. The fact that the distribution of agricultural products is an enormously complex undertaking,⁽²⁾ far from being a disincentive to investigate the distribution process, was rather taken as proof of inefficiency. What had been a confusion of opportunity cost and absolute cost in dealing with foreign competition became, in the hands of the Distribution Costs Commission, a confusion of normal and supernormal profits (ie - profits due to monopoly power and profits due to efficiency).

7.3.3 The reduction of the distribution margin had been one of the prime objectives of the 1938 Marketing Act, despite a lack of evidence at the time that the distribution margin was, in fact, too high. The objective of the Marketing Act as stated by the 1939 Report of the National Marketing Council was primarily to provide benefits to the producers:

'In the main, it is the intention of this measure to promote producers' interests by the application of conscious direction and control in the expectation that the following advantages will accrue: an improvement in producers' returns by reducing the distributive and manufacturing margin by, say, eliminating uneconomic practices, centralising sales or rationalising the processing industries.' (3)

7.3.4 While this may be taken as a candid statement of the perceived objectives of the Act, it is, nevertheless, an unfairly one-sided view of a rather complex situation. In fact, of course,

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- (1) Plato, Republic, circa 386 BC, quoted in Report of the Committee of Enquiry into Distribution Costs, UG28/1947, p.1.
 - (2) See diagram at the back of UG28/1947, illustrating the distribution networks.
 - (3) Annual Report of the National Marketing Council, UG26/1939, p.7.

if distribution costs can be reduced, then it is possible both for the farmer to achieve a higher price for his product and for the consumer to pay less. The decrease in the middleman's margin is equal to the gain to the producer and the consumer, while the precise division between producer and consumer is inversely related to the relative elasticities of the supply and demand schedules. Subject to certain important qualifications,⁽¹⁾ the party with the more elastic curve gets the smaller share. It is also worth noting that a decrease in the distributive margin is predicted to lead to an increase in both production and consumption. Welfare is increased.

7.3.5 The objective of the Act in attempting to reduce the distribution margin was, therefore, a worthy one. The difficulty in practice is twofold. For the Act to be justified it is necessary first to show that the free market distribution system is relatively inefficient (ie - expensive), which in practice requires a careful study of both the free market system and the alternative centralised system. Second, for the comparison to be meaningful, it is necessary that the marketing board provide the same quality of service as the private distribution system in terms of the location of sales outlets, etc. In practice, of course, there seems to be no reason to suppose that centralised distribution systems are in fact more efficient⁽²⁾ - in fact, there is evidence to suggest the reverse.

7.3.6 Such studies are, of course, extremely difficult to carry out, given the complexity of the operations involved. It is, however, unclear as to why the distribution of agricultural products, in particular, should have been regarded as particularly inefficient as compared to other sectors of the economy. A wide differential between producer prices and consumer prices might simply reflect the physical problems associated with the difficulty of transporting

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- (1) G S Shepherd, Agricultural Price Analysis (Iowa State University Press, 1950), 3rd ed., p.212.
- (2) This view has been expressed by, among others, Gordon Tullock, The Vote Motive, Institute of Economic Affairs, Occasional Papers.

products of a widely dispersed farming community to a few scattered urban areas. There appears to be little evidence to support the contention that distribution was inefficient before 1937 - indeed, the task of determining the distribution margin alone would have been a difficult one - and even if the information had been available, it would have been difficult to compare these costs with the activities of hypothetical marketing boards which did not then exist. Unsurprisingly, therefore, official arguments in favour of centralised marketing were based on statements of faith rather than factual analysis:

'For years, the marketing and distribution of agricultural products have been in an unsatisfactory state, and there has been no sound system of organisations and regulations, particularly from the point of view of ensuring an even and orderly flow of products from producers to the markets and from the markets to the consumers. This has not only resulted in a maldistribution of supplies between the different sections or groups of the population, but has, on the one hand, also severely handicapped development of the local market to a level of full efficiency and utility, while making, on the other, for an undue margin between the prices received by producers and those paid by consumers.' (1)

7.3.7 The major effort to investigate distribution costs came almost a decade after the passing of the Marketing Act. The Stratford Committee ⁽²⁾ focused its attention on answering two major questions:

- i) What, if anything, is wrong with the distributive machine in South Africa?
- ii) What remedies and improvements can be suggested?

7.3.8 In attempting to answer these questions the Commission

(1) Reconstruction Committee of the Department of Agriculture and Forestry, Reconstruction of Agriculture, 1944 - 5, Government Printer, Pretoria, 1943, pp.7-8.

(2) UG28/1947.

'declined to take sides in the wide controversy between the protagonists of State control and those of private enterprise,' but chose instead the 'school of the middle course,' (1) adopting an essentially pragmatic approach to the problem and thereby avoiding the central issues.

7.3.9 Indicative of the confusion of the Commission was their investigation of the distribution of fruit and vegetables. This should have been an important part of their study since price fluctuations are extremely wide in this sector and it can be shown that prices often differ widely between markets located very close to each other - presumably a situation where the superiority of centralised control would be easy to illustrate. The Commission notes that: "With very few exceptions, the retailing of fruit has attracted only the poorer and less educated class of trader The result of this is a very large number of very small units" and it is probable "that most of these units are undercapitalised; they are unable to trade on the scale or with the necessary equipment to bring about a reduction in unit costs" (2)

7.3.10 The Commission fails to show how such a change would be beneficial. A smaller number of larger retail outlets, while it might reduce unit costs to the retailer, would certainly raise costs to the average consumer, if only in terms of increased travel costs to the retail outlet. The Report, however, continues with the further remarkable statements:

"On the assumption that the very considerable price spreads to which we have referred have resulted in unduly high profits to the retailer the natural question that arises is, 'How is it that these profits have not been reduced to normal by competition?' The answer may be found in the existence of tacit price agreements subscribed to by all the traders operating in the same areathe Commission received abundant evidence, but no proof of the existence of such tacit price agreements. It is a remarkable fact testified

(1) UG28/1947, p.14.

(2) UG28/1947, p.75.

in evidence, but of course, not conclusive that (to give an example) in any one street, at any one time, the price of, say, peas and beans or tomatoes or apples are the same in every shop. This is not easy to account for by the operation of supply and demand factors, since the produce of this kind generally, supply and demand fluctuate so violently within short periods that price uniformity, even over short periods, is not to be expected." (1)

7.3.11 There is, of course, no reason why price spreads should result in high profits at all - they may simply reflect the different costs involved in distributing different goods to different places. In any event, it is contradicted a few lines further down by statements regarding the uniformity of prices. Apparently, therefore, when prices are different, profits are unduly high and when prices are the same, profits are also unduly high, assuming, of course, that one could be clear about what was meant by 'unduly.' Even if profits were high, the argument remains unsatisfactory. Price agreements can only be enforced in the long run on the assumption of barriers to entry. The Commission does not enquire into the existence of these at all. The sentences which follow are even more remarkable. The fact that prices are the same is, of course, the prediction for a competitive situation. Could supply and demand fluctuate significantly in the time taken to walk across the street from one shop to another?

7.3.12 In fact, one would imagine that it would be difficult to enforce a price 'ring' in a market such as this where there are a large number of small traders,⁽²⁾ but, as the Commission warns us, many of the traders are Asians, so perhaps anything is possible with Oriental cunning!

(1) UG28/1947, p.75.

(2) The 1972 Commission of Enquiry into Agriculture argued that there are such trading rings, but in the case, they were considered to function to the disadvantage of small traders. Third (Final) Report of the Commission of Enquiry into Agriculture, RP19/1972, p.151.

7.3.13 The most obvious way to determine whether collusion has, in fact, taken place is to investigate the existence of supernormal profits. (1) The Commission has clearly not done this and is forced to admit that the assumption of profits cannot be made "with confidence until the actual costs of distribution and handling - transport, wastage through perishability, delivery credit, etc. - have been properly analysed." (2) Supernormal profit can only be maintained in the long run, of course, if there are barriers to entry. One suspects that if there were such barriers they would have been in the form of trading licences - but control of these would presumably be outside the influence of Asian traders, in the hands of local municipalities.

7.3.14 "Having regard to the popular comment and criticism to which these large price spreads have given rise, the Commission requested the cost accountant to conduct a special enquiry into the retailing of fruit and vegetables. The results of this investigation, through not fault of the cost accountant, have unfortunately proved largely inconclusive." (3)

Exactly what the cost accountant could have hoped to prove by such an investigation is by no means clear, since cost accountants do not have a comparative advantage in the art of measuring opportunity costs. In fact, it is a basic weakness in the approach of the Committee that profits are taken as a sign of inefficiency in distribution rather than the reverse. It is accepted by them that the lower the profits, the better. Profits are calculated as 'percentage net profit on turnover,' and although it is admitted that profit as a percentage of capital invested would be a better figure to use, there are practical difficulties in calculating it; but the Commission goes ahead and draws conclusions anyway. (4)

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- (1) Though supernormal profits would appear to be inconsistent with earlier statements that the trades are undercapitalised.
 - (2) UG28/1947, p.75.
 - (3) UG28/1947, p.75.
 - (4) UG28/1947, p.54.

7.3.15 On this costing basis, bakers get a clean bill of health ("a reduction in the net profits of bakers will make no significant difference to the price paid to the consumer") (1) whereas in the case of biscuits, there are "profits considerably higher than would have accrued normal competitive conditions." (2)

7.3.16 In practice it is difficult to define inefficiency and profit level certainly does not constitute a useful index. Even if one could, it would still not follow that the marketing board option was the best of the available alternatives to reduce distribution costs. The quality of service offered, delays in meeting orders, etc. are also relevant. It is, therefore, doubtful whether in practice any definite calculation is possible. The whole exercise was, in fact, doomed to failure.

7.3.17 After publication, the report was subject to some criticism. (3) In the light of the above, one must conclude Samuels was extremely generous to the authors. Perhaps, however, the most cogent criticism is to be found in the Memorandum of Reservations to the Commission Report, submitted by Richards and Penver:

"In brief, the emphasis which has, in the past, been placed on marketing difficulties is, in our opinion, to a great extent misplaced, since the underlying weakness of agriculture lies not in the sphere of marketing but in the sphere of production." (4)

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- (1) UG28/1947, p.57.
 - (2) UG28/1947, p.57.
 - (3) See L H Samuels, 'Aspects of Controlled Marketing in the Union,' SAJE 15 (1947), pp.47-59.
 - (4) UG28/1947, p.95.

7.4 VILLAIN NO. 3: THE CONSUMER

7.4.1 Having failed to reach any satisfactory conclusion regarding the behaviour of middlemen, it was necessary for the finger of guilt to be pointed in another direction. "Broadly speaking, consumers' choices are frequently irrational and misinformed and to this extent the distributive system fails to reach optimum performance.' ⁽¹⁾ (*Italics added*). While there may, of course, be differences of opinion about what is meant by 'optimum performance,' ⁽²⁾ the irrationality of consumers is clearly a point to be stressed. "Most consumers are not rational buyers. Plain consumer ignorance increases distributive costs. Few of us realise that by our trial-and-error process of shopping, we have wasted too much of our time and nervous energy," ⁽³⁾ and then, in total contradiction of this, "The great majority of consumers have not shown any interest in becoming better informed...." despite the fact that "the consumer is at a disadvantage." ⁽⁴⁾ If trial and error shopping is not a means of acquiring information, then one wonders what it is for. ⁽⁵⁾

7.4.2 It is also interesting to note that in this passage, the consumer is considered to be at a disadvantage. More usually it is the producer who is perceived to be at a disadvantage. Clearly, however, any argument is considered to be good enough if it serves to back up an argument, however weak. The approach, as always, is to seek evidence which will serve to justify a predetermined policy measure rather than to attempt an objective analysis of the situation.

(1) UG28/1947, p.29.

(2) See Gordon Tullock, op.cit.

(3) UG28/1947, p.29.

(4) UG28/1947, p.29.

(5) For a discussion of shopping as a means of acquiring price information, see G J Stigler, 'The Economics of Information,' Journal of Political Economy 69 (1961), pp.213-225.

7.5 THE QUESTION OF SUBSIDIES

7.5.1 Having solved the problem of low priced imports by imposing import controls and having, on the basis of unsatisfactory evidence, determined that distribution was best handled by a system of control boards, it was only to be expected that the problems of the agricultural sector should reappear, though, as always, in a different form. Although the marketing boards offered farmers a substantial degree of control over output prices (though not as much as had been originally intended), it was soon argued that this was insufficient. Control of input prices (ie ± subsidisation) was also necessary. While this form of intervention can be justified on narrow economic grounds, ⁽¹⁾ the argument normally presented is a socio-political one. As the 1947 Commission noted bluntly: "The general public has as much interest in the maintenance of a large and stable farming industry in the Union as primary producers themselves." ⁽²⁾ Why was this so? The answer was presumably to be found in the stirring qualities of the rural population:

"The farmer, living close to the soil, believes that a power beyond his understanding makes the sun shine and the rain fall, makes the grass sprout and causes the seed to germinate and burgeon into full growth. He has a childlike trust in, and a deep sense of dependence on, a Supreme Being Who knows all and ordains what shall be. This is what gives a nation its inner resources and spiritual strength to surmount even the greatest setbacks and hardships" ⁽³⁾

7.5.2 These thoughts developed later, however. The Commission of Enquiry into European Occupancy of the Rural Areas ⁽⁴⁾ was more candid:

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- (1) See Nieuwoudt (1972).
 - (2) Report of the National Marketing Council on the Marketing Boards 1938-1946, UG27/1947, p.6.
 - (3) Second Report of the Commission of Enquiry into Agriculture, RP84/1970, p.179.
 - (4) Report of the Commission of Enquiry into European Occupancy of the Rural Areas, 1959.

"It is in the best interests of South Africa to maintain on the platteland the maximum number of Whites who are assured of a worthy and safe existence Only a prosperous, well-established and vocation-conscious farming population can make a positive and essential contribution to the continued existence and security of White civilisation." (1)

7.5.3 This, of course, is the essence of the matter. Regardless of the economic rationale of the policy, the political considerations are considered to be overriding. Although admitting the economic irrationality of fertiliser subsidies, it is argued that:

"....the use of fertilisers is such a basic part of the existing farming pattern that the withdrawal of the subsidy and transport rebates would inevitably result in considerable increases in production costs and, therefore, ultimately consumer price increases as well." (2)

7.5.4 Given cost-plus methods of price fixing in agriculture, one must admit that there is some truth in this - though normally causation works the other way. Fertiliser subsidies are to be accepted even though:

"The subsidy on fertilisers might have the disadvantage of encouraging farmers to plough marginal land and raise crops on them.... the subsidy might also lead to crops being grown outside their natural cultivation areas. (3)

7.5.5 The problem of soil erosion is a spectre which appears at frequent intervals in official literature and is, therefore, worth discussing briefly. The essential question is whether, in response to either increased output prices (or reduced input prices) farmers will plough and cultivate unsuitable land, thereby causing erosion. Land is, of course, the farmer's most important

(1) Quoted in RP84/1970, p.179.

(2) RP19/1972, p.112.

(3) RP19/1972, p.112.

capital asset. It is unlikely that he will lightly participate in its destruction. Ignorance may be a cause of bad farming methods, but this explanation is, of course, independent of price level. It also seems reasonable to imagine that if prices are very low, the farmer's time horizon may contract in response to his own immediate and pressing needs. The long view is a luxury he simply cannot afford.

7.5.6 This does not seem to be a very plausible explanation to apply to White farmers, though it may have had some validity in the Depression years of the 1930s when, in response to extremely low prices, farmers may have overstocked to maintain their income in the short run. It may well have some validity in the case of Black agriculture and may provide a powerful explanation for the soil erosion found there. (1)

7.5.7 But what is being asserted here is that land is being over-utilised because of high prices. It would appear, therefore, that there is a golden mean which is necessary to persuade farmers to safeguard their own capital assets. Such can hardly be the case. The value of land is closely related to the value of the output of that land. If price rises, the value of the land can be expected to rise and it becomes even less rational to misuse the land. The only possible exception to this would appear to be the case where prices are high but expected to fall. In this case, a large output now would be sufficient to compensate for a smaller output later. This, however, is essentially a short-term situation. It does not provide a satisfactory explanation for land misuse in the longer term.

7.5.8 The economic forces underlying soil erosion, therefore, remain largely unresolved. Though there is, as far as one can discover, no real economic justification for input price subsidies

(1) Though the explanation of low Black agricultural productivity as a function of unsatisfactory land tenure arrangements is possibly more satisfactory.

and the link between subsidies and soil erosion, is a tenuous one, we must admit that there is a good deal of ignorance in this area. The various Commission reports have done little to resolve these difficulties.

7.6 THE PROBLEM OF CENTRALISATION

7.6.1 As a response to the continuing problems and pressures from the agricultural sector, the answer has always been to recommend greater government intervention and a greater degree of centralisation. Though it may be argued that the 1930s were a 'watershed' in the development of agricultural organisation in South Africa, there is a sense in which the rôle of the State in agriculture can be seen as a steadily increasing one. With this accumulation of power at the centre, the question of who is to wield that power became increasingly important - a question which continues to be discussed.

7.6.2 The membership of control boards has always been a contentious issue. The 1934 Committee expressed strong views on the subject.

"The Commission is of the opinion that a price controlling body composed solely of producers is, due to its inherent weakness of representing the supply factor only, not fundamentally equipped to exercise that essential restraining influence in regard to price policy." (1)

More strongly,

"Placing the control of an industry in the hands of producers by legislation virtually amounts to conferring the power of taxation of the consuming public on a small body of producers who are, generally speaking, constitutionally unfit to exercise such power in the best interests of both producer and consumer." (2)

Indeed, the composition of the boards has been a continuous source of discussion. In their Memorandum of Objections attached to the 1947 Commission, Richards and Penver address the problem, arguing

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- (1) Report of the Commission of Enquiry into Co-operation and Agricultural Credit, UG16/1934, p.16.
 - (2) UG16/1934, p.19.

that, "the alleged safeguard of consumer representation on the Marketing Boards is largely meaningless and ineffective." (1)

7.6.3 A perusal of the Marketing Act indeed suggests that even the 'safeguard' of consumer representatives is quite illusory and that a control board comprising only producers would have been quite consistent with the 1937 Act. (2) Thus consumer representatives are not only in a minority, but appear to have no guaranteed right on these boards, though in the years immediately after the institution of the Marketing Act, no objection was raised to their presence. Reporting on the activities of the boards, the 1939 Commission reports cheerfully:

"Moreover, the producers' members themselves freely admit that their experience of mixed boards since the inauguration of the first Control Boards in the Union has confirmed in their minds that, by virtue of the capacity and experience of their representatives, recognition of the other functional interests is of the greatest help in the exercise of marketing control." (3)

Recently, however, the tone has changed and the latest Commission report has recommended that consumers' representatives be abolished. (4)

7.6.4 A closely related topic of concern in the unpublished reports has been the problem of price fixing and co-ordination. The fixation of price is, at least in the case of one-channel marketing schemes, the activity of primary importance since "a potent influence may ...be exerted through the medium of the price factor." (5) Indeed, it was primarily to deal with the low average level of agricultural prices that the Marketing Act was

(1) UG28/1947, p.97.

(2) "A scheme shall provide for the representation on its regulatory board of the persons concerned in the production of the product to which the scheme relates and may also provide for the representation on such board of persons concerned in the marketing, processing and consumption of such products....." Act No. 26, 1937, 18(2) (emphasis added).

(3) UG26/1939, p.9.

(4) See RP39/1976, p.93.

(5) UG28/1947, p.22.

passed. But though the Marketing Act provides Boards with the power for price fixing, no indication is provided as to how prices are to be determined.

7.6.5 In the absence of firm advice on this subject, costs have traditionally been used as a basis for price determination. Unfortunately, this raises further problems. The 1947 Commission posed the question:

"What costs should be used as a basis for price fixation?
 a) If the highest costs are used, it will keep inefficient units in business b) If the lowest cost is taken, then all the firms with higher costs will sooner or later be forced out of business c) To some extent, the above difficulties are overcome by taking the weighted average costs of an adequate sample as a basis." (1)

This is the familiar and unsatisfactory cost-plus method of pricing. It has been much criticised and its weaknesses need not concern us here - basically, the problem is that costs are a function of price rather than the other way round. It follows that prices cannot be satisfactorily determined on the basis of costs.

7.6.6 How else is price to be determined, though? The 1939 Commission provides some advice:

"The determination of prescribed prices must naturally occur with due regard to the interests of consumers and while, as is also common to a competitive system of a private monopoly, the aim of any control board must be to maximise the producers' revenue, it is implicit in that objective that prices be adapted as far as possible to meet the position of the low-income groups, thus rendering their demand effective." (2)

This statement, of course, is totally vacuous!

(1) UG28/1947, p.22..

(2) UG26/1939, p.7.

7.6.7 Equally fatuous advice is to be found much later, in 1972:

"Apart from the income position, price fixing should also take account of changes in production costs, the elasticity of supply and demand (as well as the long term shifts that can be expected in the supply and demand curves), the production and consumption trends, prices of substitutes, the import possibilities and overall agricultural policy." (1)

Exactly how, in practice, one is supposed to juggle these factors is by no means clear, nor is any practical advice given in the Commission's report. In fact, of course, the task is not possible.

7.6.8 It is, therefore, clear that no practical advice has been given to control boards on the central problem of how to determine their prices. The reason is quite simple. There are far too many factors to be taken into account. Apart from these practical problems, there are fundamental difficulties related to the question of price co-ordination. Since the various control boards act independently, the task of effecting co-ordination devolves upon the Minister of Agriculture, advised by the National Marketing Council. This is inevitable and is a fundamental problem associated with the structure of control boards set up on individual product lines.

"Apart from the highest cost entailed by the tendency for control boards to proliferate, the fact that there are several control boards has meant that the approach to price determination has become so sectional that, in the opinion of the Department of Agriculture, equilibrium in agriculture is being disturbed." (2)

The problem of price co-ordination, while it has been stressed in recent years, was noted much earlier.

(1) RP19/1972, pp.123-124.

(2) RP19/1972, p.138.

7.6.9 The 1949 Commission discussed the needed for greater co-ordination in price determination between marketing boards, but offers the depressing advice that:

".....the cyclical movements of prices cannot be predicted, or ignored when they occur." (1)

So that the possibilities for effective co-ordination would seem to be extremely limited. As usual, therefore, the Commission is torn between earnest advice and the practical difficulties of centralised decision making.

7.6.10 Over the years, official thinking has responded to a wide variety of practical problems. Always, the 'solution' to these problems has been found in terms of greater control and increased centralisation - import controls, price fixing, quotas, co-operatives. Recently, there is evidence of a subtle change in emphasis away from a discussion of problems of absolute price levels to a consideration of relative price levels. There may be two reasons for this. Firstly, since World War II, agricultural prices have generally been stable at a fairly high level, creating the impression that marketing boards have been effective in achieving their objectives. This is largely illusory. World prices in many products appear to have closely approximated local prices in significant products, so that marketing boards have seldom been called upon to test their strength against market forces.

7.6.11 Secondly, the problems of price co-ordination have come to attract increasing attention. As usual, it is believed that greater centralisation in decision making will lead to increased efficiency, while the realisation that the boards are, in a sense, competing with each other for the custom of the farmer may also play a rôle.

(1) UG48/1949, p.23.

7.6.12 While the case for increasing centralisation is no stronger now than it was in the 1930s, we are subject to the dangerous illusion that marketing boards have proved to be effective. While, some of the gloomier forecasts of the 1930s have not yet come true, there is little to suggest that the boards have solved any real problems. An equal cause for concern is the lack of any serious analytical foundation illustrated in the official documentation. It appears economics has been called upon to provide supportive arguments to policy measures already decided, rather than to supply techniques in an objective way. It is understandable, though unfortunate, that economists succumb to this temptation.

CHAPTER EIGHT

THE THEORY OF ECONOMIC REGULATION

8.1 INTRODUCTION

8.1.1 Previous chapters have examined aspects of State intervention in agriculture. It was argued in Chapter 3 that no theoretical basis exists to justify State intervention in agriculture. There is no reason to suppose on economic grounds that agriculture is a special case. Many of the 'explanations' for this instability are inadequate and often mutually contradictory. In particular, such simple-minded models as the 'cobweb' and 'rectangular hyperbola' model, whilst they may illustrate certain economic concepts, are as practical tools of policy so misleading as to be positively dangerous.

8.1.2 The question of State subsidisation of agriculture was examined in Chapter 4. Again, no case can be found to justify subsidies. It was argued that the net 'welfare loss' arising from these subsidies is less than is sometimes suggested, but equally, the long term effectiveness of subsidies is likely to be relatively small, the value of the subsidy simply being capitalised into returns to fixed factors.

8.1.3 Official policy documents were examined. It was argued in Chapter 6 that, from the economic point of view, the arguments used are seriously inadequate. There appears to be a disturbing tendency to misuse economic arguments to support a particular point of view. The conclusions having been reached, economic tools are invoked to justify them. In formulating agricultural policy in South Africa, political forces have overruled economic analysis. This is not to argue that that this is necessarily bad - such a judgement would be beyond the scope of this thesis. But it can justifiably be argued that an implicit choice has been made to

sacrifice efficiency as measured by value of output in return for other social and political objectives.

8.1.4 A particular feature of official doctrine in South Africa is the belief that markets are inherently unstable and, therefore, State intervention is justified to achieve stability. ⁽¹⁾ The possibilities of centralised price control were examined in Chapter 5. A technique for specifying agricultural supply functions was suggested, but difficulties were encountered in estimating satisfactory price response models. Thus central control would seem to rest ultimately upon the intuition and judgement of policy makers.

8.1.5 The results of this form of control were examined in Chapter 5. Certain empirical evidence was presented. Our task in this chapter is to examine these results in an attempt to provide a general explanation for observed behaviour.

8.1.6 Participants in the Marketing Act debate in the 1930s made a number of predictions clearly derived from their particular perspective as economists. Orthodox economic theory was used as a basis for predictions regarding the future behaviour of economic variables. It was not their objective to expand the frontiers of economic theory. They were not testing the theory - they were using it as a basis for their policy arguments.

8.1.7 Forty years later, however, our intention must be rather different. We are concerned with the predictive value of the theory they were using. To what extent were their forecasts valid? Having assembled the data and reviewed the historical evidence

(1) See for example, S J Terreblanche, 'Policy Objectives and Priorities in the South African Economy,' in Public Policy and the South African Economy, ed. by M L Truu (Cape Town: OUP, 1976), p.52: '.....the market mechanism has a tendency to be unstable; price and income fluctuations are typical features of a market economy. It cannot therefore be denied that the government has an active role to play in a modern market economy.'

we can now match the predictions with the observations to discover how well the theory has stood up to the test of time.

8.1.8 It is clear that dominant in the thinking of the economists was the theory of monopoly. ⁽¹⁾ Richards quotes with approval the suggestion of Robbins:

"Monopolistic bodies without statutory powers may well be restrained from great exploitation of their position by the fear of potential competition. It is not so clear that restraints of this sort will dictate the policy of monopolies backed by State authority."⁽²⁾

8.1.9 Not only would a monopoly situation exist (ie - the model was applicable), but the power would be used, ⁽³⁾ and, as the quotation from Robbins makes clear, was more likely to be used by a State organisation than by a private firm.

8.1.10 Other predictions were made: increased production of unwanted products, ⁽⁴⁾ increased costs of production, distributive margins and prices, ⁽⁵⁾ possible corruption, ⁽⁶⁾ chaos, bad organisation and lack of co-ordination between boards, heavy losses to the State and eventual failure. ⁽⁷⁾

- (1) See C S Richards, 'Subsidies, Quotas, Tariffs and the Excess Cost of Agriculture in South Africa,' SAJE 3 (1935), p.397. Also C S Richards, 'The "New Despotism" in Agriculture,' SAJE 4 (1936), pp.469-504, p. 503 and R Leslie, et al. 'Economists' Protest: Marketing Act 1937, Scheme Relating to Marketing of Wheat,' SAJE 6 (1938), pp. 187, 190.
- (2) Lionel Robbins, The Great Depression (London: Macmillan, 1934), p.139.
- (3) R Leslie et al. (1938), p.190.
- (4) C S Richards (1936), p.503.
- (5) C S Richards (1935), p.398, C S Richards (1936), p.503, R Leslie et al. 'Economists' Protest: Dairy Produce and Maize Marketing Schemes: Memorandum of Objectives,' SAJE 6 (1938), p.25.
- (6) R Leslie et al., (1938 (b)), pp.24, 28.
- (7) C S Richards (1975), p.398, C S Richards (1936), p.503.

8.2 THE THEORY OF MONOPOLY

8.2.1 The question of monopoly demands careful handling. We can easily see why the monopoly model appeared to be appropriate and useful to the economists of the 1930s. In terms of the Marketing Act, the maize, wheat and dairy boards were given powers which amounted to those of a monopoly. ⁽¹⁾ In addition, the majority of the board members were producers and a simple assumption of self interest would appear to lead to the prediction that they would attempt to achieve the highest possible producer price. It was true that the Minister of Agriculture was to have overall control, but this was not seen as an important factor, partly because the range of his duties was so great that he could not effectively fulfil them all. ⁽²⁾ Besides, he could be expected to favour the producers in any event because of the dominant political influence of the rural electorate. And as a matter of self interest, he was himself a farmer.

8.2.2 A comparison of the results and the predictions of the economists ⁽³⁾ suggests that their forecasts in this respect have not been very accurate and the question needs to be posed why this is so.

8.2.3 To answer this question we need to return and review monopoly theory with some care. It is clear that, as Downs ⁽⁴⁾ has suggested, monopoly theory yields useful predictions only because of specific ownership arrangements. The conventional

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- (1) It should be noted that control over total output, normally associated with monopoly, did not apply. Nevertheless, the Boards could effectively control the quantity marketed, so the difference was not, therefore, a very important one.
- (2) C S Richards (1936), pp.487-8.
- (3) See Chapter 5.
- (4) A Downs, An Economic Theory of Democracy (New York: Harper and Row, 1957), Ch. 2.

textbook theory of monopoly (single seller, etc.) needs to be more carefully defined. Implicit in the theory is the assumption that the decision maker also owns the fixed factors. Property rights are clearly defined. Given this particular arrangement, the owner of the fixed factors can be expected to operate the firm in the way predicted by monopoly theory. ⁽¹⁾ In other words, given our profit maximisation assumptions, we can test whether our assumption regarding property rights is correct. (ie - using profit levels as a indicator of the existence of a monopoly). Alternatively, if we know the property rights situation, we can test the profit maximisation assumption.

8.2.4 It follows from this 'property rights' view of monopoly that, since monopoly can be shown to be undesirable from a welfare point of view and since the behaviour of the monopolist is a function of both property rights and the utility function of the monopolist, there are two possible ways to deal with the problem. We might try to change his utility function by persuading him to 'stop being selfish,' a policy which, as Downs has suggested, ⁽²⁾ is unlikely to be successful (ie - tastes are relatively fixed). Or we can attempt to change property rights, via regulations, taxation, etc. This latter approach is, of course, the normal procedure adopted.

8.2.5 It is clear, however, that the predictions of the monopoly model rest on the twin assumptions of human nature and property rights. It is to these assumptions that we must look if we wish to understand the failure of the monopoly model to yield useful predictions of the behaviour of marketing boards.

(1) This would be the case even if the owner had, say, a very high leisure preference. In this case it would be rational to sell the firm, internalising the rents and the new owner would have to operate in a monopolistic fashion to less normal profits. See J M Buchanan & G Tullock, 'The "Dead Hand" of Monopoly,' Antitrust Law and Economic Review 1(4) (1968), pp.85-96.

(2) See Downs, op. cit., pp.282-3.

8.2.6 As far as the utility function is concerned, it is correct, though tautological, to suggest that the members of the boards make choices consistent with their utility functions. It is not operationally useful, however, nor directly empirically testable, since it is actions which reveal utility functions, not the other way round. Observing actions is the only way to deduce information about utility functions.

8.2.7 An attempt to investigate the utility functions of marketing board members is likely to be an unrewarding task, however. Though utility functions may, for reasons of analytical simplification, often be assumed given (the consumer has given tastes, etc.), in fact, realistically, they are not exogenous, but are themselves functions of other factors. We might suggest, as a reasonable approximation, however, that a high producer price is an important or even dominant variable in the utility functions of most producers.

8.2.8 Property rights offers a more fruitful field for investigation, therefore, since we can only understand actions if we understand the constraints on those actions. This point has been very well explained by Sowell.⁽¹⁾

"Since theory is meant to predict what emerges, it cannot proceed by aggregating or averaging the perceptions or behaviour of the individual actors in the drama, but only by seeking to construct the constraining relationships which lead their mutual pulling and tugging to produce one result rather than another."

In the case of marketing boards, we have a clear case of the separation of ownership from control. The people who make the price decision are not the same as those who make the production decision and, crucially, there is no direct relationship between the decision and the rewards accruing to the decision makers. This means that the conventional micro models, based on important but usually implicit assumptions regarding a coincidence of decision

(1) T Sowell, Say's Law (Princeton UP, 1972), p.231.

making and ownership, are simply no longer applicable. In the absence of ownership over resources, decision makers no longer maximise their utility in the simple way predicted by economic theory, so that although a high producer price may be important to producer members, it is not necessarily their only objective. Other objectives are clear - leisure preference, the desire for stability, the desire to avoid adverse public criticism, etc.

8.2.9 If, therefore, in terms of economic theory, the behaviour of marketing boards is difficult to understand, it is because 'economic theories of government universally fail to assign any motives to the men in government.' (1) This is an important failing and is increasingly recognised as such as government activity spreads to cover an ever widening area of economic activity. (2) Once motives are assigned, in particular the obvious motive of self interest, a framework starts to fall into place within which we can examine the behaviour of marketing boards.

8.3. THE AMERICAN EXPERIENCE

8.3.1 Much of the investigation of the activities of government has taken place in the United States, where government intervention in the economy often takes the form of 'regulatory agencies.' Exactly what these agencies have been doing is a matter of some dispute. Ostensibly, their function is to protect the public against the adverse effects of monopoly. (3)

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- (1) Downs, op. cit., p.282.
- (2) 'Perhaps one fifth of the US national income originates in industries subject to some direct regulations and yet economists know very little about how regulation affects the market performance of an industry.' R E Caves, 'Direct Regulation and Market Performance in the American Economy,' AER 54 (1964), pp.172-191, p.172.
- (3) See R A Posner, 'Taxation by Regulation,' Bell Journal of Economics and Management Science 2 (Spring 1971), pp.22-50, p.22.

8.3.2 The case of falling costs or 'natural monopoly' is recognised as a theoretical justification for government intervention of this sort. In this respect, the situation in the United States does not parallel the South African experience. No one has ever attempted to justify marketing boards on the basis of falling average costs. In addition, other structural differences exist which could be expected to cause significant differences between the behaviour of American regulatory agencies as compared to South African marketing boards. For example, regulatory agency board members are appointed, not from special interest groups, but, ostensibly, from those who have no particular liability or debt to any of the interested parties. They are enjoined to behave in a non-partisan manner. ⁽¹⁾ In the case of the South African marketing boards, of course, members are appointed specifically to represent special interests (producers, millers, etc.). In South Africa, however, policy makers receive the same advice regarding non-partisan pricing policies. ⁽²⁾ Other similarities exist. The experience in the United States is that 'there is unlikely to be effective organisation of the consumers as a group,' ⁽³⁾ which seems to parallel the South African experience.

8.3.3 Closer examination reveals other striking similarities. It seems to be the case that natural monopoly is not, in fact, the explanation for the use of regulation in the USA (though it may be the ostensible justification for it). Regulation occurs not to protect the consumer against unbridled monopoly power, but rather at the instigation of the regulated firms themselves. It is often a cheap (and legal) way to operate a cartel. ⁽⁴⁾ It would seem to

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- (1) See M Russell and R B Shelton, 'A Model of Regulatory Agency Behaviour,' Public Choice 20 (Summer 1968), pp.47-62.
- (2) Report of the Commission of Enquiry into the Marketing Act, (Act No. 59 of 1968), RP39/1976).
- (3) See Russell and Shelton (1968), p.50.
- (4) See G Tullock, 'Regulating the Regulators,' in Government Controls and the Free Market, ed. by S Pejovich (Texas A&M University Press, 1976), pp.144-146. See also Posner (1971), p.22, "Regulation is procured by politically effective groups, assumed to be composed of members of the regulated industry itself, for the own protection."

be possible to find parallels here between these explanations of regulatory authorities and the often expressed need for South African farmers to combine.

8.3.4 Thus it would seem that the parallels, while not exact, are at least close enough to demand attention. In any event, a good theory of government activity should be able to explain both types of institution with some degree of precision, so there are advantages in comparing institutions which are sufficiently different to provide a good test for the theory.

8.4. THE THEORY OF BUREAUCRACY

8.4.1 It may be as well, before turning to the literature on US regulated industries, to consider briefly the conventional justifications for State intervention. Just as orthodox micro-economics embodies implicit assumptions regarding ownership, property rights, etc., it also embodies certain assumptions about the motivations of bureaucrats and the functioning of the executive arm of the State. 'In the Pigouvian tradition, the bureaucrat is both informed and incorruptible, in the Coase framework, he is ignorant and incorruptible.'⁽¹⁾ It was this belief in the efficiency of government relative to the free market which led to the theoretical argument in favour of regulation - a comparison of an imperfect (though technically efficient) free market system as opposed to costless and fully informed government intervention - an argument which was analytically sound though unsatisfactory in practice.⁽²⁾

(1) J M Buchanan, 'The Coase Theorem and the Theory of the State,' Natural Resources Journal 13 (1973), p.592.

(2) This approach, though simplistic, had the advantage of being clear-cut, at least in theory. The realisation that we are comparing two inefficient forms of operation leads to much more difficult analytical problems. See R H Coase, 'The Problem of Social Cost,' Journal of Law and Economics 3 (1960), p.18. See also J W McKie, 'Regulation and the Free Market: The Problem of Social Cost,' Bell Journal of Economics and Management Science 1(1) (Spring 1970), p.6-26.

8.4.2 'There is no reason to believe that government reaches perfect solutions either. The number of cases where economists have argued that the market is imperfect and therefore recommended that government should deal with the problem is very large They assumed that government reaches a perfect solution. No one really believes this, but economists frequently recommend government action simply because the private market creates externalities and hence is not likely to function perfectly. This is clearly a mistake; we should compare the likely errors of both in the real world and the use of the institution which will cause less inefficiency, whether government or the market.' (1)

8.4.3 Also, of course, the case for government intervention could only be made in clearly defined circumstances. Government regulation was only justifiable in cases of 'natural monopoly.' Government was only justified in cases where property rights were ill-defined. There was no case for government intervention to reconcile or mediate between different interests - only the market could do that. Clearly, however, South African marketing boards can be justified on neither of these grounds.

8.5. THEORIES OF REGULATION

8.5.1 Before we can evaluate government intervention in the economy we need to know what the objectives of this intervention are. Otherwise the discussion becomes pointless. In practice, however, it is often difficult to know what regulatory authorities are supposed to be doing since their terms of reference are so vague. As Caves has argued, "To put it mildly, the hierarchy of economic objectives pursued by a regulatory commission are often unclear from its decisions and authorising legislation. At best, a list of regulatory objectives will be discernible, but not the weights placed upon them." (2) This appears to be a general view. "What the regulatory commissions are trying to do is difficult to discover; what effect these commissions actually have is, to a large extent,

(1) G Tullock, The Vote Motive, Institute of Economics Affairs, Occasional Papers, p.6.

(2) See R E Caves, (1964), p.10, p.174.

unknown; when it can be discovered, it is often absurd." (1)

8.5.2 The problem with evaluating government is that even when objectives are explicit they are so broad and general - and often, in fact, conflicting - that evaluation is difficult. What is needed is a theory to explain the behaviour of these organisations in a satisfactory and empirically refutable way. Tullock (2) has discussed three broad 'schools of thought' in the behaviour of regulatory agencies in the USA. These are:

- a) Unbudgeted income transfer (3)
- b) Random behaviour (4)
- c) Maximising the well-being of members of the board (5)

These three approaches may be briefly summarised:

8.5.3 Posner argues that 'One of the functions of regulation is to perform distributive and allocative chores usually associated with the taxing or financial branch of government.' (6) "Regulation," he argues, 'is a method of public taxation and expenditure.' (7)

8.5.4 Wilson's findings are in close agreement with a path-breaking study by Stigler and Friedland (8) on electric utilities. They argued that regulation in this sector had no observable effect when compared with performance in a comparable unregulated sector of the industry. They attributed this to the difficulty of

- (1) R H Coase, Discussion on three papers, AER 54 (1964), p.194. See also R C Cramton, 'The Effectiveness of Economic Regulation - a Legal View,' AER 54 (1964), pp.182-191 for a similar view.
- (2) G Tullock, 'Regulating the Regulators,' op. cit., p.146.
- (3) R A Posner (1971).
- (4) J Q Wilson, 'The "Dead Hand" of Regulation,' The Public Interest 33 (Fall 1971), pp.39-58.
- (5) J F Chant and K Acheson, 'The Choice of Monetary Instruments and the Theory of Bureaucracy,' Public Choice 12 (Spring 1972), pp.13-23.
- (6) R A Posner (1971), p.23.
- (7) R A Posner (1971), p.29.
- (8) G Stigler and C Friedland, 'What can Regulators Regulate? The Case of Electricity,' Journal of Law and Economics 5 (1962)

obtaining satisfactory information on which to base decisions and the absence of monopoly power (ie - competition from other energy sources). Wilson makes the important point that lack of specific rules is an advantage to regulatory agencies - it provides them with more arbitrary power to deal with specific cases.

8.5.5 Chant and Acheson argue that agencies are 'concerned with prestige and self-preservation.'⁽¹⁾ Consistent with this desire to avoid conflict and criticism is the fact that they provide confusing and ambiguous information about their own behaviour. Ambiguity is an important part of their image. The authors argue that rules are better than allowing a wide degree of discretion to regulatory agencies.

8.5.6 The parallel with our findings in the case of South Africa would appear to be simple and direct. We can point to cases of income transfer - in fact, any deviation of local prices from world prices indicates an income transfer, intentional or otherwise. It is also clear that self-advertisement is not characteristic of the boards, though occasionally it is in their interests to establish some sort of public image. Producer members may find it useful to appear as champions of their own particular interest groups. In general, however, they keep a low public profile.

8.5.7 The 'random behaviour' argument may perhaps be re-specified as neutral behaviour in the South African context. This was roughly what we discovered in the case of some of the boards investigated.

8.5.8 Let us examine the 'neutral behaviour' argument a little more closely. It is, after all, somewhat surprising that, given the formidable array of powers, they should behave in this neutral way,⁽²⁾ particularly since they derive their powers not from the

(1) J F Chant and K Acheson (1972), p.14.

(2) This applies in particular to the maize and meat boards.

uncertainties of the market, but from the State which, as Stigler has noted, has 'one basic resource - the power to coerce.' (1)

8.5.9 'Neutral behaviour' perhaps becomes more explicable if we consider the problems faced by the board in making its decision. Output is clearly a function of numerous factors of which only the price of that product is in the hands of the board. Weather, costs, natural hazards and the decisions of individual farmers are not. Most importantly, the prices of substitutes in production (and even complements) are often beyond their control (eg - sunflowers, in the case of maize). In other cases, of course, it is not so. The wheat board is a clear example of this and it is clear that policies in this case have been directed to maintaining a constant ratio between the prices of the various winter cereals. Apart from this problem, an important fact overlooked during the 1930's debate, is that the boards are, in effect, in competition with each other. (2) This affords some protection to consumers since it constrains boards in raising prices. It would, therefore, appear that, in this kind of situation, following a firm line of policy, particularly against what might be described as 'normal' market forces, would be extremely difficult.

8.5.10 A further important factor was not considered during the debate of the 1930s. With the exception of vegetables, which significantly are not controlled, few agricultural products are sold directly to the consumer. (3) Most undergo further processing and (an important point) are often sold to other farmers (eg - as cattle food). Though clearly consumers may be a diffuse, disorganised

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- (1) G Stigler, 'The Theory of Economic Regulation,' Bell Journal of Economics and Management Science 2(1) (Spring 1971), p.4.
- (2) The relationship between boards was noted as posing a problem of co-ordination during the 1930's debate, but the relationship between boards was not seen as a competitive one. The suggestion of the importance of competition between boards is supported by Downs (1957). 'Every large organisation is in partial conflict with every other social agent it deals with.' (Ch.17).
- (3) See R G Noll, 'Reforming Regulation: Studies in the Regulation of Economic Activity,' The Bookings Institution (1971), p.73.

group, the food processing industry is probably reasonably powerful and growing more so. This is not, of course, a cause for congratulation. It leads though, to two possible conclusions. If continuous clashes are to be avoided, some modus vivendi needs to be established. Indeed, it is more likely to be established anyway, since costs of reaching agreement are likely to fall as the size of the group falls as are the costs of arranging a conspiracy. (1)

8.5.11 We recall C S Richards's prediction regarding conspiracy and corruption, (2) and it is clear that opportunities for such arrangements exist, particularly at the rather indistinct boundary between regulation and private enterprise. (3)

8.5.12 Returning to the economist's predictions, 'unwanted products' are difficult to define. If we mean 'more than the equilibrium quantity,' then the answer may be 'yes,' though we have argued that if this is so, the results are not as costly as Richards argued. Distribution costs are, of course, more difficult to assess because we are asking a counter-factual question here - had the marketing boards not existed - or had some other form of regulation existed - would distribution costs have been lower? We cannot, of course, answer this question because different arrangements for distribution would lead to different quality of service as well as different costs. It is clear that pressures exist on both the maize and wheat boards to keep producer prices high and consumer prices low. Cross-country comparisons of costs are not useful in this case since, of course, the physical distance of farms to markets differs. In the United States, for example, distances are much greater, but so also may be economies of scale in transportation, so it is not clear what sort of conclusions one

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- (1) F M Westfield, 'Regulation and Conspiracy,' AER 55 (1965), pp.424-443.
 (2) C S Richards (1936), p.502.
 (3) See J W McKie (1970).

could draw from available data. Nevertheless, the American experience seems to suggest that the operation on the free market does not pose insuperable obstacles to efficient distribution. Comparison of, say, meat packing and marketing arrangements in the USA with South Africa suggest that the meat marketing board may have held up innovation. Again, how would one measure this? To the extent that existing capital is producing less than it could per unit of output, this is a net loss to the community. To the extent that investment has been channelled elsewhere, the loss has to be offset against the production gained in other (though presumably less productive) uses.

8.5.13 Failure there has not been, chaos occasionally, but this, of course, is a relative term. We are, after all, comparing two imperfect systems. Excess inventories and miscalculations, of course, occur in both systems. The fact that rewards are directly tied to success in prediction in the free market system suggests that performance is likely to be greater in this regime. As was shown in Chapter 6, there is no apparent reason to suppose that the centralisation of decision making leads to increased performance. The reverse is likely to be the case.

8.5.14 On the question of co-ordination, the prediction of the economists would seem to have been proved correct. The current philosophy is to reduce the number of marketing boards to improve co-ordination. Chapter 6 discussed practical problems of co-ordination and suggested that in practice, the possibilities were limited. Reducing the number of marketing boards is more likely to reduce competition than to improve co-ordination. This tendency towards centralisation was noted above. ⁽¹⁾ It is clear that, essentially, the problem of co-ordination remains as it was before.

(1) See p. 143.

8.6 CONCLUSION

8.6.1 It would seem therefore, broadly, that our findings regarding the behaviour of South African marketing boards are consistent with observations of similar regulatory organisations in the United States. The difficulties of the investigation have been much the same - to discover what they have been doing, and secondly, to interpret their behaviour. To pass judgement on their performance is more difficult since we do not know what they are really supposed to have been doing - what 'success indicators' (1) are we to use?

8.6.2 There would seem to be something more that we can say. At the beginning of the chapter we mentioned the need to produce some theory, empirically testable, to account for the behaviour of these organisations - otherwise one is left in the unsatisfactory position of simply describing their behaviour - a procedure which amounts to an acceptance of the hypothesis that organisations are beyond rational explanation - 'politics are imponderable.' (2) While it is true that we have the useful tautology that members of boards behave to maximise their own utility and although this is a useful corrective to the belief that regulatory organisations can be expected to act in the 'public interest' (though it does not contradict or deny the possibility that they might - a well-designed system would allow utility maximisation of board members to coincide with the public interest), it does not seem to yield useful predictions. We would anticipate that the behaviour of the boards will vary as the immediate constraints on their actions vary. It would be difficult to devise a test to disprove this.

(1) This term was used by Noll (1971), p.40, who discusses a similar problem.

(2) G J Stigler (1971). Similar views are expressed by M Perlman: "It is after all very embarrassing for the economist always to have to reply: 'That depends on political decisions,' whenever he is asked to predict economic events."

Commentary 3 (1977), p.64.

8.6.3 A useful way to observe or to understand the behaviour of government agencies may be to interpret their behaviour in terms of a 'Golden Rule.' One would argue that regulatory authorities find a 'golden rule' or a rule of thumb and stick to it. Having been given confusing and often contradictory guidelines to follow, it would seem to be sensible for them to choose some simple rule of thumb to follow. If the rule is well chosen, the organisation appears to function efficiently. (1)

8.6.4 There is nothing inherently bad about such a procedure, of course. Indeed, from the point of view of the decision makers, it is highly desirable, since it reduces their costs in terms of time spent studying and understanding and interpreting the hundreds of variables relevant to a decision on, say, the maize price. Though it reduces costs to the decision makers, it does not reduce costs to the organisation as a whole. It is necessary to conceal the fact that such a simple rule is being followed, partly because, as Coase has suggested, the rule may actually be absurd (2) and partly because it is important for the prestige of all parties to maintain committees, a large research department, survey teams and top level discussions - this is, after all, part of the psychic income of the board members.

8.6.5 The advantages of the Golden Rule theory are that it is empirically testable and appears to be consistent with much of the available evidence.

8.6.6 Wilson's argument that behaviour is 'random' may simply mean that the rule is there, but he has not discovered it. In the

(1) Ideally, the rule should be independent of their own actions. Thus, cost-plus would be a bad rule to follow (See Appendix 3) whereas world prices would be a useful guideline. Similarly, a central bank might decide to increase the money supply by a steady, say, 5% per annum. This would be better than 'last year's inflation rate plus 5%,' a policy that would be likely to prove inflationary.

(2) See p. 159.

case of the Stigler and Friedland investigation, the rule is presumably to set the price level at the same level as comparable companies in the free market sector. Hence, economists who interpret the data would obviously conclude that regulatory authorities do nothing - not because they are unable to, but because they choose not to.

8.6.7 The analysis of Russell and Shelton is, of course, only understandable in terms of a 'golden rule' style of operation. As they themselves explain, "The analysis is limited to the rate-of-return on base rate regulations of firms which provide utility services under conditions of controlled entry." (1) Once the rule is explicit, in other words, behaviour becomes understandable.

8.6.8 We can find other evidence to support the hypothesis that organisations, rather than try to disentangle and interpret an infinite number of economic signals, resort to the 'simple rule' approach. It has been suggested that Soviet planners follow this sort of approach. (2) As further evidence, we would expect the early years of regulatory agencies to be marked by mistakes and erratic behaviour. This may, of course, be due to decision makers' learning new jobs, but could be explained in terms of the 'golden rule' theory by the fact that the organisation has not yet defined a suitable rule to follow. Naively, the decision makers may even be trying to follow their confusing instructions.

8.6.9 Chant and Acheson's remark that the explanations of the organisations' behaviour put out by the organisation itself must be ambiguous, is interesting. It is necessary, of course, to conceal the rule. It might seem that if, in fact, organisations do simply follow a rule-of-thumb in determining their actions, it would be

(1) M Russell and R B Shelton (1968), p.47.

(2) See P Craig Roberts, Marx's Theory of Exchange, Alienation and Crisis (Hoover Institution Press, Stanford, 1973).

better for them to be provided with a specific rule to follow rather than have them evolve it for themselves. Such a suggestion would be quite useless, however. No political consensus could be reached on the rule which the organisation should follow. Indeed, it is precisely because of this lack of consensus that regulatory organisations are established in the first place.

8.6.10 One might, however, tentatively, suggest some golden rules for establishing the 'Golden Rule.'

- i) The variable chosen as the datum should be independent of the organisation's own actions
- ii) Ideally, it should be a variable determined by the free market to minimise strains and distortions as much as possible
- iii) Ideally, it should be a relatively stable variable.

8.6.11 If this interpretation is correct, we are forced to view recent literature favouring market intervention policies in a more sceptical light. It is always possible, of course, to make one person better off at the expense of somebody else. Further, when two parties engage in trade, we can conclude that they do so because both parties expect to benefit. If a third party is engaged to oversee this trade, if he has coercive powers, privileged access to information and functions with altruism, then both trading parties may be better off than they would be in the absence of the third party. On such foundations recent theoretical work is based.

8.6.12 These simplifications (which are, of course, readily acknowledged by the authors of many recent models) may not matter much if the models are seen as mathematical toys; but one imagines that they are intended to be something more than that. Though they are largely abstract from political factors, they are designed to provide some sort of representation of the real world. Yet political decision making is the essence of marketing boards. They are step-children of the political process. The market provides a certain distribution of wealth. This is judged to be unsatisfactory by certain powerful interest groups and a marketing board is established to attempt to provide a different one. If the South African experience can be generalised, marketing boards are not established to

maximise economic welfare. They are intended to re-distribute it - though in this way they may not be as successful as the architects of these schemes would have wished.

CORRELATIONS:PERCENTAGE OF OUTPUT OF EACH PRODUCT ACROSS 60 ECONOMIC REGIONS

	Maize	G.Sorgh.	Wheat	Other cereals	Sunflowers	Groundnuts	Tobacco	Sisal	Phor.ten.	Hay & Feed	Vegetables	Sugar Cane	Citrus Fruit	Cattle	Sheep	Pigs	Ostriches	Poultry	
Maize	1,0																		
Grain Sorghum	,77	1,0																	
Wheat	,22	,27	1,0																
Other Cereals	-,03	-,04	,74	1,0															
Sunflowers	,74	,76	,01	-,03	1,0														
Groundnuts	,63	,41	,02	-,09	,40	1,0													
Tobacco	,00	,09	,03	-,01	,17	,39	1,0												
Sisal	-,09	-,09	-,12	-,09	-,07	-,03	-,05	1,0											
Phormium tenax	-,04	-,05	-,07	-,05	-,05	-,06	-,04	-,04	1,0										
Hay & Feed	,55	,64	,39	,13	,49	,28	-,01	-,12	-,02	1,0									
Vegetables	,10	,23	,05	,13	,36	,17	,44	-,10	,02	,18	1,0								
Sugar Cane	-,13	-,12	-,15	-,10	-,09	-,13	-,06	,67	,25	-,20	-,10	1,0							
Citrus Fruit	-,13	-,06	-,09	-,02	-,01	-,03	,38	,01	-,02	-,06	,60	-,01	1,0						
Cattle	,55	,56	,21	,06	,52	,62	,39	,03	-,11	,77	,34	-,16	,11	1,0					
Sheep	,12	,16	,27	,21	,04	,05	-,13	-,12	-,09	,57	-,08	-,19	-,14	,38	1,0				
Pigs	,55	,43	,32	,33	,47	,52	,29	-,08	-,01	,57	,47	-,18	,02	,68	,20	1,0			
Ostriches	-,06	-,04	-,04	-,02	-,03	-,05	,03	-,04	-,02	-,08	-,07	-,05	-,06	-,08	-,06	-,07	1,0		
Poultry	-,01	-,01	,07	,14	-,02	-,07	-,03	-,06	,79	,01	,18	,16	-,09	-,09	-,15	,30	-,07	1,0	

APPENDIX 2

NUMBER OF STAFF EMPLOYED AND SALARIES PAID BY
EACH MARKETING BOARD 1973-4

	White	White	Sea- sonal em- ployees	Total	White (R)	Non- White (R)	Total (R)
Potato Board	31	33		64	142 926	15 796	158 712
Soy Bean Board	10	2		12	55 056-44	1 500	56 556-44
Dried Fruit Board	15	1		16	82 686-93	1 023-31	83 710-24
egg Control Board	86	116		202	362 348-75	101 467-06	463 815-81
Arakul Board	5	1		6	39 966-73	284	40 250-73
Cotton Board	2	1		3	2 252-42	75	2 327-42
Meat Board	143	18		161	673 895-07	15 002	688 897-07
Cicerne Seed	4	-		4	15 331	-	15 331
Milk Board	67	15		82	307 014	17 305	324 319
Rubber Board	318	39		357	1 293 980-64	36 246-77	1 330 227-41
Flaxseed Control Board	43	5		48	203 085-30	5 137-50	208 222-80
Banana Control Board	53	99		152	355 641-74	108 550-03	464 191-74
Livestock & Meat Industries Control Board	379	115		494	1 638 027	123 682	1 761 709
Canning Fruit Board	7	-		7	42 575-57	-	42 575-57
Goibos Tea Control Board	4	18		22	22 875-28	8 733	31 608-28
Aciduous Fruit Board	169	46		215	935 365	58 387	993 762
Onion Control Board	19	52	132	203	99 846	74 222	174 068
Straw Board	315	64		379	1 581 602	31 669	1 613 271
Wool Board	197	120		317	954 851	99 977	1 054 828
Wool Board	37	10		47	232 343	2 860	235 203
Chair Board	10	2		12	63 039	2 062-80	65 101-80
Tobacco Board	11	2		13	84 629	2 260	86 889
				<u>2 816</u>			<u>9 885 571</u>

Source:

Hansard, 11th February, 1975.

APPENDIX 3

INFLATION INDEXED PRICE SUPPORTS

In a recent issue of the AJAE Harris⁽¹⁾ describes a model illustrating the effect on land values of a certain form of price support policy. The model shows that under a defined set of conditions land values may rise rapidly, sometimes indeed explosively.

The model, though relatively simple, serves well to illustrate a fundamental problem and it would be unproductive to criticise it on the basis of its various simplifying assumptions. It might though legitimately be asked whether, given a rapidly rising support price X_t such as occurs when $\gamma = 0.70$, farmers would continue to expect the price suggested in expression (11).

This is, however, incidental to the main thrust of the model which is to illustrate the dangers of using costs as a method of establishing price. South Africa provides a useful case study in this respect. The price of maize has been set in recent years partly on the basis of cost data, while over the same period land values have risen extremely fast. Harris' model provides a credible explanation why this should be so.

The model leaves several problems unresolved however, and these deserve careful attention, especially in view of the interest which this method of price fixing is apparently attracting in the United States.

It would be unfortunate if the question of cost based price supports were to become confused with the question of inflation indexing. The two problems are conceptually quite different. The Harris model is presented as an 'inflation index' model, and yet inflation is not a necessary feature for its operation. Indeed, in the numerical example provided (pp.492-3) it is assumed that inflation rate is zero ($\delta = 1.00$). A further feature which is not obvious from the model is the nature of the factor markets. It is, in fact, a two factor model - land and 'operating costs' or variable factors. The assumption behind expression

- (1) Harris Inflation indexed price supports and land values, AJAE 59(3) (August 1977), pp. 489-495.
- (2) J A Sharples: "Adjusting Price Supports: Comparison of Alternative Methods", AAEA Conference paper, San Diego 1977.

(7) is that agriculture is a price taker in the market for variable factors. Furthermore, the value of land is determined as a residual, once payment has been made for the variable factors. These are both perfectly acceptable assumptions, of course, but they need to be made explicit, since it implies that we are dealing with rather special kinds of factor markets.

It is also quite clear, by reference to the numerical example that in this situation the only sensible value for γ_L is zero in a situation where all prices are stable. Any positive value implies a quite unjustified increase in the value of land.

The rule is more general than this, however. Since the value of land is determined exclusively by the value of output, it is quite unsound to incorporate the value of land as part of the basis for calculating output prices. An explosive, or at least a very rapid increase in land values, is likely to result. What Harris' model illustrates clearly is that the only possible value for γ_L which is consistent with sound policy is zero. This argument applies with equal force to any factor with a perfectly inelastic supply curve.

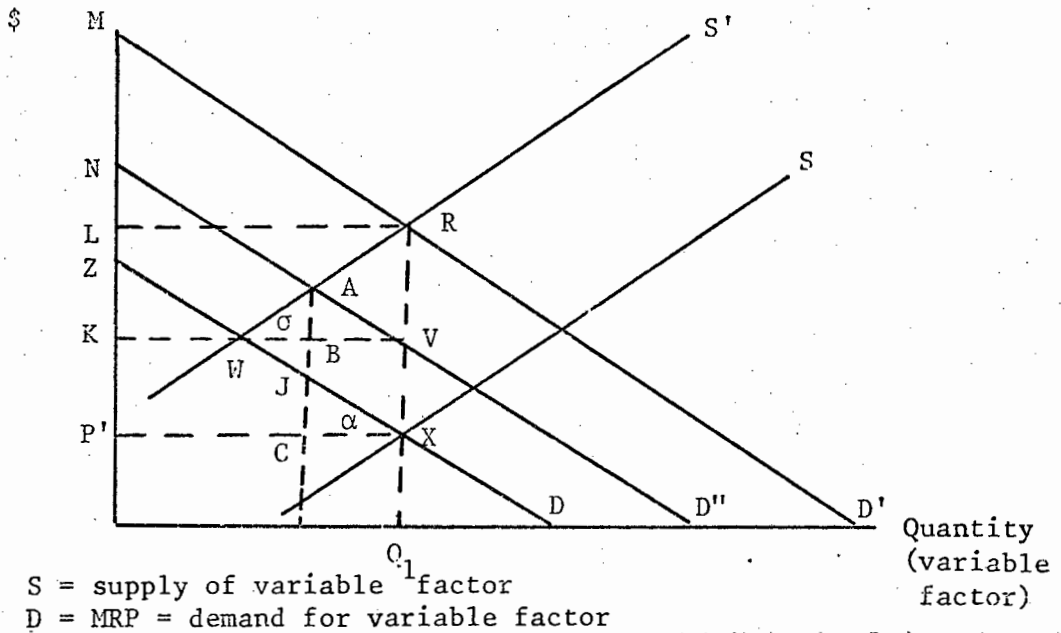
Let us consider two cases of price increases:

(1) The inflation case. If we consider a situation where all prices rise at the same rate, this is equivalent to multiplying expression (1) through by some fixed value. Since we are assuming that the rate of inflation affects all prices to the same extent, both P_t and C_t will be equally affected. R_t and consequently V_t will rise by the same proportion. In real terms price ratios stay exactly the same. The argument is essentially a trivial one, the only question being why it should be necessary to use this form of price fixing at all, since the market achieves the same effect by itself.

(2) A change in relative factor prices. This is a far more interesting case. Suppose that the general price level stays constant, but the price of one of the input factors changes. We are not forced to ask the fundamental question:

what is the object of our price fixing? Because if the product market was in equilibrium before the factor price increase, and if we allow this increase in production costs to raise our product price, then the product market will no longer be in equilibrium. On the other hand, if we do not, then farmers are worse off than before. The only justification for cost-based pricing is to preserve the capital value of the farmer's assets.

Now, consider the following diagram:



To simplify the argument, assume we are dealing with straight line supply and demand functions of known slopes. Assume the initial point is $X(P_1 Q_1)$. Now, the supply curve shifts to the left, causing the price to rise. The new point is W. Recalling that the residual, after paying for the variable factors, accrues to land, the return to land has shrunk from $ZP_1 X$ to ZKW . The problem is to compensate the farmer for this price increase.

If we adopt the device of fully compensating the farmer for the price increase, we should increase the product price until D shifted over to D' . The new equilibrium point would be R and net social cost would be illustrated by triangle RWX . (Wallace⁽¹⁾).

(3) T D Wallace, Measures of Social Cost of Agricultural Programs, JFE 44 (1962), pp. 580-594.

The effect of this is to protect the farmer fully against all price increases ($ZP_1X = MLR$), while the increase in product price itself tends to drive up the factor price - the problem discussed in the Harris model.

If the policy is to increase product prices to cover the increased cost of factor inputs, then point R is the new logical equilibrium point.

Consider demand curve D'' . If the new demand curve were D'' and if the price of the variable factor remained at OK , the farmer would be as well off because the return to land $NKV = ZP_1X$. In fact, of course, if the demand curve were D'' , the new equilibrium point would be A , because as demand shifts from D to D'' , producers drive the price up against themselves. It would seem to be reasonable for the price support agency to cover producers for the amount of the increase P_1K . If they attempt to cover KL , however, the possibility exists of an explosive increase in the price of the factor.

$$\text{The ratio } \frac{KL}{P_1K} =$$

$$\frac{AB}{BC} = 1 - \frac{\tan \alpha}{\tan \alpha + \tan \sigma}$$

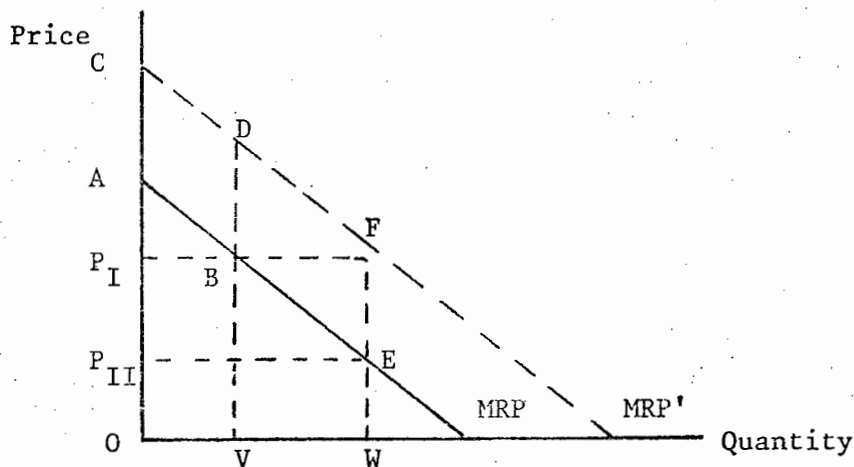
If agriculture is a price taker in the factor market, $\tan \alpha = 0$, and the entire price increase is incorporated in the product price since $\frac{AB}{BC} = 1$. The possibility of an explosive escalation

in costs does not exist on the price taker assumption. As the supply function becomes steeper $\frac{AB}{BC} = 0$ so that in the case of an inelastic factor input such as land, none of the price increase in the factor is incorporated in the product price.

Point A is not, of course, an economically efficient point in any sense. The only point which satisfies the requirements of efficiency is W . Point A does have the advantage, though, that

farmers are compensated for the shift of the S curve to the left, but there is no possibility of the pricing system generating explosive increases. The return to land also declines, so that farmers are not totally shielded from the effects of the increased factor prices - the increased costs are simply apportioned between taxpayers and farmers in a more sensible manner. Net social costs fall from RWX to AWJ.

THE REWARD FOR IGNORANCE



The farmer is assumed to be a price taker in the fertiliser market. Assume he is in a situation of declining marginal productivity (given fixed land, adding additional fertiliser)

- OP_I = existing price of fertiliser
- MRP = marginal revenue product curve as farmer perceives it
- MRP' = marginal revenue product curve as it really is
- OV = quantity of fertiliser he will choose to use given his information
- OW = social optimum quantity of fertiliser

Using OV fertiliser the farmer expects total revenue of $OABV$. Actually he gets a total revenue of $OCDV$. Thus area $ACDB$ = the 'pleasant surprise' area. To persuade him to use the economically optimum quantity OW , we need to lower the price of fertiliser to OP_{II} . Then total expenditure on fertiliser = $OP_{II}EW$ (which may be more or less than $OPBV$) and his total revenue is $OCFW$. His net revenue is $P_{II}CFE$. Had he been fully informed, his total use of fertiliser at price P_I would have been OW and total expenditure on fertiliser $OP_I FW$. Thus the area $P_I P_{II} FE$ represents the additional revenue which accrues to the farmer as a result of his ignorance. It is also a measure of the wealth transfer from tax payer to producer. Of course, the situation is not quite so simple. Though one farmer may be a price taker in the fertiliser market, farmers as a whole are not. As Nieuwoudt points out:

(The) "farmer's share of the subsidy on fertiliser and the share

of the fertiliser manufacturer depend on the elasticity of demand for and supply of fertiliser. The more elastic the supply, the bigger the farmer's share and the more elastic the demand, the bigger the manufacturer's share." (1)

Nevertheless, the principle remains clear.

(1) W L Nieuwoudt, 'Factor Subsidies and Certain Policy Implications,' Agrekon 11(3) (1972), pp.5-8, p.5.

THE COBWEB MODEL

(a) THE SIMPLE COBWEB

Mathematically, the cobweb model is normally specified as

$$\begin{aligned}x_s &= a + b P_{t-1} & a < 0 & \quad b > 0 \\x_d &= c + d P_t & c > 0 & \quad d < 0\end{aligned}$$

i.e. Demand is dependent on current price, whereas supply relates to a price one period previously, i.e. producers assume that the current price will continue. Assuming again that price is such as to clear the market at time t ,

$$a + b P_{t-1} = c + d P_t$$

a first order difference equation, which solves to

$$P_t = (P_0 - \bar{P}) \left(\frac{b}{d}\right)^t + \bar{P}$$

where

$$P_0 = \text{the initial price and } \bar{P} = \frac{(c-a)}{(b-d)}$$

Clearly \bar{P} is positive. If the initial price is the equilibrium price (i.e., $P_0 = \bar{P}$), the first term on the right hand side = zero, and the equilibrium price is maintained.

In other cases, the important factor is the relative magnitude of b and d . By assumption, $b > 0$, $d < 0$, hence the price P_t will oscillate about its equilibrium value. If $|b| < |d|$, these oscillations will be damped and P_t will ultimately return to \bar{P} . In the alternative case, $|b| > |d|$, and the oscillations will steadily increase, while if $|b| = |d|$, a constant amplitude will be maintained.

- (b) A variant of model assumes that production is lagged not one period, but z . As before, demand is determined by the current price level.

$$\text{Supply: } x_s = a + bP_{t-z} \quad a < 0, b > 0$$

$$\text{Demand: } x_d = c + dP_t \quad c > 0, d < 0$$

Assuming that the price clears the market.

$$x_s = x_d$$

and the equations solve to

$$P_t = \bar{P} + (b/d) \{P_{t-z} - \bar{P}\}$$

a very similar result to model (a), and the same conclusions may be derived regarding the behaviour of the price level under different values of b and d .

- (c) The above models imply a fairly rigid response of production to prices. Demand and supply are both directly linked to current or past prices.

A more realistic model would include some element of speculation - some allowance for foresight on the part of buyers and sellers, and expectations as to future prices. Allen⁽¹⁾ deals with a simple case of this.

Assume that current demand and supply depend on current price and on the rate at which prices are changing, i.e. P_t and P'_t .

(1) R G D Allen, Mathematical Analysis for Economists (London: Macmillan, 1972), pp. 435 - 436.

Then

$$\text{Supply: } x_s = a + bP_t + gP'_t \quad a < 0, b > 0, g \begin{matrix} > \\ < \end{matrix} 0$$

$$\text{Demand: } x_d = c + dP_t + fP'_t \quad c > 0, d < 0, f \begin{matrix} > \\ < \end{matrix} 0$$

When $x_s = x_d$ the model solves to

$$P_t = \bar{P} - (P_0 - \bar{P})e^{Lt}$$

where $\bar{P} = (c-a)/(b-d)$ and $L = (b-d)/(f-g)$ and $P_0 =$ the initial price

Ignoring the special case where $P_0 = \bar{P}$, the crucial term is clearly L . If L is positive, the price steadily diverges from the equilibrium price \bar{P} over time. If L is negative, the price path converges to the \bar{P} level.

Since we defined $b > 0$, $d < 0$, the numerator of L will be positive between price levels P' and P'' . The values of f and g are, however, undefined. Positive values imply that a rising price stimulates both demand and supply. It could equally well be argued, however, that a rising price causes producers to hold back in expectation of higher prices in the future, i.e. to speculate.

In the case where L is positive, a price level that diverges will cause a price controlling body to sell from stocks continuously. A falling price will, on the other hand, require continuous use of financial resources to maintain the floor price.

A further significant point is that whether price diverges upwards or downwards depends on whether $(P_0 - \bar{P}) > 0$, i.e. the price path depends on the price level at the time the scheme was introduced.

Given the following cobweb models for two markets interrelated on the supply side but not the demand side:

$$\begin{array}{ll} \text{Demand:} & P_1 = cQ_1^D & P_2 = wQ_2^V & (D, V < 0) \\ \text{Supply:} & Q_1 = A(P_1/P_2)^B & Q_2 = X(P_2/P_1)^Y & (B, Y > 0) \end{array}$$

Then:

$$\begin{array}{ll} \text{Demand:} & \log P_1 = \log C + D \log Q_1 \\ & \log P_2 = \log W + V \log Q_2 \\ \text{Supply:} & \log Q_1 = \log A + B \log P_1 - B \log P_2 \\ & \log Q_2 = \log X + Y \log P_2 - Y \log P_1 \end{array}$$

Then solving

$$M = \begin{bmatrix} D & 0 \\ 0 & V \end{bmatrix} \quad N = \begin{bmatrix} B & -B \\ Y & Y \end{bmatrix}$$

$$\text{So} \quad MN = \begin{bmatrix} -dB & dB \\ VY & -VY \end{bmatrix}$$

Calculating roots we conclude that if

$$\begin{array}{ll} dB + vY < 1 & \text{Cobweb stable and damped} \\ = 1 & \text{Cobweb constant amplitude} \\ > 1 & \text{Unstable} \end{array}$$

Interestingly enough both prices are either stable or unstable. This arises from the fixed relationship between P_1 and P_2 .

APPENDIX 6

LINEAR REGRESSION

Ordinary Least Squares

Assume a linear relationship exists between a variable Y and $(k-1)$ explanatory variables X_2, X_3, \dots, X_k and a disturbance term u . For a given observation i from a sample of size n we specify this relationship as:

$$Y_i = \beta_1 + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + u_i \quad i = 1, 2, \dots, n$$

or in matrix notation as

$$Y = X\beta + u \quad \dots \dots \dots (1)$$

In order to obtain estimates of β (defined as $\hat{\beta}$) it is necessary to make certain assumptions about this model. The simplest possible set of assumptions are

- (i) $E(u) = 0$
- (ii) $E(uu') = \sigma^2 I_n$
- (iii) X is a set of fixed numbers
- (iv) X has rank $k < n$

To derive the least squares estimate $\hat{\beta}$ we rewrite (1) as

$$Y = X\hat{\beta} + e$$

where e is the column vector of observed residuals $(Y - X\hat{\beta})$.

Then

$$\begin{aligned} \sum_{i=1}^n e_i^2 &= e'e \\ &= (y - X\hat{\beta})'(y - X\hat{\beta}) \\ &= y'y - 2\hat{\beta}'X'y + \hat{\beta}'X'X\hat{\beta} \end{aligned}$$

To find the value of $\hat{\beta}$ which minimises the sum of squares, we differentiate

$$\begin{aligned}\frac{\partial e'e}{\partial \hat{\beta}} &= -2X'y + 2X'X\hat{\beta} \\ &= 0 \text{ (for extremum)}\end{aligned}$$

So

$$\begin{aligned}\hat{\beta} &= (X'X)^{-1} X' y \text{ and it can be shown that} \\ \text{var}(\hat{\beta}) &= \sigma_u^2 (X'X)^{-1}\end{aligned}$$

Under assumptions (i) - (iv) the Gauss-Markov theorem shows that this estimator is best linear unbiased.

Various techniques are available to deal with frequently encountered situations where the classical assumptions are not satisfied. If nonsphericalness is present, assumption (ii) is respecified as

$$E(uu') = \sigma_u^2 \Omega \text{ where } \Omega \text{ is symmetrical, positive definite}$$

In this situation the ordinary least squares estimates will be biased and less efficient than the alternative estimate.

$$\hat{\beta} = (X' \Omega^{-1} X)^{-1} X' \Omega^{-1} Y$$

which is unbiased.

RIDGE REGRESSION

If assumption (iv) is not satisfied, ordinary least squares estimation procedures are inappropriate since the matrix $(X'X)$ cannot be inverted. Serious difficulties, however, are likely to be encountered when explanatory variables are highly (but not perfectly correlated). This very common situation is defined as multicollinearity.

The major consequences of multicollinearity are as follows:

i) The precision of estimation falls so that it becomes very difficult to disentangle the relative influences of the various X variable;

ii) Variables may be incorrectly dropped from the analysis because their coefficients are not significantly different from zero, but this may be a reflection of estimation difficulties rather than the lack of dependence;

iii) Estimates become very sensitive to particular sets of sample data;

iv) It is possible to have a high R^2 while 't' values suggest that no single coefficient is different from zero. ⁽¹⁾

The consequences of multicollinearity can be illustrated in the two variable case:

Consider the model

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + U_t$$

Rewriting in deviation form

$$Y_t = \beta_2 x_{2t} + \beta_3 x_{3t}$$

Suppose X variables are linearly related to each other by:

$$x_{3t} = \alpha x_{2t} + V_t \quad t = 1 \dots n$$

$$\text{and suppose } \sum x_{2t}^2 = \sum x_{3t}^2 = 1$$

$$\sum V_t = 0 \quad \sum V_t x_{2t} = 0$$

(1) Goldburger, Econometric Theory, (New York, John Wiley & Sons, 1964), p.193.

Then

$$(X'X) = \begin{bmatrix} \sum X_{2t}^2 & \sum X_{2t} X_{3t} \\ \sum X_{2t} X_{3t} & \sum X_{3t}^2 \end{bmatrix} = \begin{bmatrix} 1 & \alpha \\ \alpha & 1 \end{bmatrix}$$

Inverting

$$(X'X)^{-1} = \frac{1}{1-\alpha^2} \begin{bmatrix} 1 & -\alpha \\ -\alpha & 1 \end{bmatrix}$$

$$\text{and } \text{var}(\hat{\beta}) = \sigma_u^2 (X'X)^{-1} = \frac{\sigma_u^2}{1-\alpha^2} \begin{bmatrix} 1 & -\alpha \\ -\alpha & 1 \end{bmatrix}$$

$$\text{ie: } \text{var } \hat{\beta}_2 = \text{var } \hat{\beta}_3 = \frac{\sigma_u^2}{1-\alpha^2}$$

$$\text{Covariance } \beta_2 \beta_3 = \frac{-\alpha \sigma_u^2}{1-\alpha^2}$$

Clearly as α increases toward 1.0, $\text{var } \hat{\beta}$ will increase explosively. Correspondingly, estimated 't' values will fall.

Indications of Multicollinearity

- i) High correlations between X values;
- ii) High correlations between Y and X; but low 't' value
- iii) Changed of sign of $\hat{\beta}$. To illustrate this, consider the model

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2$$

Then it can be shown

$$\beta_1 = \frac{r_{X_1 Y} - r_{X_2 Y} r_{X_1 X_2}}{1 - r_{X_1 X_2}^2} \frac{S_Y}{S_X}$$

where $r_{X_1 Y}$ is the correlation between X_1 and Y, etc. and S_Y is the standard deviation of Y.

Now suppose Y, X_1 and X_2 are all positively correlated. Then β should also be positive. However, if

$r_{X_1 Y} < r_{X_2 Y} r_{X_1 X_2}$ then β , is negative. And this condition is quite likely if $r_{X_1 X_2}$ is large, i.e. if X_1 and X_2 are closely correlated. Ridge regression has been introduced as an attempt to deal with the problem of multicollinearity.

Ridge Regression (1)

Define the distance from $\hat{\beta}$ to $\beta \equiv L_1$

Then

$$\begin{aligned} L_1^2 &= (\hat{\beta} - \beta)' (\hat{\beta} - \beta) \\ E[L_1^2] &= \sigma^2 (X'X)^{-1} \end{aligned}$$

where $(X'X)$ is in correlation form.

If the eigen values of $X'X$ are denoted by

$$\lambda_{\max} = \lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p = \lambda_{\min} > 0$$

then the average squared distance from $\hat{\beta}$ to β is

$$E L_1^2 = \sigma^2 \sum_{i=1}^p (1/\lambda_i)$$

and variance under the assumption that errors are normally distributed is

$$\text{var } L_1^2 = 2 \sigma^4 \sum_{i=1}^p (1/\lambda_i)^2$$

$$\text{since } \sum_{i=1}^p (1/\lambda_i)^2 = \text{Trace } (X'X)^{-2}$$

Lower bounds for the average and variance are σ^2/λ_{\min} and $2\sigma^4/\lambda_{\min}^2$ respectively so that an $X'X$ matrix possessing one or more small eigen values will tend to a large L_1 .

To control this problem associated with the non-orthogonality of the $(X'X)$ matrix, the following estimate has been suggested:

$$\hat{\beta}^* = (X'X + kI)^{-1} X'Y \quad k \geq 0$$

Clearly this estimate will be biased for $k > 0$ but it can be shown that it is possible to obtain estimators with a reduced mean square error if k is correctly chosen.

- (1) A E Hoerl and R W Kennard, 'Ridge Regression: Biased Estimators of Non-Orthogonal Problems', Technometrics 12 (1970), pp. 55-67.

Defining

$$E L_1^2(k) = E (\hat{\beta}^* - \beta)' (\hat{\beta}^* - \beta)$$

this can be shown to be equal to the variance of the estimator plus the square of its bias

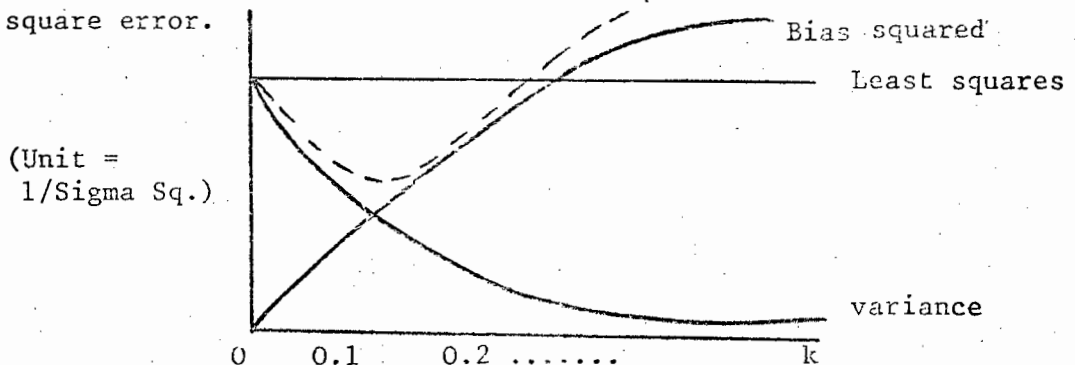
$$\begin{aligned} \hat{\beta} &= X'X (I_p + k (X'X)^{-1})^{-1} X'Y \\ &= (I_p + k(X'X)^{-1})^{-1} (X'X)^{-1} X'Y \\ &= Z\beta \text{ where } Z = (I_p + k(X'X)^{-1})^{-1} \end{aligned}$$

$$E [L_1^2(k)] =$$

$$\begin{aligned} E (\hat{\beta} - \beta)' (\hat{\beta} - \beta) &= E (\hat{\beta} - \beta)' Z'Z (\hat{\beta} - \beta) + (Z\beta - \beta)' (Z\beta - \beta) \\ &= \sigma^2 \text{Tr}(X'X)^{-1} Z'Z + \beta' (Z-I)' (Z-I) \beta \\ &= \sigma^2 \left[\text{Tr} (X'X + kI)^{-1} - k \text{Tr}(X'X + kI)^{-2} \right] + k^2 \beta' (X'X + kI)^{-2} \beta \\ &= \sigma^2 \sum \frac{\lambda_i}{(\lambda_i+k)^2} + k^2 \beta' (X'X + kI)^{-2} \beta \\ &= \gamma_1(k) + \gamma_2(k) \end{aligned}$$

The first term, $\gamma_1(k)$ can be shown to be the sum of the variances of the parameter estimates. The second term, $\gamma_2(k)$ is the squared distance from $Z\beta$ to β .

As k increases, total variance decreases while squared bias increases. It can be shown (by differentiating and taking limits) that it is possible for reasonably small k to trade off minimum variance in exchange for a small amount of bias and obtain a reduced mean square error.



APPENDIX 7

THE WELFARE TRIANGLE

$$\text{Area of } \Delta BCD = \frac{1}{2} (CD) (FE)$$

$$P_1 = OK \quad Q_1 = OF$$

$$T = \frac{JK}{OK} \quad \eta = \frac{FE}{KH} \cdot \frac{FB}{OF}$$

$$E = \frac{FE}{KJ} \cdot \frac{FB}{OF}$$

$$\begin{aligned} \text{Hence } & \frac{1}{2} P_1 Q_1 T^2 E (1 + E) \\ & = \frac{1}{2} \cdot OK \cdot OF \cdot \left(\frac{JK}{OK} \right)^2 \cdot \left(\frac{FE \cdot FB}{JK \cdot OF} \right) \cdot \left(\frac{KH + KJ}{KJ} \right) \end{aligned}$$

which reduces to

$$\begin{aligned} & \frac{1}{2} (CD) (FE) \\ & = \Delta BCD \end{aligned}$$

Q.E.D.

APPENDIX 8

THE NERLOVE MODEL

Following Nerlove (1) we consider the model

$$a_t = \alpha_0 + \alpha_1 P_t^* + u_t \quad \{1\}$$

so that area planted is linearly related to expected price in the same time period.

We specify the expectation function

$$P_t^* = P_{t-1}^* + \beta \{P_{t-1} - P_{t-1}^*\} \quad \{2\}$$

$$0 < \beta \leq 1$$

so that expected price at time t is last period expected normal price plus an adjustment factor depending on the difference between last year's observed and expected prices.

{2} can be rewritten as

$$P_t^* = \beta P_{t-1} + (1-\beta) P_{t-1}^*$$

a first order difference equation which can be solved to (2)

$$P_t^* = \sum_{\lambda=0}^t \beta(1-\beta)^{\lambda-1} P_{t-\lambda}$$

(1) M Nerlove, The Dynamics of Supply, (John Hopkins, 1958), Ch.8.

(2) M Nerlove, op. cit., pp.54-55.

so that expected price can be expressed as a weighted function of past (observed) prices.

Substituting into {1} we get

$$a_t = \alpha_0 + \alpha_1 \left\{ \sum_{\lambda=0}^t \beta(1-\beta)^{\lambda-1} P_{t-\lambda} \right\} + u_t$$

Lagging one period, multiplying through by $(1-\beta)$ and subtracting, we obtain

$$a_t = \alpha_0 \beta + \alpha_1 \beta P_{t-1} + (1-\beta) a_{t-1} + u_t - (1-\beta) u_{t-1}$$

which can readily be estimated by linear regression.

1958/59-60 100

FIG.1

Producers' Price Index

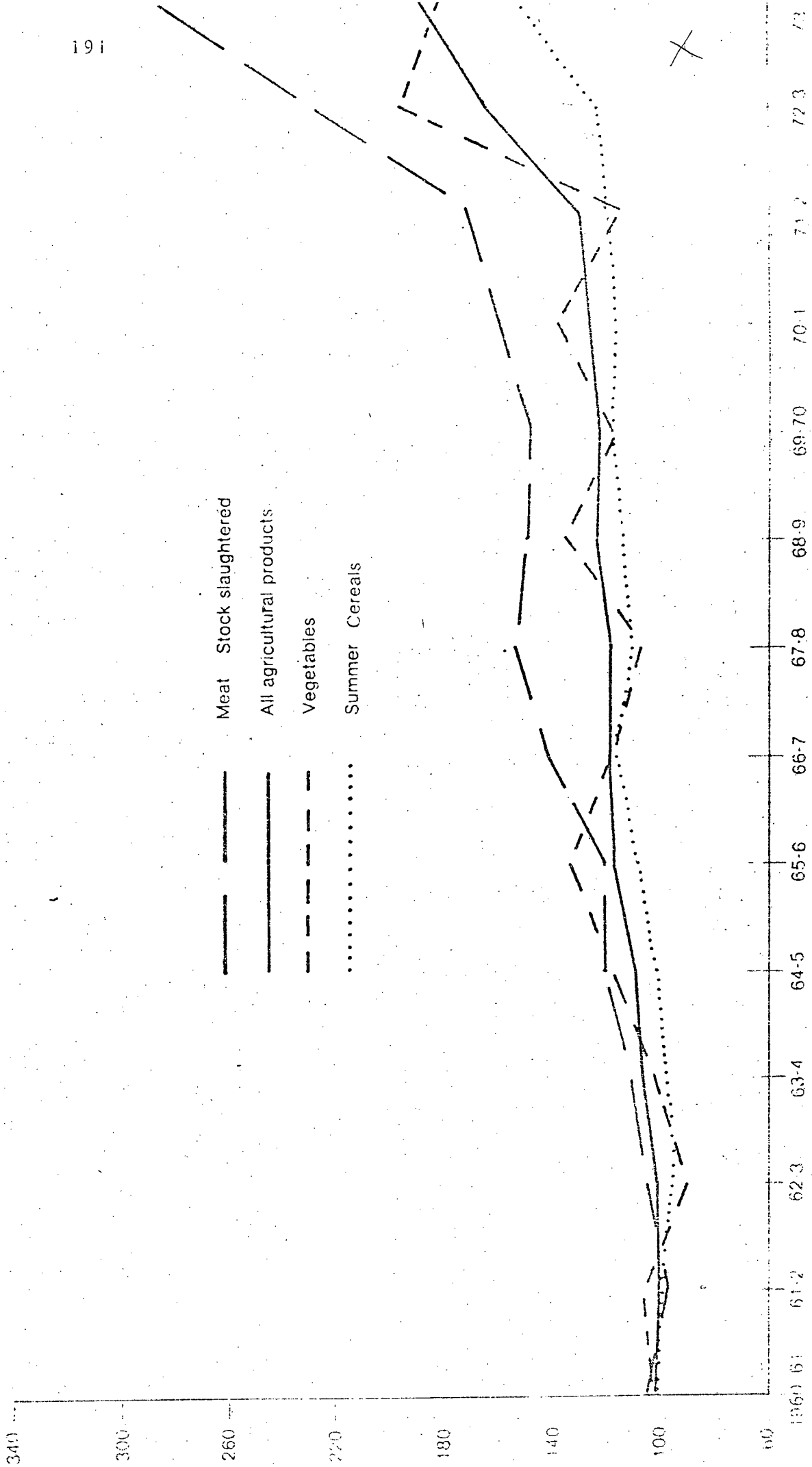
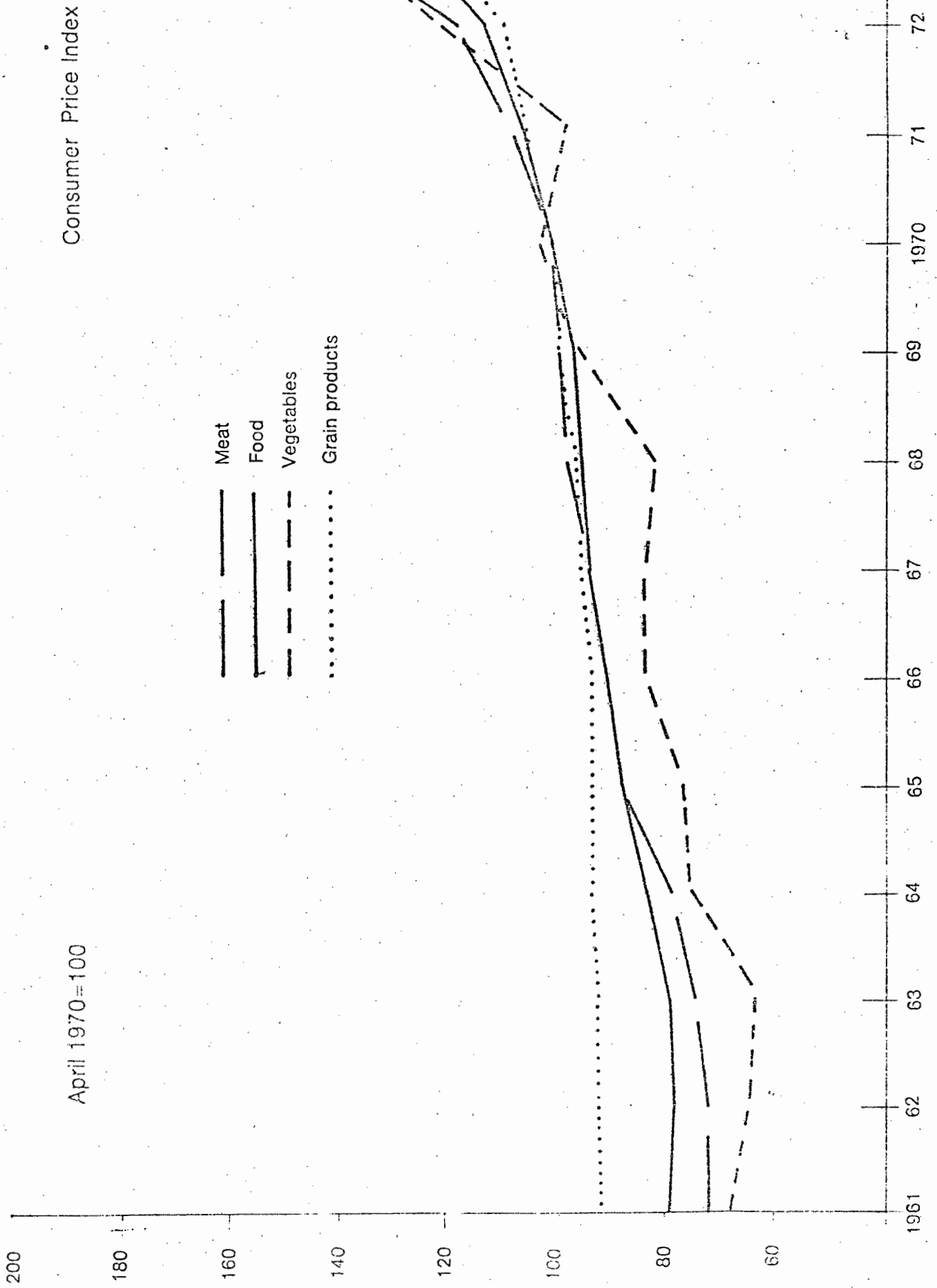
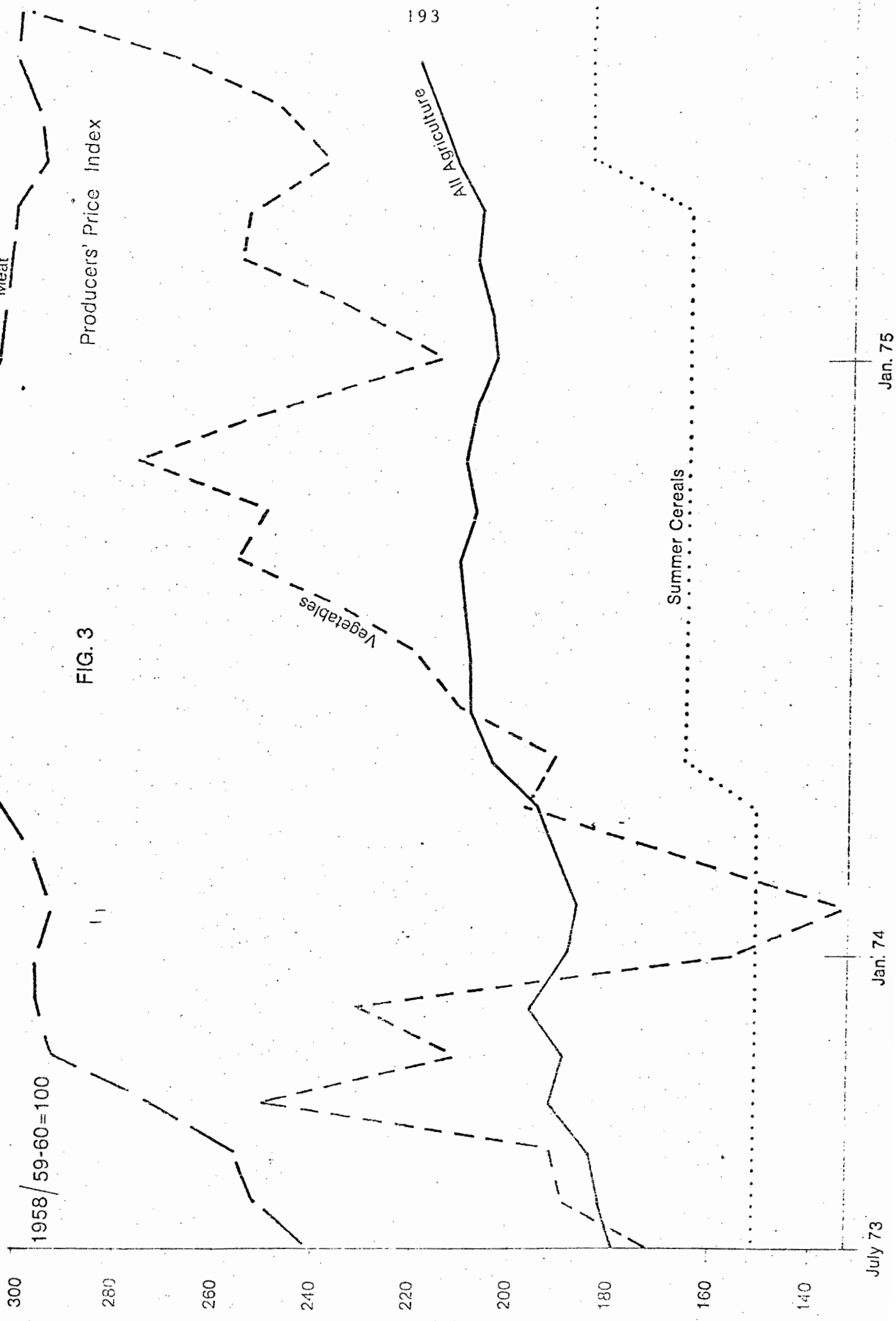


FIG. 2





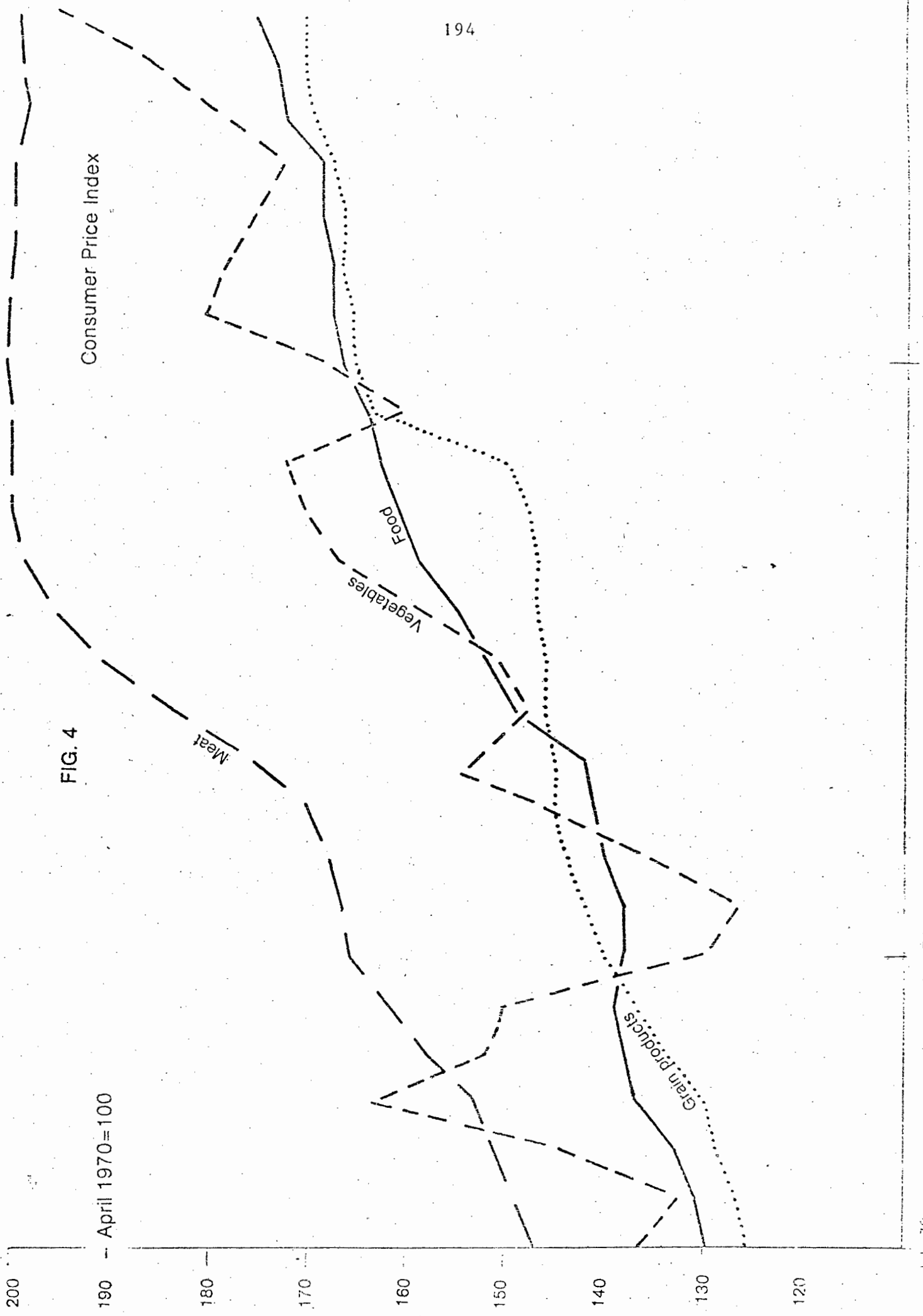


FIG. 4

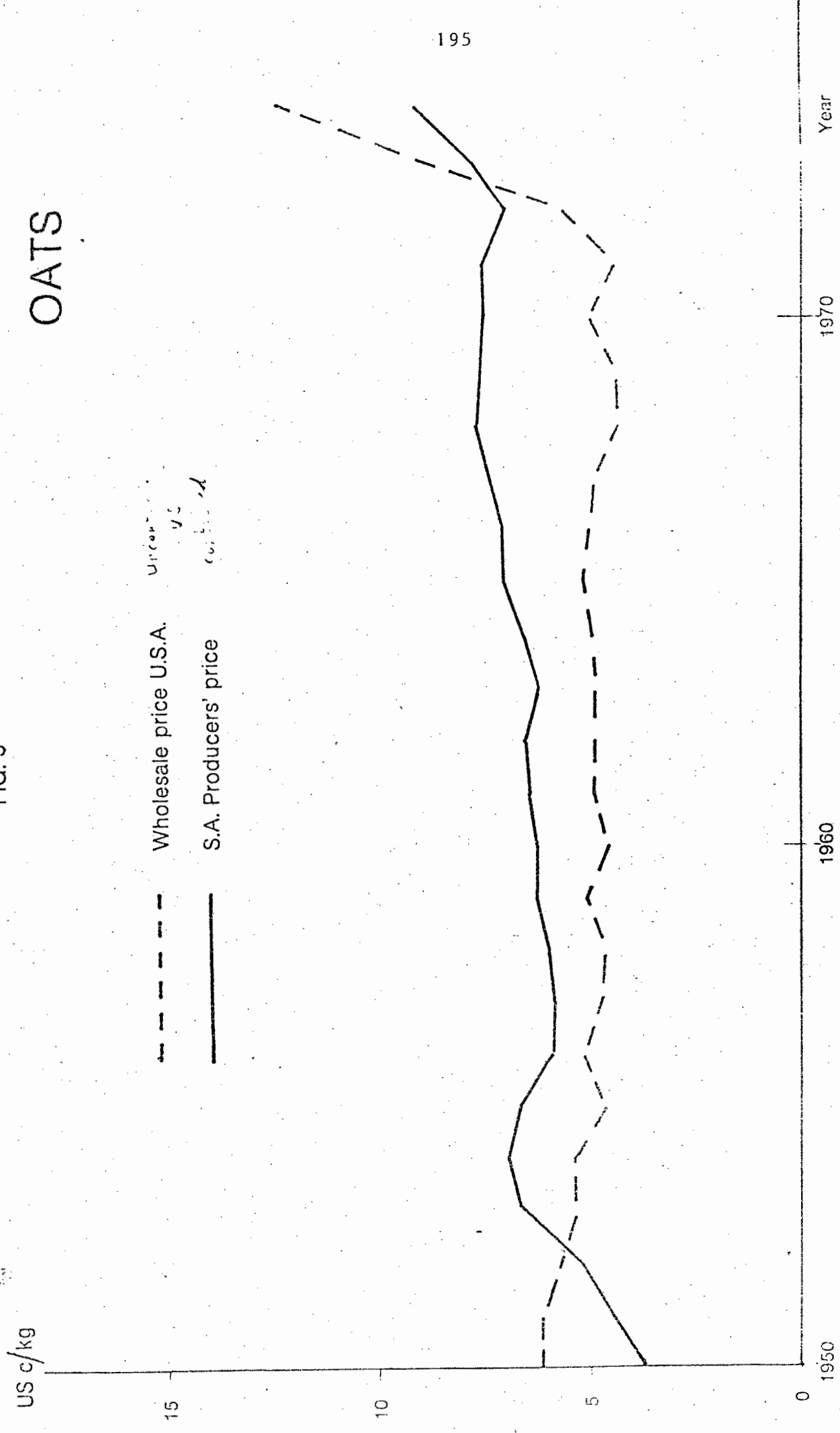
Consumer Price Index

April 1970=100

July 71 Jan 72 Jan 73 Jan 74 Jan 75

OATS

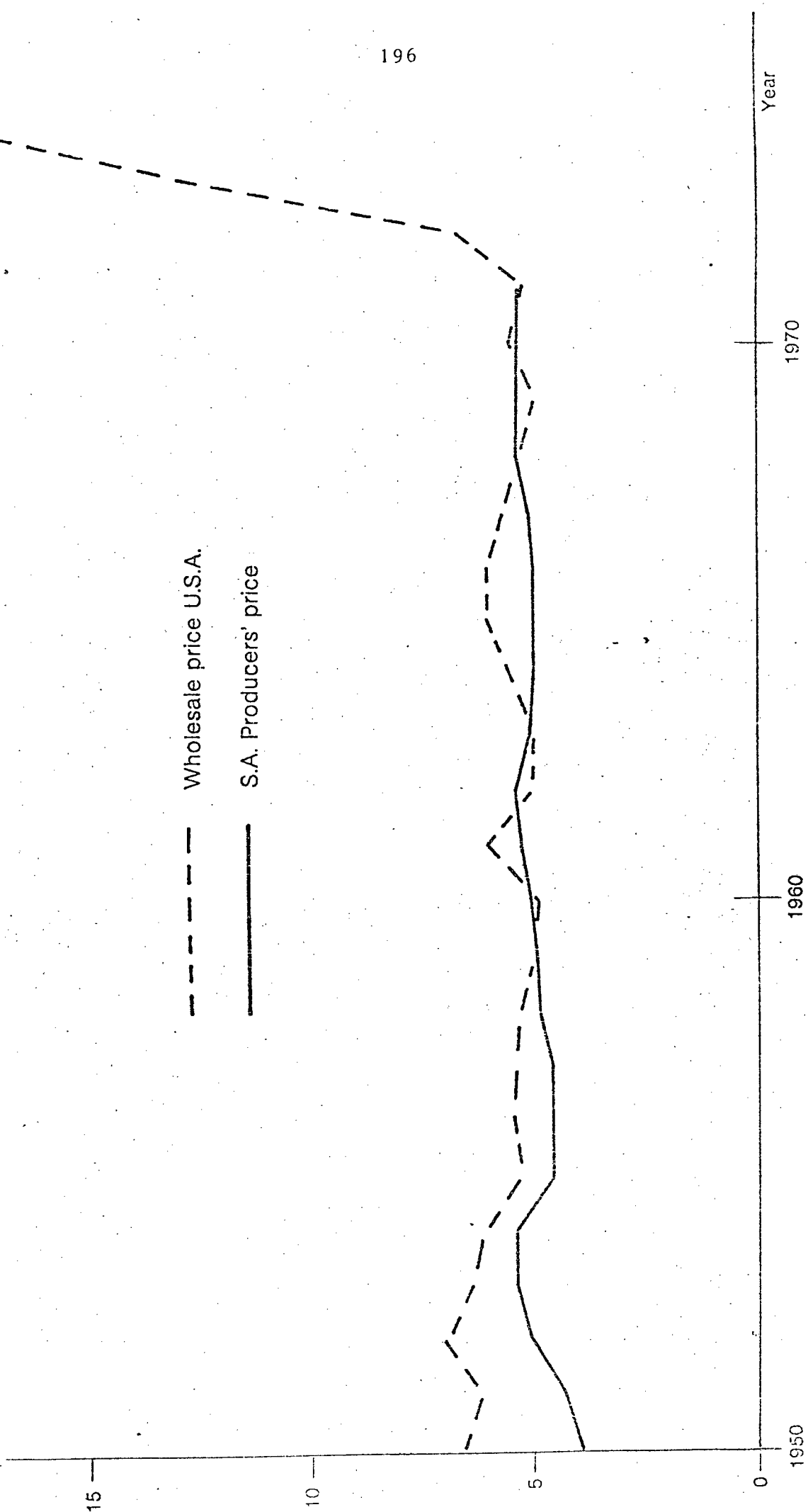
FIG. 5



BARLEY

FIG. 6

U.S. c/kg



Year

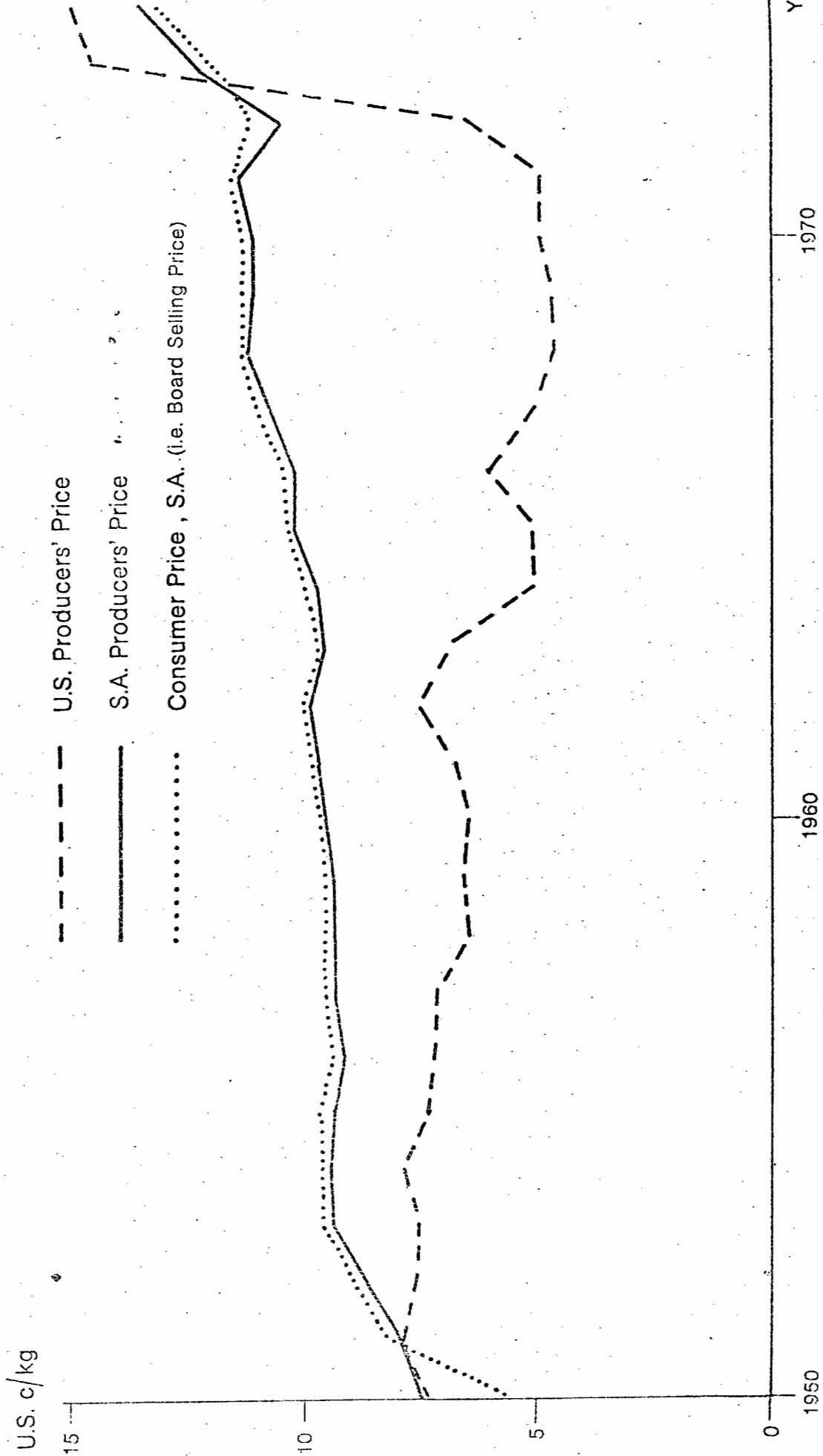
1970

1960

1950

WHEAT

FIG. 6a



U.S. c/kg

FIG. 7

MAIZE

- Wholesale Price U.S.A.
- S.A. Producers' Price
- S.A. Maize Board Selling Price

15

10

5

0

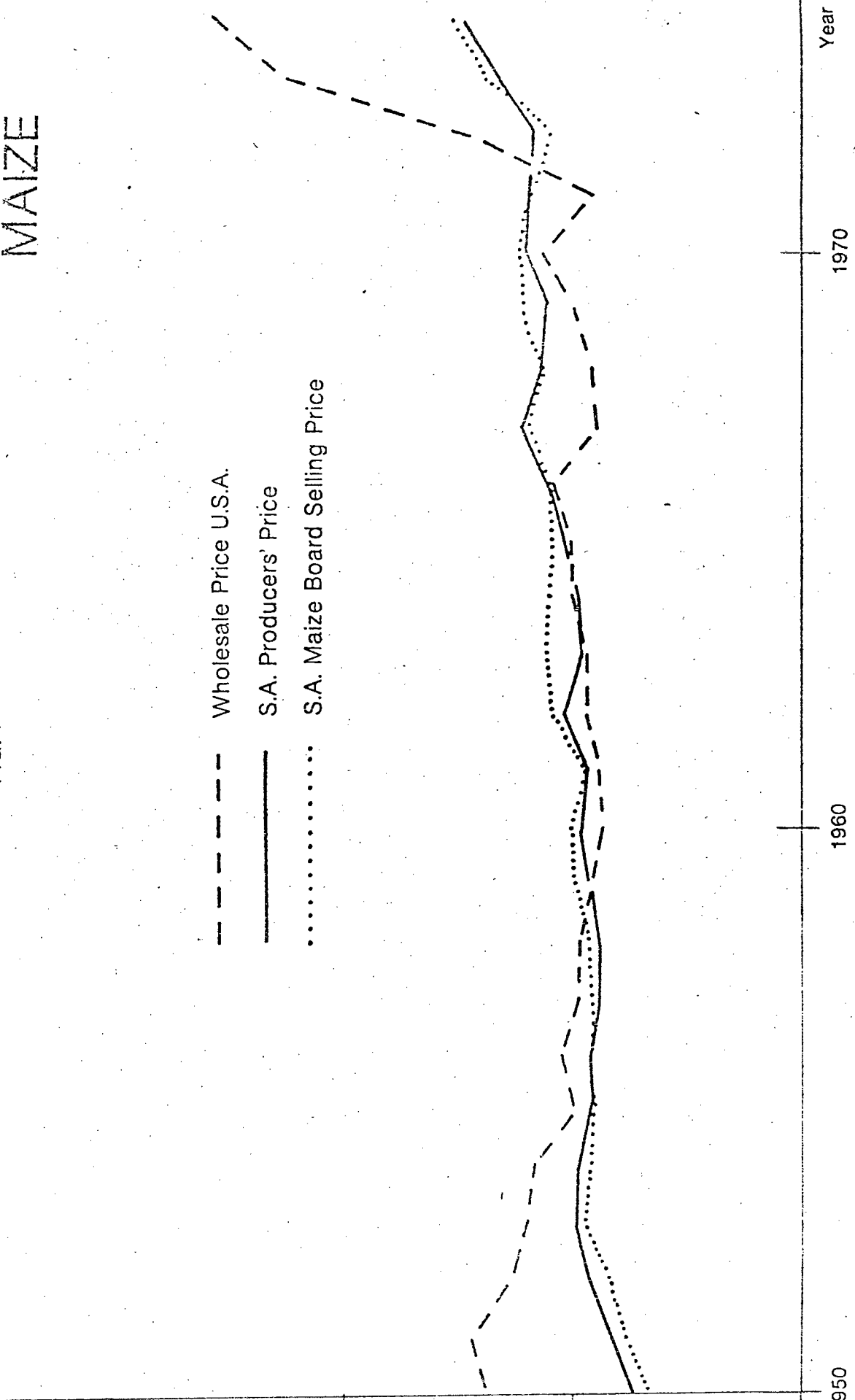
1950

1960

1970

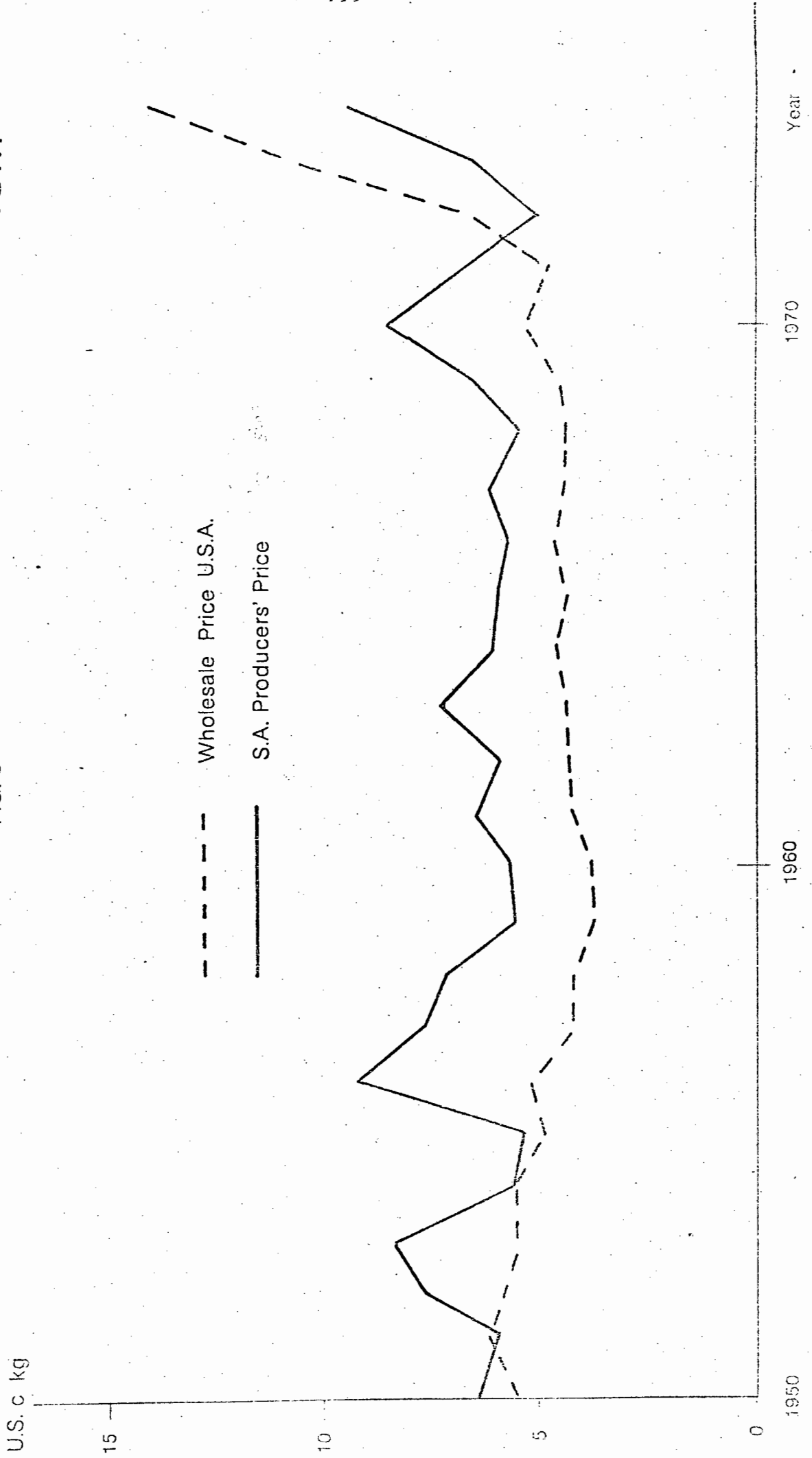
Year

198



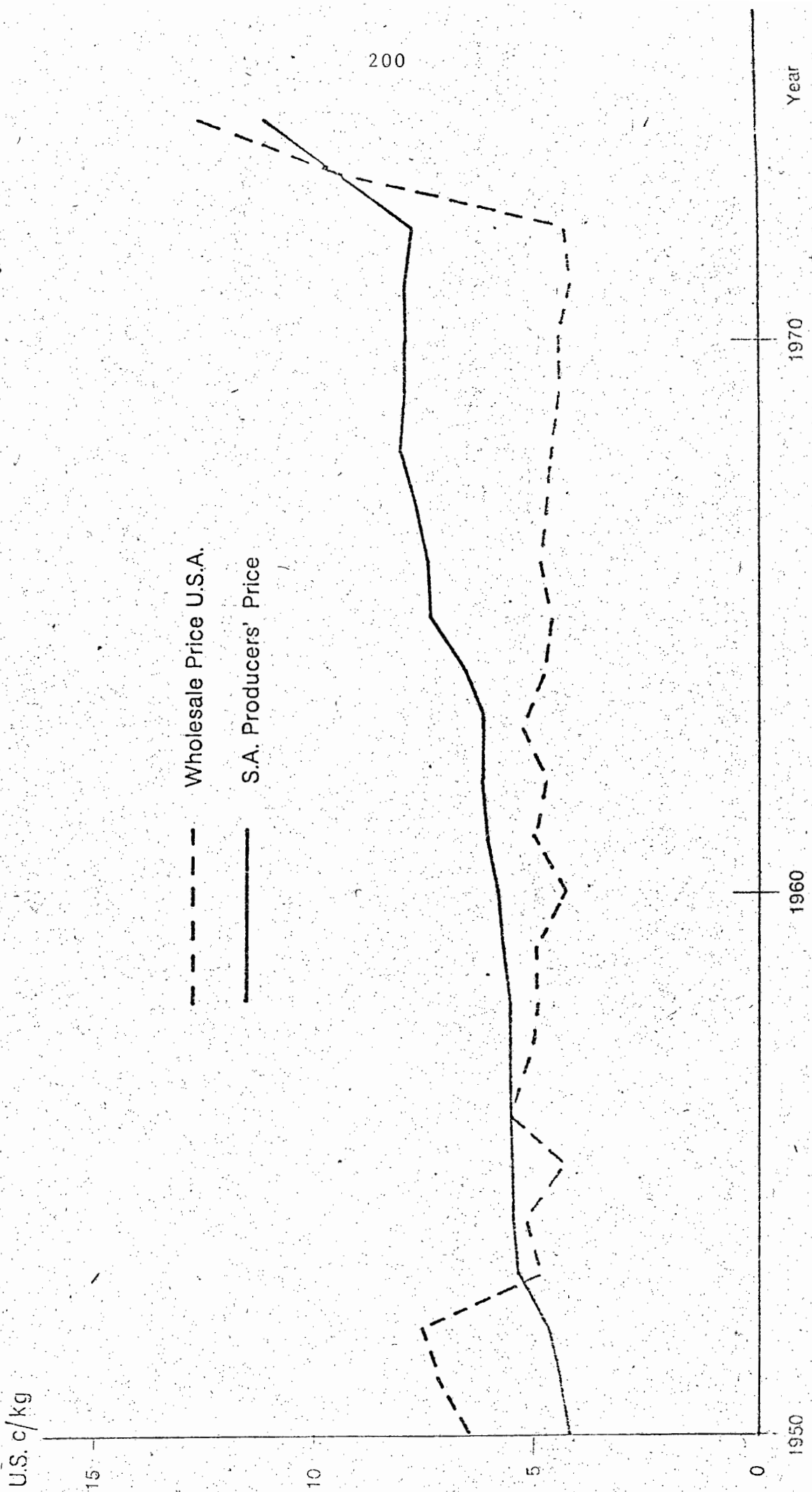
GRAIN SORGHUM

FIG. 8



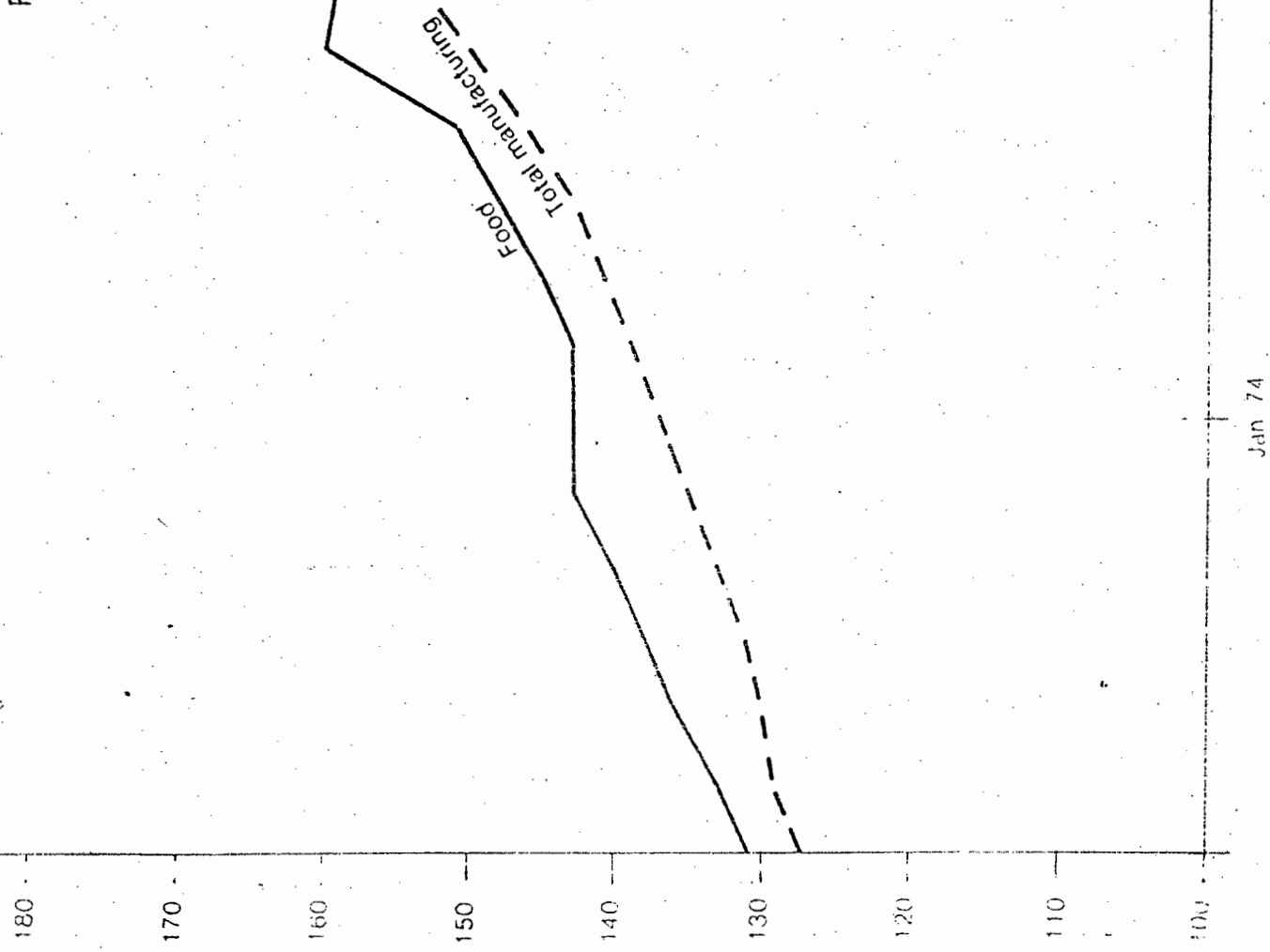
RYE

FIG. 9



Wholesale Price Index
Output Of S.A. Industry Groups

FIG. 10



Jan 74

Jan 75

April 1970=100

180
170
160
150
140
130
120
110
100

April 1970=100

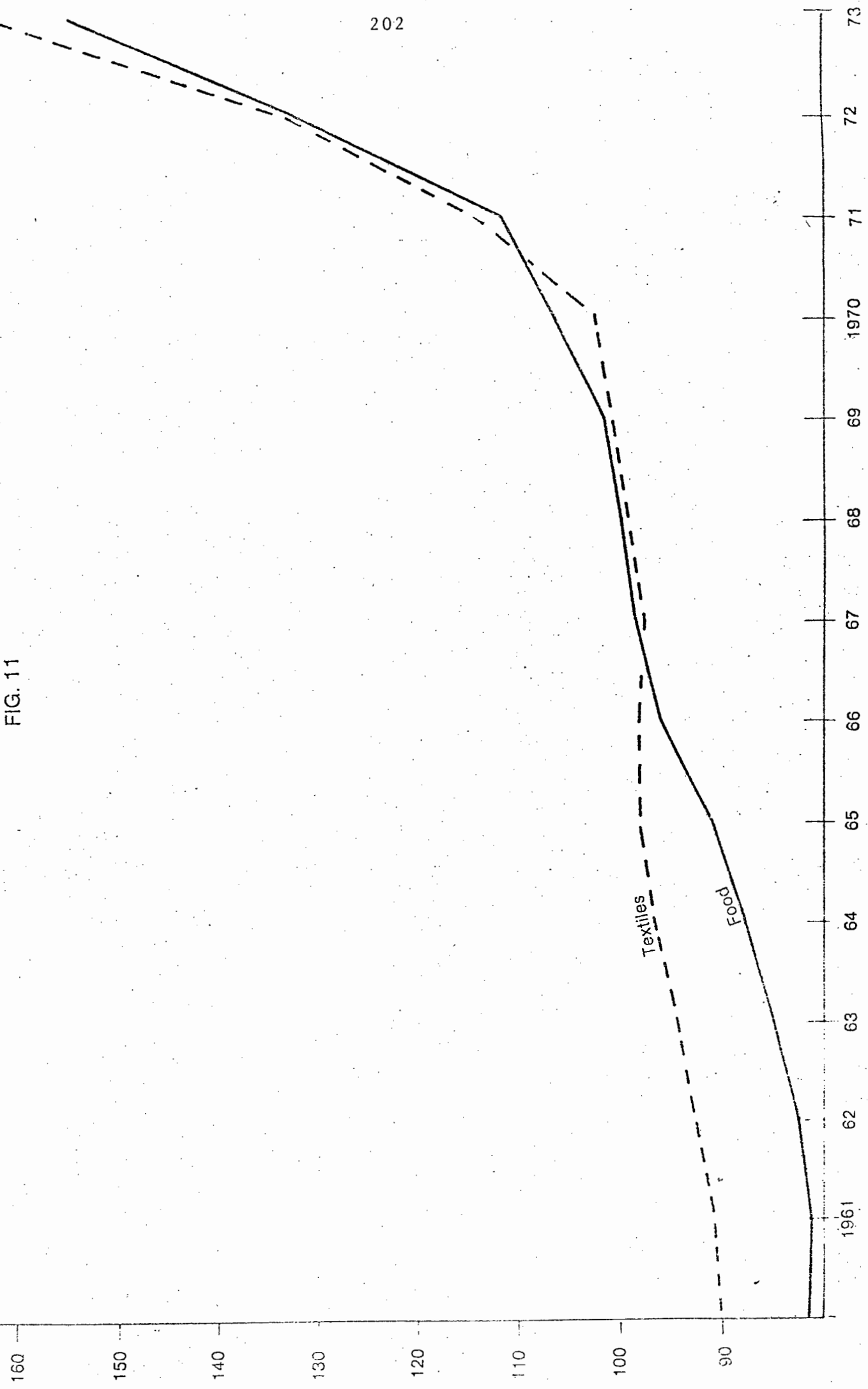
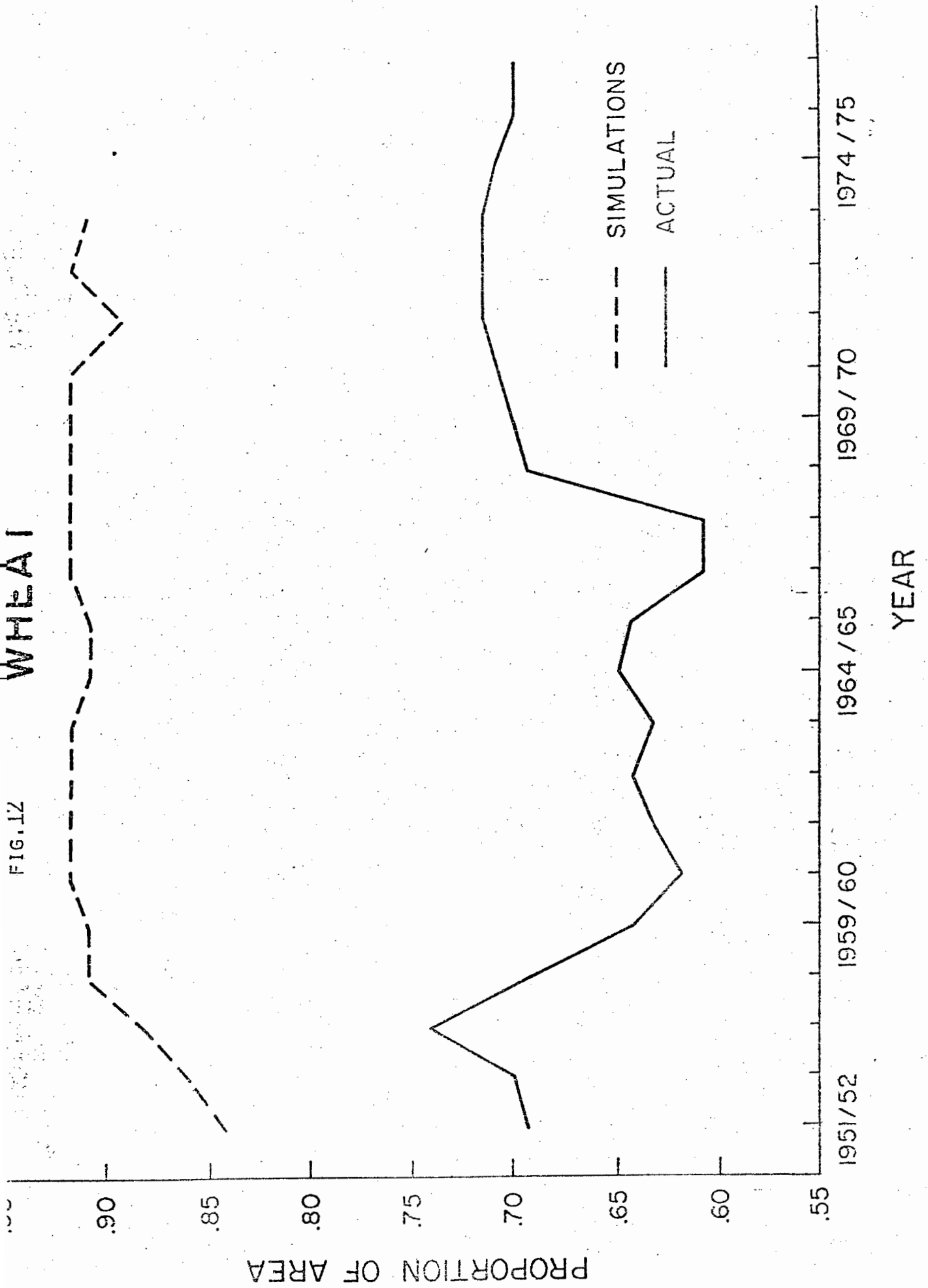
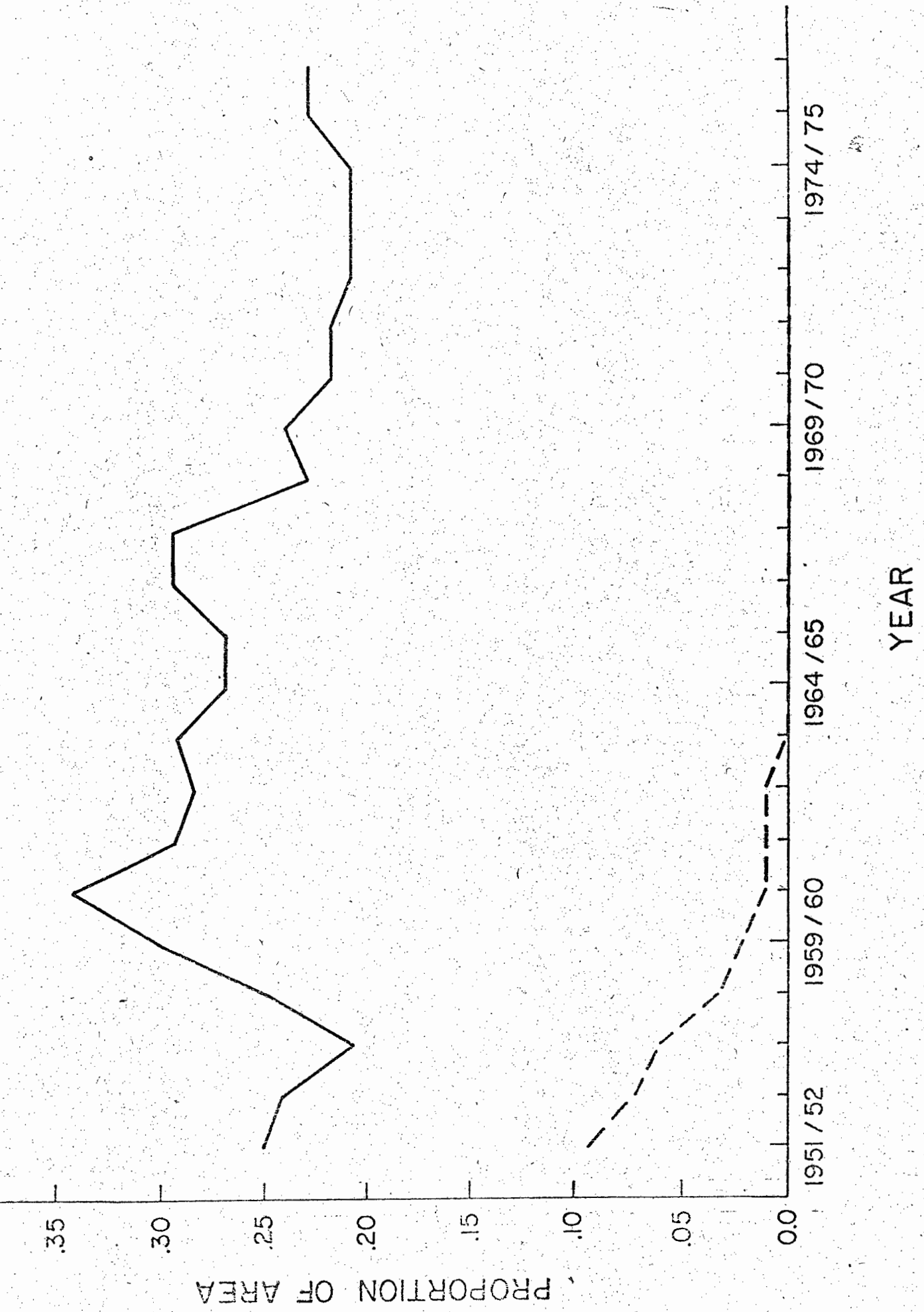


FIG. 11

WHEAT

FIG. 12





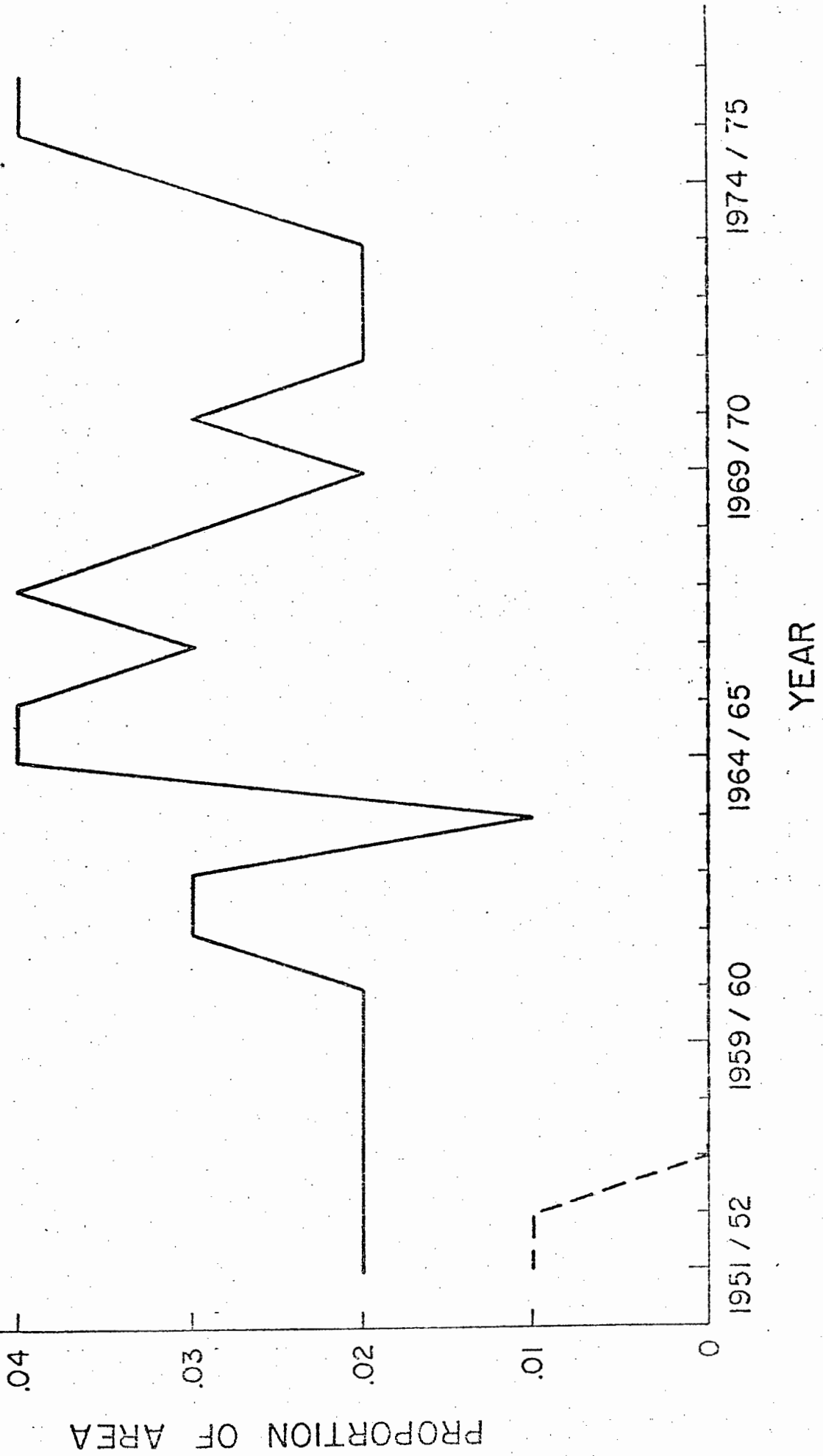
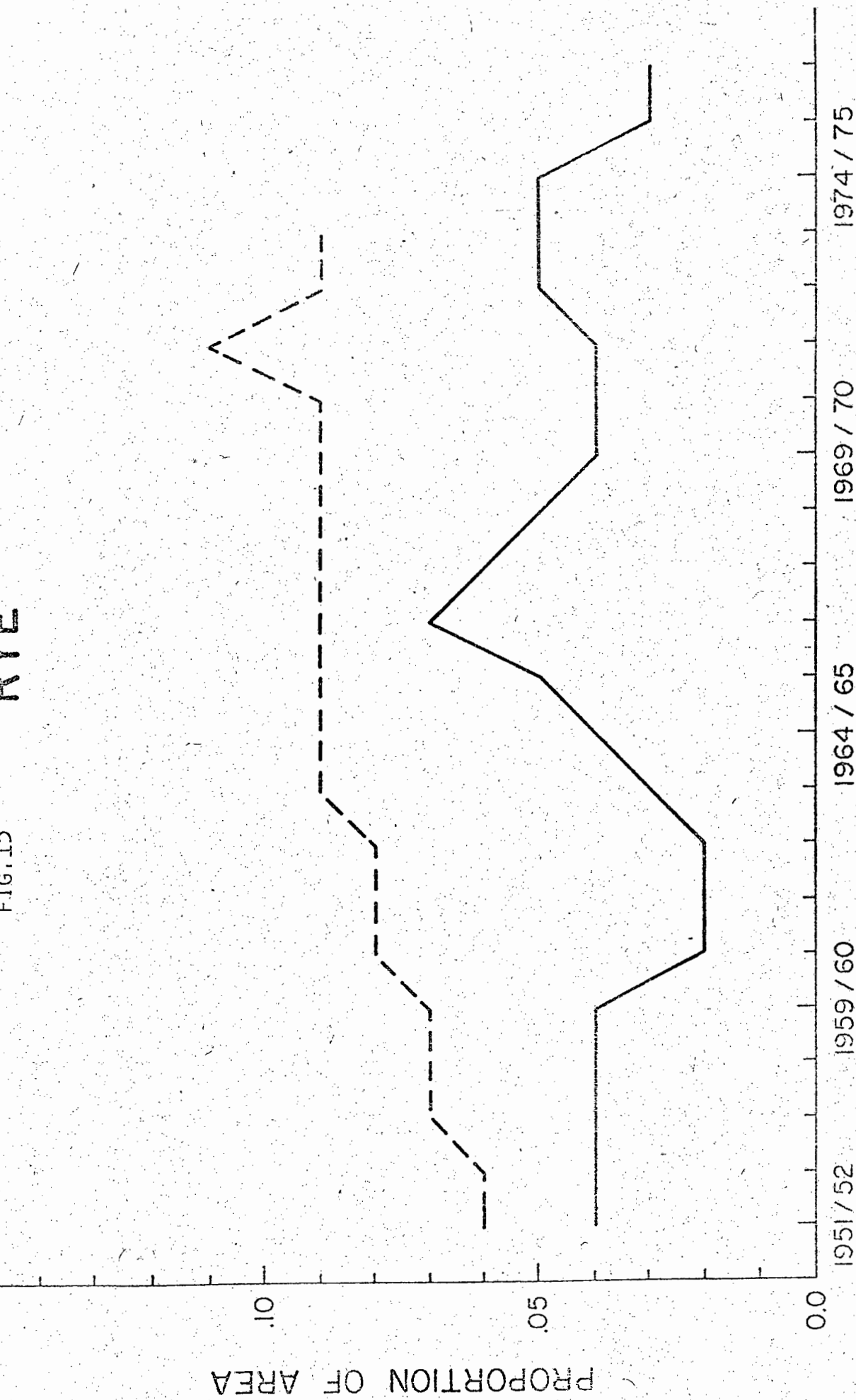


FIG. 13
RATE



YEAR

BIBLIOGRAPHY

- Akerman G 'The Cobweb Theorem: A Reconsideration,' QJE 71 (1957).
- Anderson G H 'Income Stabilisation for Primary Producers: An Empirical Evaluation of the Bauer-Paish Proposal,' SAJE 38 (1970).
- Ardendorf J Ekonomiese Neigings, die Produksie, Verbruik en Pryse van Vleis in die Unie van Suid-Afrika (D.Comm. thesis, University of Pretoria, 1958).
- Ardington T 'Factors Affecting Wages and Employment in Sugar Farming,' in Farm Labour in South Africa, ed. Francis Wilson, Alide Kooy and Delia Hendrie (Cape Town: David Philip, 1977).
- Barker R 'The Response of Production to a Change in Rice Price,' Phillippine Economic Journal 5(2), (1966).
- Bauer P T and Paish F W 'The Reduction of Fluctuations in the Incomes of Primary Producers,' EJ 62 (1952).
- Behrman J L Supply Response in Underdeveloped Agriculture: A Case Study of Four Major Crops in Thailand, 1937-62 (Amsterdam, 1968).
- Blandford D and Currie J M 'Price Uncertainty - the Case for Government Intervention,' J of Agric. Econ. 26 (1975).
- Boulding K E Economic Analysis Vol. I 4th ed. (New York: Harper and Row, 1955).
- Brits R N 'The Marketing of South African Maize,' SAJE 37 (1969).
- Brown C P Primary Commodity Control (OUP, 1975).
- Buchanan J M and Tullock G 'The "Dead Hand" of Monopoly,' Antitrust Law and Economic Review 1(4) (1968).

- Buchanan J M 'The Coase Theorem and the Theory of the State,' Natural Resource Journal 13 (1973).
- Buchanan N S 'A Reconsideration of the Cobweb Theorem,' JPE 47 (1939).
- Caine S 'Instability of Producer Incomes: A Protest and a Proposal,' EJ 64 (1954).
- Caves R E 'Direct Regulation and Market Performance in the American Economy,' AER 54 (1964).
- Chant J F and Acheson K 'The Choice of Monetary Instruments and the Theory of Bureaucracy,' Public Choice 12 (Spring 1972).
- Coase R H 'The Problem of Social Cost,' Journal of Law and Economics 3 (1960).
- Cochran W W 'Concetualising the Supply Relation in Agriculture,' AJAE 57 (1955).
- Corden W M Trade Policy and Economic Welfare (Oxford: Clarendon Press, 1974).
- Cramton R C 'The Effectiveness of Regulation - A Legal View,' AER 54 (1964).
- Day R H 'Recursive Programming and Supply Production,' in Readings in the Economics of Agriculture ed. by Karl A Fox and Gale D Johnson (London: Allen & Unwin, 1970).
- Dean G W and Heady E O 'Changes in Supply Response and Elasticity for Hogs,' JFE 40 (1958).
- Devletoglou E A 'Correct Public Prediction and the Stability of Equilibrium,' JPE 69 (1961).
- Du Toit C M 'Agricultural Marketing Management under the Control Board System,' Agrekon 11 (1975).

- Downs A An Economic Theory of Democracy (New York: Harper and Row, 1957).
- Ezekeil M 'The Cobweb Theorem,' QJE 52 (1938).
- Fisher I The Making of Index Numbers (London, 1927).
- Floyd J F 'The Effect of Farm Price Supports on the Returns to Land and Labour in Agriculture,' JFE 173 (1965).
- Friedman M 'A Reduction of Fluctuations in the Incomes of Primary Producers: A Critical Comment,' EJ 64 (1954).
- Galbraith J K A Theory of Price Control (Harvard University Press, 1952).
- Griliches Z 'Estimates of the Aggregate United States Supply Function,' JFE 42 (1960).
- Grunberg E and Modigliani F 'The Predictability of Social Events,' JPE 62 (1954).
- Hallett G The Economics of Agricultural Policy (Oxford, 1971).
- Hazell P B L and Scandizzo P L 'Market Intervention Policies when Production is Risky,' AJAE 57(4) (1975).
- Heady E O et al. (eds) Agricultural Supply Functions (Ames, Iowa, 1961).
- Heady E O and Kaldor D R 'Expectations and Errors in Forecasting Agricultural Prices,' JPE 62 (1954).
- Hicks J Value and Capital (Oxford: Clarendon Press, 1939).
- Hoerl A E & Kennard R W 'Ridge Regression: Biased Estimation of Non-Orthogonal Problems,' Technometrics 12 (1970).

- Hooten J 'Risk and the Cobweb,' EJ 60 (1950).
- Horwitz R Political Economy of South Africa (London: Weidenfeld and Nicholson, 1967).
- Houthakker H S 'The Scope and Limits of Futures Trading,' in M Abramovitz et al. (eds), The Allocation of Economic Resources (Stanford University Press, 1959).
- Howarth R W 'Market Pricing in Agriculture,' in Essays in the Theory and Practice of Pricing, Institute of Economic Affairs.
- Johnson G D World Agriculture in Disarray (St Martin, 1973).
- Johnson G D 'The Nature of the Supply Function for Agricultural Products,' AER 140 (1950).
- Johnson H G 'The Destabilising Effect of International Commodity Agreements on the Price of Primary Products,' EJ 60 (1950).
- Johnstone J Econometric Methods, 2nd ed. (New York: McGraw Hill, 1960).
- Just R E et al. 'The Distribution of Welfare Gains from International Price Stabilisation under Distortions,' AJAE 59 (1977).
- Kaldor N 'A Classificatory Note on the Determinateness of Equilibrium,' Review of Economic Studies 1 (1933/34).
- Kemp M C 'Economic Forecasting when the Subject of the Forecast is Influenced by the Forecast,' AER 52 (1962).
- Lachman D 'Commodity Prices and Equilibrium,' Review of Economic Studies 3 (1935/36).
- Law A D International Commodity Agreements (Lexington: D C Heath, 1975).

- Leontief W 'Verzorgte Angebotsanpassung und Partielles Gleichgewicht,' Zeitschrift für Nationalökonomie, December 1934.
- Leslie R et al. 'Economists' Protest: Marketing Act 1937, Scheme Relating to the Marketing of Wheat,' SAJE 6 (1938).
- Leslie R et al. 'Economists' Protest: Dairy Produce and Maize Marketing Schemes: Memorandum of Objections,' SAJE 6 (1938).
- Lipton M 'White Farming in South Africa,' Journal of Commonwealth and Comparative Politics XII (I) (1974).
- Lipton M 'South Africa: Two Agricultures?' in Francis Wilson, Alide Kooy and Delia Hendrie (eds) Farm Labour in South Africa (Cape Town: David Philip, 1977).
- McBean A I Export Instability and Economic Development (Allen & Unwin, 1966).
- McKie J W 'Regulation and the Free Market: The Problem of Social Cost,' Bell Journal of Economics and Management Science 1(1) (Spring 1970).
- Moore H L Forecasting the Yield and the Price of Cotton (New York: MacMillan, 1917).
- Nattrass J 'Migration Flows in and out of Capitalist Agriculture,' in Francis Wilson, Alide Kooy and Delia Hendrie (eds) Farm Labour in South Africa (Cape Town: David Philip, 1977).
- Nerlove M The Dynamics of Supply: Estimation of Farmers' Response to Price (Baltimore, 1958).
- Nerlove M 'Adaptive Expectations and Cobweb Phenomena,' QJE 72 (1958).
- Nieuwoudt W L 'Die Aanbodelastisiteit van die Suid-Afrikaanse Landbou,' SAJE 40 (1972).

- Nieuwoudt W L 'Risk and Uncertainty in Agriculture,' Agrekon 11(2) (1972).
- Nieuwoudt W L 'Factor Subsidies and Certain Policy Implications,' Agrekon 11(3) (1972).
- Noll R G Reforming Regulation: Studies in the Regulation of Economic Activity, The Bookings Institution (1971).
- Nourse E G 'Economic Philosophy of Co-operation,' AER 12 (1922).
- Paarlberg D 'Contributions to the New Frontier to Agricultural Reform,' JFE 44(5) (1962).
- Posner R A 'Taxation by Regulation,' Bell Journal of Economics and Management Science 2 (Spring 1971).
- Prest A R How Much Subsidy? Institute of Economic Affairs, Occasional Papers.
- Ricci U 'Die Synthetische Ökonomie von Henry Ludwell Moore,' Zeitschrift für Nationalökonomie, April 1930.
- Richards C S 'Planning and Control in Agriculture: A Rejoinder,' SAJE 6 (1938).
- Richards C S 'Tariffs, Quotas and the Excess Cost of Agriculture in South Africa,' SAJE 3 (1935).
- Richards C S 'The "New Despotism" in Agriculture,' SAJE 4 (1936).
- Robbins L The Great Depression (London: MacMillan, 1934).
- Roberts P C Marx's Theory of Exchange, Alienation and Crisis (Hoover Institution Press, Stanford, 1973).

- Robertson D H A Study of Industrial Fluctuations (London School of Economics, 1915).
- Robinson K L 'Unstable Farm Prices: Economic Consequences and Policy Options,' AJAE 57 (1975).
- Rothschild K W 'Cobweb Cycles and Partially Correct Forecasting,' JPE 72 (1964).
- Russell M and Shelton R B 'A Model of Regulatory Agency Behaviour,' Public Choice 20 (Summer 1968).
- Samuels L H 'Aspects of Controlled Marketing in the Union,' SAJE 15 (1947).
- Sapiro A An Analysis of Marketing, Fundamental Principles of Co-operation. Reprinted in F V Waugh, Readings in Agricultural Marketing (Ames, Iowa State College Press, 1954).
- Schmidt D S 'Ko-operasiewese,' Department of Agricultural Economics and Marketing. 'Die Staat se Bydrae tot Landbou-ekonomiese Dienste en Navorsing in Suid-Afrika 1925 - 75,' Symposium held in Pretoria 17 October 1975.
- Shepherd G S Agricultural Price Analysis (Ames, Iowa, 1957), 4th ed.
- Shoup C S Public Finance (Chicago: Aldine, 1969).
- Smythe D J 'Effect of Public Price Forecasts on Market Price Variation: A Stochastic Cobweb Example,' AJAE 55 (1973).
- Sowell T Say's Law (Princeton University Press, 1972).
- Stigler G J The Theory of Price (New York: MacMillan, 1952).
- Stigler G J 'The Economics of Information,' JPE 69 (1961).

- Stigler G J and
Friedland C 'What can Regulators Regulate? The Case of
Electricity,' Journal of Law and Economics
5 (1962).
- Stigler G J 'The Theory of Economic Regulation,' Bell
Journal of Economics and Management Science
2(1) (Spring 1971).
- Swerling B C 'Income Protection for Farmers: A Possible
Approach,' JPE 67 (1959).
- Telser L 'Futures Trading and the Storage of Cotton
and Wheat,' JPE 66 (1958).
- Terreblanche S J 'Policy Objectives and Priorities in the South
African Economy,' in Public Policy and the
South African Economy, ed. by M L Truu,
(Cape Town: OUP, 1976).
- Tinbergen J 'Bestimmung und Deutung von Angebotscurven:
Ein Biespiel,' Zeitschrift für National-
ökonomie, April 1930.
- Tullock G The Vote Motive, Institute of Economic Affairs,
Occasional Papers.
- Tullock G 'Regulating the Regulators,' in Government
Controls and the Free Market, ed. by
S Pejovich (Texas A&M University Press, 1976).
- Turnovsky S J 'Price Expectations and the Welfare Gains
from Price Stabilisation,' AJAE 56 (1974).
- Van Biljon F J 'Controlled Agricultural Maketing,' Agrekon
13 (1974).
- Van der Merwe C Agricultural Policy in Economic Policy in
South Africa, ed. by J A Lombard (Cape Town:
Haum, 1972).
- Van Waasdijk T 'Agricultural Prices and Price Policy,' SAJE
22 (1954).

- Wallace T D 'Measures of Social Cost of Agricultural Programs,' JFE 44 (1962).
- Waugh F V 'Cobweb Models,' JFE 46 (1964).
- Waugh F V 'Does the Consumer Benefit from Price Instability?' QJE 58 (1944).
- Westfield F M 'Regulation and Conspiracy,' AER 55 (1965).
- Wilson F Farming 1866-1966 in The Oxford History of South Africa, ed. by Monica Wilson and Leonard Thompson (Oxford: Clarendon Press, 1971), Ch.3.
- Wilson J Q 'The "Dead Hand" of Regulation,' The Public Interest 33 (Fall 1971).
- Wold H & L Jureen Demand Analysis (New York: John Wiley & Sons, 1953).
- Wolgin J M 'Resource Allocation and Risk: A Case Study of Smallholder Agriculture in Kenya,' AJAE 57 (1975).

OFFICIAL PUBLICATIONS

SOUTH AFRICA

- 1 Report of the Commission to Enquire into the Advisability of Reorganising the Existing Agricultural Department, G2/1905.
- 2 Interim Report of the Drought Investigation Commission, UG20/1922.
- 3 Report by Chas. W H Kohler to the Government Liquor Commission, 1931.
- 4 Report of the Commission of Enquiry into Co-operation and Agricultural Credit, UG16/1934.
- 5 W J Pretorius, An Economic Study of the Wheat Industry in the Union, Department of Agriculture and Forestry, Bulletin No. 141, 1935.
- 6 Annual Report of the Marketing Council, UG26/1939.
- 7 Third Interim Report of the Industrial and Agricultural Requirements Commission, UG40/1941.
- 8 Reconstruction of Agriculture 1944-45. Report of the Committee of the Department of Agriculture and Forestry, 1943.
- 9 Social and Economic Planning Council, 'The Future of Farming in South Africa,' UG10/1945.
- 10 Report of the Commission on the Distribution of Food, UG31/1946.
- 11 Report of the National Marketing Council on the Marketing Boards 1938-1946, UG27/1947.
- 12 Report of the Committee of Enquiry into Distribution Costs, UG28/1947.

- 13 Report of the Commission of Enquiry into European Occupancy of the Rural Areas, 1959.
- 14 Report of the Commission of Enquiry into Co-operative Affairs, RP78/1967.
- 15 Second Report of the Commission of Enquiry into Agriculture, RP84/1970.
- 16 Report of the Commission of Enquiry into Agriculture. Third (Final) Report, RP19/1972.
- 17 South African Department of Statistics, Agricultural Census No. 46, Report No. 06-01-10, 1972-3.
- 18 Report of the Commission of Enquiry into the Marketing Act (Act No. 59 of 1968), RP39/1976).

FOREIGN

- 1 United Nations Food and Agricultural Organisation, Monthly Bulletin of Agricultural Economics and Statistics (various issues).
- 2 New Zealand Wool Board and New Zealand Wool Commission. First Report of the Wool Marketing Study Group. Wellington, 1967.
- 3 International Monetary Fund and International Bank for Reconstruction and Development. Joint Staff Study on Price Stabilisation, 1969.