THE UNITED KINGDOM GRAINS AGREEMENT (1964): AN ECONOMIC ANALYSIS

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ABSTRACT

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by Timothy E. Josling

The United Kingdom has, for many years, supported the income of its domestic cereal producers by announcing a guaranteed price and paying a deficiency payment representing the difference between this price and the domestic market price. In times of low market price and high domestic output, the deficiency payment bill was large. Mainly as an attempt to stabilize these "open-ended" subsidies, the United Kingdom has sought to enter into agreements with foreign suppliers of these products to establish minimum import prices whilst at the same time undertaking to limit payments to domestic producers. Such an agreement was signed in 1964 between the United Kingdom and its four major suppliers of cereal--Argentina, Australia, Canada, and the United States.

This study analyses the effects of these bilateral treaties--referred to collectively as the United Kingdom Grains

Agreement--on the cereal producer in the United Kingdom, and on users of grain such as millers, feed-compounders, and livestock producers. It quantifies the impact of the minimum import price and standard quantity provisions of the Agreement on budget cost and on outpayments of foreign exchange. The study also estimates the real resource cost of the program.

The method used is to develop a Marshallian partial-equilibrium model accounting for domestic supply, demand, and imports of grain. The policy constraints of a guaranteed domestic price and a minimum import price are added to the model, and expressions for budget cost, foreign exchange saving, economic (resource) cost, cost to grain users, and income transfer to grain producers are derived. From these expressions are obtained average costs (ratio of costs to benefits) and marginal costs (added cost of an extra dollar of the benefit) of the policies. The parameters of supply and demand for grains in the United Kingdom are estimated by the single equation least squares method from data covering the years 1954/55 to 1965/66. Some of these parameter estimates, along with values from previous studies, are then used to quantify the expressions derived earlier for program costs and benefits.

The technique used was to take a year when grain prices were low and to assume that the 1964 minimum import prices had

been in effect. The years chosen were 1961/62 when corn prices were depressed in the UK, and 1962/63 when wheat prices were low. It was found that imposition of the minimum import price would have saved budget outlay on deficiency payments at the expense of grain users; it may have saved foreign exchange if exporters did not raise their prices and if imports of the grain-using product did not increase. Average budget and economic costs of saving a unit of foreign exchange do not change appreciably with the introduction of a minimum import price. Marginal budget costs of saving an extra dollar of exchange range from $1.40 to $3.90 depending on the elasticity of domestic supply; marginal resource cost ranges from $0.36 to $0.56, this measure being independent of supply elasticity.

The effect of the standard quantity mechanism on the cost of deficiency payments and on producer returns is calculated by assuming hypothetical standard quantities for the years before the program was instituted. Over a period of years the government cost would have been reduced by some 10 percent in the case of wheat payments and 4.5 percent in barley payments. Producer returns would have been less by about 2 percent and 1 percent respectively.

The UK Grains Agreement appears to be potentially successful at controlling the cost of the deficiency payments scheme. However, a heavy cost is imposed on grain users, and foreign

exchange may be lost by further imports of the grain-using product. The effect of cereal import policies on domestic grain-using secondary industry should be given careful attention.

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CHAPTER I

INTRODUCTION

On April 15, 1964, the United Kingdom signed an agreement with the United States regarding imports of wheat and feed grains into the UK market. At the same time, similar bilateral agreements were signed between the UK and her other major grain suppliers--Canada, Australia, and Argentina. The agreement set minimum-import-prices at which cereals could enter the UK, and introduced a system of variable levies to enforce these prices. At the same time the UK agreed to restrict payments to domestic producers by limiting the full deficiency payment (the difference between the market price and an announced guaranteed price) to a "standard quantity" of domestic output. Furthermore, the UK expressed a willingness to maintain present levels of cereal imports into the UK by means of adjustments in her domestic policy.

Outline and Objectives

This study is an attempt to analyse this group of bilateral trade agreements with reference to its impact on UK policy objectives,

and on the pattern of grain imports into the UK market. To do this, a simple Marshallian partial-equilibrium model of the UK grain economy is developed, which relates domestic supply of grains to imports and to the demand for human and livestock uses. The deficiency payment program, as operated up to 1964, is introduced, and its effect on imports described. The minimum-import-price and standard quantity provisions are added to the model. Changes in budget cost and foreign exchange are expressed as functions of the basic supply and demand parameters. Expressions for resource cost and for the impact on grain users are derived. Using data for the year 1954/55 to 1965/66, the parameters of the functions relating to the demand for cereals (for various uses), the domestic supply response, and the import demand are estimated. Using these estimates of the parameters and the algebraic relationships derived from the model, the potential effects of the UK grains agreement are examined. Specifically, the following questions are answered:

i) What effect will the agreement have on UK farmers, both livestock and cereal producers?

ii) What will be the impact on other grain users, such as millers and feed compounders?

iii) What changes in UK budget cost of deficiency payment programs can be expected as a result of the policy?

iv) What effect will there be on the outpayments of foreign exchange?

v) What real costs are involved in terms of resource use?

vi) What implications can one draw for future trade policy discussions with respect to other countries and commodities?

vii) What has been the experience with the policy since 1964, and how does this relate to the other questions?

The UK Grain Agreement is of some importance both with respect to UK domestic policy and also within the wider field of trade in temperate agricultural products among industrial nations. From the UK standpoint it is an attempt to reconcile the budget cost of the domestic programs with the position of the country as a major importer. The international significance of the Agreement is that it represents an attempt at assuring access to import markets for the grain exporters. It brings a country's domestic policy to the bargaining table. In spite of this, no economic analysis appears to have been conducted on this topic, even in those government departments responsible for setting up the agreement and reviewing its progress annually. It is hoped that by analysing this program, this study will contribute to the understanding of policies designed to reconcile trade and domestic objectives among industrial countries.

CHAPTER II

THE CONTEXT: AGRICULTURAL TRADE AMONG INDUSTRIAL NATIONS

Agriculture and the Kennedy Round

Four years of trade negotiations, the Sixth Round of Trade Negotiations under the General Agreement on Tariffs and Trade (GATT), ended recently in Geneva. The outcome of this "Kennedy Round" was to reduce the tariffs on some $40 billion of commodities, and the nations making the concessions account for some 75 percent of total world trade. Two-thirds of the reductions were of 50 percent or more and the average tariff reduction was probably about 35 percent.[1] By these criteria, the Kennedy Round overshadows all previous trade negotiations. Tariff barriers probably no longer present a major obstacle to trade among developed countries. These accomplishments were welcomed by those who believe that an expansion of trade is desirable in terms of economic prosperity and political

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[1] These figures are from a statement by Ambassador W. R. Roth, the US representative at Geneva, reported in USDA, Foreign Agriculture, July 24, 1967, p. 3.

stability. Less enthusiastic were those who would bear the major cost of economic adjustment.

From the point of view of agricultural trade, the Kennedy Round was of considerable importance. This was the first time that any real effort had been made to incorporate agricultural commodities into a round of trade bargaining. The European Economic Community (EEC), negotiating as a bloc, proposed initially to exclude agriculture from the agenda. This position was reversed following strong opposition from the United States.[2] Including agriculture as an integral part of the negotiations had the effect of requiring the participants to clarify their positions on agricultural trade policy and to identify the major problems.[3] Although tariffs on some items were reduced, the more significant tangible achievement was the negotiating of an international grains agreement incorporating a new price range for wheat (replacing that established under the International Wheat Agreement which expired in June 1967) and a schedule for a quantity of food aid involving both exporting and importing countries. To appreciate the

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[2]This account of the positions taken by the US and the EEC relies heavily upon T. K. Warley, "Organizing World Trade in Temperate Agricultural Products," Farm Management Notes, University of Nottingham, England, Spring 1965, p. 31.

[3]This is the opinion of Secretary Freeman, the US Secretary of Agriculture, as expressed in Foreign Agriculture, op. cit., p. 5.

significance of these events, and hence the place of the United Kingdom policy, one must examine the bargaining positions of the main protagonists, the EEC and the US.

The US, as a major exporter of temperate foodstuffs, was interested in facilitating the movement of such products to the large markets of Western Europe and Japan. One of the two major principles of GATT, the reliance upon (fixed) tariffs as the sole form of protection, the levels of which were to be reduced in negotiations, had proved ineffective in liberalizing trade in agricultural products. The US had in fact been largely instrumental in the de facto exclusion of agriculture from the GATT framework: as a result of pressures caused by the attraction of imports into the price-supported US market and the embarrassing surpluses accumulated under the same policies, they had introduced import quotas and export subsidies as an adjunct to the domestic programs. Only when the threat of similar practices by the EEC became real did the US change its position in self-defense.[4] The less developed nations had already become disenchanted with the efficacy of GATT and at the United Nations Conference on Trade and Development (1964) pressed for the formation of

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[4]See H. G. Johnson, Economic Policies Toward Less Developed Countries, Brookings Institution, Washington, D.C., 1967, p. 10.

a separate organization, the Trade and Development Board, to establish rules for world trade.

The US position at the Kennedy Round was, then to bring the whole system of protectionism in agricultural trade to the negotiating table. Most agricultural commodities are not subject to heavy tariffs. The chief obstacles to trade in such products are non-tariff barriers which are a part of, or allied to, domestic programs. Such programs are firmly established and are changed only with difficulty by domestic legislatures; they are all but immune to pressure from foreign producers. Mounting budget cost and changing political influence may force modifications in method, but the continuance of domestic farm programs does not seem to be in doubt. The EEC proposal of February 1964 contained two major elements. First, as a short-run measure, the "level of protection" given agricultural products was to be frozen. This level was to be renegotiated at intervals of three years. Thus, domestic policies were to be discussed in an international forum, at least with regard to their external effects if not their actual form. Secondly, the EEC proposal called for the establishment of Commodity agreements for cereals, meats, sugar, butter, and oil crops. Such agreements would specify minimum prices to the wealthy countries and organize

concessionary sales to developing nations. The burden for controlling surpluses was laid at the door of the exporting countries.

Neither of these elements was acceptable to the United States. Commodity agreements should, they argued, be primarily a means of assuring access to import markets for low-cost producers. The methods for binding support levels were considered quite inadequate, and the mere binding of such support did not give any assurance that domestic production would not displace imports.

The apparently irreconcilable positions of the US (and the major exporters of temperate agricultural produce) and the EEC (with tacit support from other importers) stem from two different views of the major problems. The exporters look to growth in overseas markets to contribute towards important farm income (and in the case of the US, balance of payments) goals. It is the protection given to domestic producers in the importing countries that forms the main obstacle to market growth. Surpluses are as much the outcome of high-cost production in Western Europe as of excessive commitment of resources in the Americas and Australia. The importing countries should restructure their agricultures and concentrate upon those products suggested by conditions of comparative advantage. The powerful ethic of free trade is invoked by the exporters,

though more out of faith than hope.[5] The importers argue that the "world price" is depressed by the price-support policies of the exporters (primarily the US) and the associated export subsidies. They also point to the growing efficiency of their domestic agriculture, and the relatively slow growth of demand for the products under discussion. Access guarantees are unrealistic in such a situation. To them, trade policy is a branch of domestic policy. A tariff is a convenient way of regulating domestic price. Reduction of such tariffs forces politically uncomfortable domestic adjustments and farm income losses (or higher government cost) with the main benefit accruing to large American farmers. It is not surprising that the sin of protectionism, never so feared in Continental Europe, is borne lightly by the importing nations. These conflicting philosophies should be borne in mind when discussing developments in agricultural trade policy.

Problems of the Grain Trade

The Kennedy Round, however, produced no sweeping reform of agricultural trade policies. Many products, such as

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[5] Secretary Freeman, in the speech cited above (footnote 3), seems to inject a moral tone into the discussion. "If some countries insist on producing at heavy cost . . . we can try in every way we know to show them that they are wrong and where they are wrong, and try to get them to move toward the principle of comparative advantage." Foreign Agriculture, op. cit., p. 6.

vegetables, fruits, oil seeds, and tobacco, were subject to tariff cuts along the lines of the industrial goods. Three major classes of products, cereals, meats, and dairy products, were discussed by groups set up at the 1963 GATT meeting of ministers. Of these groups, only that considering cereals emerged with a plan acceptable as a basis for negotiation. The conflict discussed above, between exporters and importers, is nowhere more evident than for grains. Along with the pricing arrangements in the US chemical industry, the plan for an International Grain Agreement shared the distinction of being one of the crucial issues on which the fate of the Kennedy Round hung in its final stages. The main characters in the drama were again the EEC and the US. The United States is the leading exporter of grains. In the trade season 1965/66 she accounted for 39.6 percent of world wheat trade, 65.5 percent of corn (maize) trade, and 85.6 percent of trade in sorghum grains, as well as considerable amounts of barley and oats. Four other exporters--Canada, France, Australia, and Argentina--account for much of the remaining exports of grain.[6] The importance of the US in the grain market is accentuated both by the fact that she is able to, and for many years did, carry over large stocks of grain, and also that she sells much of her grain exports

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[6]Figures in this paragraph are from FAO, World Grain Trade Statistics, Rome, 1965/66.

(especially wheat) on concessionary terms as part of her foreign aid program. Changes in these PL 480 sales have an impact on commercial markets. Concentration among importers is less marked. Western Europe taken as a whole, however, in 1965/66 took some 28.0 percent of world wheat imports, 81.2 percent of barley imports, 88.3 percent of oat imports, 74.6 percent of corn, and 44.0 percent of world grain sorghum imports.

The major developments in world grain trade in recent years have been the accumulation (and more recently the reduction) of stocks in the US and Canada, the large volume of concessionary sales primarily under PL 480, the emergence of China and in some years the USSR as major importers, and the increase in domestic production of grains in Western Europe. The US has, for political reasons, felt unable to take advantage of the import markets in centrally planned economies. Noncommercial outlets, while still important, are limited by transportation problems, and by a growing realization that domestic agriculture in the recipient countries must not be stifled. With these constraints, and encouraged by the objective of offsetting a persistent deficit in the balance of payments, the commercial export market for grains assumes added importance. It is not surprising that the US has been particularly concerned at the possibility of a shrinking market or at least a declining market share

in Western Europe for some imported grains, and it is against this background that the UK Grains Agreement was heralded on both sides of the Atlantic as a promising step towards access agreements protecting the market share of grain exporters. It was felt that the format might provide a basis for an International Cereals Agreement, under discussion in Geneva.

The New International Cereals Agreement

The International Wheat Agreement, renewed in 1962 for a four year period, expired in July 1966.[7] In view of the participation of many of the members of the IWA in the GATT negotiations, the 1962 Agreement was extended for 12 months. The IWA had established maximum and minimum prices for a reference grade of wheat (Canadian Manitoba #1, Northern).[8] The price of wheat had stayed within the 40 cent per bushel range, though probably as a result of the

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[7] The original IWA was signed in 1949, and contained guaranteed quantity provisions as well as a price range for wheat. The 1953 IWA was similar, and was marked by the withdrawal of the UK and some other importers. They returned to the fold in 1959, when the quantity provisions were dropped. The fourth (1962) IWA was similar. See Gerda Blau, "International Commodity Arrangements," Monthly Bulletin of Agricultural Economics and Statistics, Vol. 12, no. 9 (September 1963), pp. 1-9. (Reproduced in C. K. Eicher and L. W. Witt, Agriculture in Economic Development, McGraw Hill, 1964, pp. 322-339.)

[8] These prices were $\$1.62\frac{1}{2}$ and $\$2.02\frac{1}{2}$ per bushel, for Canadian No. 1 Manitoba, in store, Ft. William/Port Arthur. Ibid.

pricing policies of Canada and the US, rather than as a direct result of the IWA.[9] The International Cereals Agreement that emerged from the Geneva negotiations was similar to the 1962 IWA except for two provisions. The concept of a reference wheat was discarded in favor of a series of maxima and minima for a number or representative grades, and there was included a schedule of food aid contributions which involved both importing and exporting nations. The price range for wheat was raised by about 23 cents per bushel.[10] Other grains were not incorporated into the Agreement.

This Agreement is open for ratification but would not become effective until July 1, 1968. The major problems seem to involve the enforcement of the minimum price. The price of wheat had been fairly high (due largely to the extra demand from the USSR) since 1964, but during the summer of 1967 there was a rapid decline in price, to a level below the agreed minimum. Prospects of a large

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[9]For an analysis of wheat pricing, see A. F. McCalla, "A Duopoly Model of World Wheat Pricing," J. F. E., August 1966, p. 711.

[10]The plan is briefly discussed in USDA, Wheat Situation, May 29, 1967, p. 12.

crop for the 1967/68 harvest make it doubtful that prices will rise to the recent high levels.[11]

The mechanism set up in the agreement for taking action in the event of a price for a certain grade of wheat dropping below the minimum is of some interest. It calls for a meeting of the Price Review Committee which will then decide on the action to be taken by the errant member. In the event of failure by the Committee or the Grains Council itself to reach agreement, the Council can decide to suspend temporarily the provisions of the agreement.[12] If major trading countries such as the USSR stay outside the Council, then in times of low world prices the viability of the new agreement may well be put to the test early in its life.[13]

An appendix to the International Cereals Agreement states that the UK Grains Agreement of 1964 shall continue in existence for

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[11]The price of Canadian No. 1 Northern dropped about 20 cents from April to September 1967, to a low of $1.77 per bushel. This is 4 cents below the level to be set by the new Agreement. See Financial Post, September 16, 1967, p. 1. For the prospects for 1967/68, see Monthly Bulletin of Agricultural Economics and Statistics, Vol. 16 (July/August 1967), p. 9.

[12]Information on procedure was kindly supplied by the Department of Trade and Commerce, Ottawa, Canada.

[13]The USSR was a member of the 1962 IWA, but not of GATT. However, non-GATT members may join the ICA.

the duration of the ICA, three years from the date of ratification. Indeed the UK bilateral agreements are to be incorporated as an annex to the ICA. It is possible that the UK will seek to change the minimum price for various wheats to correspond to the ICA minima.[14]

The Position of the United Kingdom

The United Kingdom has historically based her agricultural trade policy on the importation of products from abroad at world prices to supplement domestic production. Farm income is supported by means of deficiency payments which make up the difference between the market price and an announced guaranteed price. The level of these guarantees is set each year after a consultation with representatives of farmers and a review of cost and productivity changes. The strength of a deficiency payments system (over say a variable levy) is that users of the commodity can purchase at world prices. Cost of support is borne by the taxpayer rather than through higher consumer prices. One weakness which has become evident in the UK in recent years is that the budget cost becomes

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[14]A comparison of these minimum prices is difficult, as transportation rates differ from season to season. At present freight rates, hard wheat prices are considerably higher under the ICA plan. Feed grains, of course, are omitted from the ICA.

very large and unpredictable in the event of either a low world price or high domestic output. The program is said to be "open ended."[15] For this reason the Conservative government decided to try to interest suppliers to the UK market in limiting imports or at least agreeing to minimum import prices. A quota agreement went into effect for the imports of butter in 1963. Arrangements were concluded with Denmark and other exporters with the objective of setting up market shares for bacon. A loose agreement limiting imports of beef from Argentina was concluded, but no general policy on beef materialized. For cereals a system of bilateral agreements, referred to in this study as the UK Grain Agreement, was approved. This was put into effect in the 1964/65 crop (and trade) year. The policy was primarily justified in terms of "price stability." As one politician put it, "We cannot afford the luxury of bargain-basement (cereal) prices."

At about the same time a new set of pressures was building up. The country became conscious once again of the chronic

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[15]The cost of the deficiency payment scheme for cereals has fluctuated in recent years from $185 million in 1963 to $103 million in 1965 (at $2.40 = £1). In general, this payment represents about one-quarter of the total payments to farmers. This total fluctuates even more--ranging from $822 million in 1961 to $562 million in 1966. It was the high total budget cost in 1961 (primarily due to the low price of imported meat) that probably gave the impetus to "close" the subsidies. See Annual Review, 1967, Cmnd 3229, H.M.S.O., 1967.

deficit in the balance of payments.[16] Farm groups emphasized the import-saving potential of the agricultural industry--particularly the cereals sector. About one-half of the nation's grain requirements had been imported in the previous decade. This was emphasized in the National Plan which the Labour government produced in 1965 after about one year in office.[17] The plan was a mixture of admonition and prognostication; for agriculture it described the effect an expanded domestic output could have on import saving, but made no indication that domestic policy would be used to fulfill the prophecy. Groups both inside the country and abroad assumed that cereal production would be encouraged--despite the provisions of the UK Grains Agreement signed a year earlier.

Another influence on UK policy about that time was the need to adjust British agricultural policy to the Common Agricultural Policy of the EEC, should she be admitted. The Gallic veto of 1963 notwithstanding, both political parties espoused programs that emphasized control of imports. Giving up the traditional "cheap food" policy was seen as one of the prices to be paid for membership into

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[16]The balance of payments on current account has shown a deficit in five of the past seven years. The average deficit for the period 1960 to 1965 was $234 million. See Annual Abstract of Statistics 1965, H.M.S.O., 1966, p. 236.

[17]See National Economic Development Plan, Cmnd 2764, H.M.S.O., 1965.

the Community. The minimum import price of the UK Grains Agreement is qualitatively similar to the variable levy-threshold price mechanism in operation for grains (and some other products) entering the EEC. The main difference, from the standpoint of the exporter, is the level at which the minimum price is set.[18] The UK has made no attempt to raise this price to inhibit trade in "normal" years.

This chapter has attempted to give a background to the UK Grains Agreement of 1964. Domestically, it was intended to stabilize budget cost by restricting payments to producers and guarding against low priced imports. Exporters saw in it a commitment to assure access to an important market, with the implication that such an agreement could be negotiated for other markets and perhaps other commodities. The next chapter gives the details of the agreement, and is followed by an analysis of the impact of such a policy on the importing country.

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[18] Prior to devaluation, the producer prices for wheat and barley appeared to be about 40 percent and 25 percent higher in the EEC than in the UK, (see The Common Agricultural Policy of the EEC, Cmnd 3274, H. M. S. O., 1967). These differences have increased by some 17 percent as a result of the new exchange rate, and the EEC threshold price is now about twice the level of the UK minimum import price.

CHAPTER III

THE UNITED KINGDOM GRAINS AGREEMENT

On April 15, 1964, an agreement was signed between the US and the UK regarding future imports of wheat, feed grains and some grain products. Similar agreements were entered into on the same day between the UK and three other major suppliers of such products--Canada, Australia, and Argentina. Since that date some 16 other countries, occasional suppliers of grain onto the UK market, have also agreed to the terms. The products covered in these bilateral agreements are wheat, barley, oats, corn (other than sweet corn), sorghum, flour, bran, and meal. Rice and rice products are excluded.

The Agreements were designed to be temporary, pending the outcome of the GATT negotiations in Geneva, from which it was hoped would emerge an international cereals plan. The underlying policy objective was to avoid the destabilizing effect of low-priced imports of grain in years when the world market was depressed. The problem had become acute not only in grains but also in livestock

products. The cost of the deficiency payment scheme became politically embarrassing when world prices were low.

Minimum-Import-Prices

The main provision of the Grains Agreement was the establishment of a minimum-import-price for each grain. This was to be enforced by a levy on consignments that entered below this price (a consignment levy) high enough to bring the landed price up to the minimum. In the event that the general offer price of an exporting country was below the minimum, a "country levy" would be imposed to similar effect. A third type of levy, a "general levy," was to be applied to non-signatory exporters. Transhipments through European ports of American grain were to be considered as imports from America, and provision was made so that forward contracting would not be disadvantaged. Thus, one major source of budget uncertainty was reduced, namely that arising from a low import, and hence domestic market price. A major task in the analysis of later chapters is to isolate the "cost" of this stability.

Standard Quantity Provision

In exchange for this cooperation, the UK government on its part undertook to limit financial assistance to its

farmers.[1] The procedure has been to announce (at the Annual Review) a "standard quantity" of output on which the full deficiency payment is made.[2] This deficiency payment is reduced in the event of production exceeding the standard quantity, by the proportion of the actual output to that standard quantity. For any given difference between market price and guaranteed price, the maximum payments bill is given by this difference times the standard quantity.[3] The

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[1]This move would probably have taken place in the absence of these bilateral agreements merely because of the uncertainty in budget cost of the "open ended" deficiency payment scheme. Most commodities covered by a deficiency payment program now have some form of budget cost limitation.

[2]The Annual Review refers here to the "Annual Review and Determination of Guarantees" published in March of each year (since 1947). This document gives the level of guaranteed prices, standard quantities and such things as production grants for the coming year. The process leading up to the determination of the new guarantees involves a review of the domestic industry over the past year in consultation with various farmer organizations--notably the National Farmers Union.

[3]If domestic output were a_1, standard quantity a_2, and the difference between guaranteed and market price was p_1, then p_2, the actual deficiency payment (per unit) is given by

$$p_2 = p_1 \cdot \frac{a_2}{a_1}$$

Since $(p_2 \cdot a_1) = (p_1 \cdot a_2)$, the total deficiency payment bill is given by $(p_1 \cdot a_2)$. Full details are given in: UK Ministry of Agriculture, Fisheries, and Food, Cereal Deficiency Payments Scheme (1967 Edition), H. M. S. O., London, 1967. The effectiveness of this mechanism in reducing the incentive to domestic farmers is explored in Chapter VII, below.

introduction of the standard quantity in combination with a minimum import price gives an absolute maximum cost to the government for the program for any given year.

Conditions of Access

In addition to the need to restrain government cost, there has been considerable pressure within the UK to expand the production of grains in order to conserve foreign exchange. The exporting nations fear erosion of their markets on these grounds.[4] The UK grains agreement sets up the mechanism for reducing imports of grains (by raising the minimum import price, increasing standard quantity, or increasing guaranteed price) but it also states that the UK is committed to maintaining a certain level of grain imports. This ambiguity has been at the root of the discontent that has characterized the attitude of the exporting countries to the working of the Agreement. A few quotations from the text will illustrate the objectives and the spirit that apparently prevailed at that time.[5]

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[4]This fear will be intensified in response to the recent devaluation of the pound (from $2.80 to $2.40 = £1), which would (ceteris paribus) give imported grains a price disadvantage of some 17 percent. Other policy changes may come in the wake of devaluation, but for the purposes of the present study all but the "direct relative price effect" of the change in exchange rate will be ignored.

[5]The text of the Agreement is given in: U.S. Department of State, Trade: Cereals, Cereal Products, and By-products,

For the world trade in cereals, the signatory countries wished to achieve "a better and more economic balance between world suppliers and commercial demand," and decided "that to this end there should be the provisions of acceptable conditions of access into world markets."[6] This commitment to an access agreement marked a new departure in grain-trade policy, and was heralded on both sides of the Atlantic as a forerunner to an international agreement expected from Geneva.[7] Access was to be assured for exporting countries as a whole--no mention was made of changes in the market share of individual nations. This access was defined in terms of "maintaining a fair and reasonable balance between home production and imports."[8] This balance was to be based on the present levels of domestic and imported grain--implying satisfaction with present market shares. An opportunity to share in future growth was to be provided for domestic and overseas suppliers, but no guidelines were established

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Treaties and Other International Acts series 5581, Washington, D.C., 1964, and in Exchange of Notes, Cmnd 2339, H.M.S.O., 1964. Details of the procedures for assessing levies is to be found in: UK Ministry of Agriculture, Fisheries and Food, Cereals: Minimum Import Prices and Levy Arrangements, London, 1964.

[6]U.S. Department of State, op. cit., p. 2, (emphasis added).

[7]See, for instance, comments in the New York Times and the London Times for April 16, 1964.

[8]U.S. Department of State, loc. cit.

for sharing in this growth. From the exporter's standpoint, the relevant question is to what extent do the provisions of the program adequately preserve the import market.

The provision of a minimum import price can in no way be construed as a movement to assure access. It can be justified only as a measure to impose a limit to government cost. The introduction of standard quantities, the "restraint of financial assistance . . . applied through the effective reduction of guaranteed prices,"[9] on the other hand, can be considered a plausible weapon in altering the market shares, or maintaining the status quo in the face of market changes. The problem seems to be that changes in the standard quantity on which full deficiency payments are made is only an indirect way of reducing domestic production (or slowing its growth). The Agreement appears to assume that domestic producers will restrain production to a level at or near the standard quantity--for this is how the expected level of imports for 1964/65 is arrived at in the text.[10] Since farmers will not know, when they make their planting decisions, what the total production will be relative to the standard quantity, this mechanism is likely to be relatively ineffective in the short run. Even if they were to estimate correctly what reduction there would be in guaranteed

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[9] Ibid., p. 2, (emphasis added).

[10] Ibid., p. 3.

price, one would not expect output to be cut back to the standard quantity, but rather to some intermediate output.

Review Procedures

An important departure in the Agreement is the apparent willingness of the UK to discuss its domestic policy with the signatory exporters. Indeed a review procedure is set up to discuss annually the degree to which the objectives are being reached.[11] Significant changes in the level of the minimum price are also subject to agreement by the signatory parties. The review also seems to have been envisaged as an opportunity for reconsidering the desired balance "in the light of supply and marketing conditions, including the relative efficiency of suppliers, and changes therein," between domestic production and imports.[12]

Interpretation of the Agreement

Three major questions arise from the agreement. First, to what extent did the signatories consider this to be an effective access

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[11] Ibid., p. 4.

[12] Ibid., p. 2. Though the documents relating to these annual meetings are not made public, it is understood that the UK has in fact argued for a change in this balance between domestic and imported supplies of grain, to allow a larger share of the market to be met by domestic production.

agreement. There is a pledge to "take effective corrective action at the earliest practicable time . . . if it is found that the total imports of cereals . . . have shown an appreciable decline below the average volume . . . during the three years preceding July 1, 1964, (about 9 million tons) and that this decline has taken place . . . because the (minimum import price and standard quantity provisions) have failed to be effective."[13] But in the passage quoted in the last paragraph it appears that the balance between imports and domestic supply should be changed along with market conditions. If domestic production is increased because of efficiency (or good weather) above that which is consistent with imports of 9 million tons, then it might be argued that the desired balance has changed, rather than that the provisions of the program have "failed to be effective."

The second and closely related question is to what extent did the parties to the agreement believe that the imposition and manipulation of the standard quantity would be effective in curtailing domestic output. It certainly puts a limit on government cost (of the support program), but the effect on domestic output is much more obscure. The Agreement seems to use the standard quantity as a "target output" for the home industry. If the guaranteed price is set at a level which would encourage more than this desired output, then

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[13] Ibid., p. 3.

a scheme whereby the farmer receives the market price for output above this target (which would require individual farm quotas) would be necessary to have any chance of keeping output at this level.[14] It seems implausible that the exporting countries considered the standard quantity mechanism an effective method for controlling the steadily expanding grain output in the UK.

The third question, more relevant from the point of view of the analysis attempted in this study, is the extent to which the parties envisaged the levy system to come into operation. The agreement pledges exporters' cooperation "so far as is practicable in the operation and observance of minimum-import prices."[15] UK importers, however, appear to be fairly active in searching for the cheapest source of supply. Similarly exporters have denied the possibility of collusion to raise the offer price of grain in the UK market, though there would be ample incentive in times of low world

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[14]Another way of looking at the standard quantity mechanism is to say that the domestic industry as a whole receives only the market price on surplus above the standard quantity. In the absence of farm quotas, the individual farmer will not take this market price into account since he will be receiving a higher price for all his output, a price much nearer the guaranteed price. For a discussion of a plan involving farm quotas, see D. E. Hathaway, "The Search for New International Arrangements to Deal with the Agricultural Problems of Industrialized Countries," Agricultural Economics Report No. 5, East Lansing, March 1965.

[15]U. S. Department of State, op. cit., p. 6.

prices.[16] There may, of course, be some cooperation between importing and exporting firms. Thus, although it would be to the advantage of the UK to encourage importers to buy as cheap as possible and pay the levy, the Agreement gives not just an invitation but an obligation to collude--to "observe" the minimum price.

No answers to these questions will be attempted in this study. Instead the quantitative implications of the various alternatives will be explored. The conditions under which access can be assured, and the efficacy of the standard quantity mechanism in controlling domestic output, and the impact on budget cost and foreign exchange outpayments of discrimination by the exporters will be analysed, along with the importance of the program to domestic grain producing and using sectors. To go beyond this would be to leave the realm of economic analysis to enter into political speculation.

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[16] The possibility of price discrimination in the face of a minimum import price is discussed in: M. E. Abel, "Price Discrimination in the World Trade of Agricultural Commodities," J. F. E., May 1966, p. 194. Although there is some doubt as to how Abel's discriminating exporter distributes his product between markets, the conclusion that it is profitable is sound.

CHAPTER IV

THE UNITED KINGDOM GRAIN MARKET: A PARTIAL EQUILIBRIUM MODEL, UNDER FREE TRADE

During the post-war period the United Kingdom has imported somewhat less than half its requirements of feed grains, and a little more than half its bread grains. The major crops grown at home are barley, wheat, and oats, and the acreage of land under cereals has increased steadily since 1954.[1] A fairly stable quantity of hard wheat is purchased to mix with the indigenous and imported soft wheats to produce flour acceptable for the type of bread sold in the UK, and large quantities of corn are bought for livestock feed. Imports of barley have declined steadily in recent years, and the country has exported some barley of late. Imports of oats were never high, but sorghum grains are finding increasing use in feed compounds.

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[1] Most of this increase has come in barley acreage, at the expense of oats and other tillage crops. Wheat acreage in aggregate fluctuates from year to year, but shows no consistent trend.

The procedure followed in this chapter and the next is as follows: First, a general model will be advanced to indicate the determinants of domestic supply, utilization, and imports of grains. It is "general" in the sense of excluding policy restrictions, and will be referred to as a free trade model. It is, however, strictly a partial equilibrium model; the interdependence of factor returns and income is ignored. In other words, it is a Marshallian model, isolating the factors which affect the supply of a commodity from those influencing the demand. The usefulness of this model is that it is possible to introduce policy restrictions and investigate the implications of these policies. This is the second stage. To make this step more manageable, it is assumed that the functions relating price to quantity are linear throughout, and variables other than price and quantity are held constant.[2] In Chapter VI, the model is expressed in an empirically testable form, and estimates of the parameters are derived. In Chapter VII the estimates are used to indicate the quantitative implications of the policy constraints associated with the UK Grains Agreement.

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[2]This not only simplifies the algebra but allows a parallel graphic presentation. The method can, of course, be generalized to include more variables (and more policies).

The Model

For brevity of exposition, the discussion will be in terms of a single commodity, "grains."[3] Later a distinction will be made between grains used in the production of a commodity that is also imported and grains used in products which do not compete with imports. No attempt is made in this chapter or the next to identify any particular type of grain with these properties.[4] It is assumed throughout that suppliers and users of grains act economically--they need not be literally maximizing profits, but they must react to price changes in a way predictable by standard micro-theory, and must be aware of market opportunities such as the cheapest source of supply. Information in the grain trade appears to be adequate, and there is no a priori reason to doubt the relevance of these assumptions. The various functions are expressed in a deterministic form. Discussion of interdependence between residuals is therefore irrelevant. Such problems only arise in the context of equations in an estimatable form, and are dealt with in Chapter VI.

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[3]The arguments hold, of course, for any individual grain or group of grains. Excluded grains are then included in the categories of "other products" or "other inputs" as appropriate.

[4]This degree of abstraction is designed to allow the economic argument to proceed uncluttered by individual grain market peculiarities.

Supply Relationships

Changes in the quantity of grains supplied domestically can be separated into changes due to acreage adjustment and those due to variations in yield. Although yield can be altered by the farmer after planting (e.g., through extra fertilizer application or chemical weed control) it seems reasonable to assume that in any given year, the acreage that the farmer plans to plant is a measure of his intended supply. Instead of treating land as one input, with output a function of a combination of inputs, the grain acreage is taken as the variable to be explained. The variables which will influence the land planted to cereals are the price level of grains, the price of other factors used in conjunction with land, and the opportunity cost of the land input--incorporating the profitability of using the land in other enterprises. Thus for any given state of technology (i.e., production function) the desired grain acreage can be written as:

$$A_g^* = f(P_g, P_a, C) \qquad 4.1$$

where A_g^* is the desired acreage of grains

P_g is the relevant price level of grains

P_a is the price of other inputs

C is the opportunity cost of land in grain production

There are, however, technical constraints as the acreage of grain planted. Problems of disease control and soil fertility impose limitations on the rotations employed by farmers. A major factor influencing the supply of cereals in the UK recently has been the growing realization that on certain types of soil cereal crops can be grown for some years on the same field without a great drop in the yield. Better varieties and improved chemicals have reinforced this trend. The acreage planted to fall wheat is influenced to a large extent by the condition of the land after harvest.[5] A wet fall may prevent preparation of the land. Fields not planted to fall wheat may either be sown to barley or oats in the spring, or used in some other enterprise. Total cereal acreage in this latter case will be affected by fall rainfall. Actual acreage can be expressed as:

$$A_g = f(A_g^*, t, R_f) \qquad 4.2$$

where A_g is actual acreage of grains planted

A_g^* is desired acreage of grains based on relative prices, as in 4.1

t is a trend variable representing the changes in rotational restraints

R_f is the rainfall in the post-harvest period

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[5] Spring sown varieties of wheat may be returning to popularity as improved strains are bred. Most of the wheat acreage in the UK is and will be for some time sown in the fall.

The main source of year to year fluctuations in domestic supply is yield, rather than acreage changes. Yield is affected both by weather conditions during the growing season and at harvest, and also by disease conditions which may or may not be linked to weather conditions. Yield is increasing over time as a result of improved varieties and changes in husbandry practice, such as fertilization, and disease and weed control. This may be expressed as:

$$Y_g = f(W, t) \qquad 4.3$$

where Y_g is the yield of grain crops

W is a variable encompassing weather and disease variations from year to year

t is a trend to account for changes in variety and husbandry practice

Supply of cereals is, of course, the interaction of actual acreage and yield

$$Q_g = A_g . Y_g = f(P_g, P_a, C, T, R_f, W) \qquad 4.4$$

where Q_g is the total supply of grains, and the other symbols are as described above

The supply of imported grains will depend upon conditions in the world market, together with changes in the transportation cost to the UK. For the purposes of this study it will be assumed that changes in UK demand (of the order of magnitude that are under

consideration) will not affect this world price.[6] The supply curve of imported grains to the UK is thus infinitely elastic at the prevailing world price, and can be written:

$$P_{g'} = f(P_w, F) \qquad 4.5$$

where $P_{g'}$ is the import price (c.i.f.) of grains to the UK,

P_w is the "world price" of such grains set either institutionally or by world market conditions, and

F is the freight and any duty charged on imported grains.

Demand Relationships

Grains are used as inputs in the production of flour for making bread and biscuits, breakfast foods, concentrated feeds for livestock, and several industrial products such as alcoholic beverages and starch. The demand for grains will depend, as with any intermediate product, on the conditions in the final product market and on the supply conditions for other inputs, as well as on the production relationship between inputs and output. This can be expressed as:

---

[6] The price of wheat is largely institutionally determined (see Chapter II), and for corn one would expect the domestic price support and output control program in the US, the major exporter, to be the predominant influence on world price. Even if UK demand could affect the world price, it is likely that this price change would be small relative to the changes in the other variables.

$$Q_p = f(Q_g, Q_o, t) \quad 4.6$$

$$Q_p = f(P_p, P_s, Y) \quad 4.7$$

$$P_g' = f(P_w, F) \quad 4.8$$

$$Q_o = f(P_o, P_r) \quad 4.9$$

where Q_p, Q_g, Q_o are the quantities of product, grain input, and other inputs, respectively,

P_p, P_g', P_o are the prices of the product, grain, and other inputs,

P_s, P_r are the prices of products which compete with "p," and the price of other products that can be produced with input "o," respectively,

Y is a measure of disposable income relevant in the demand for the product,

t is a trend which accounts for changes in the conversion of inputs into the product over time, and

P_w, F are the world price, and freight rates for grain.

Equation 4.6 is the production function expressing output of the product as a function of levels of inputs, but allowing for a change in this relationship over time. Steady changes have, for example, taken place in the feeding of barley to beef cattle, and of wheat and corn to poultry. The demand equation for the product, 4.7, expresses the quantity demanded as a function of relevant prices and

income. Equation 4.8 is the supply equation for grain; as in 4.5 the price is determined in the world market. The supply of the cooperating factors, 4.9, is dependent upon relative input prices.

On the assumption that firms using grains buy inputs competitively and sell the product in a competitive market,[7] and that they equate the marginal cost of producing a unit of product using a least-cost combination of inputs with the price of the product, then it is possible to specify the demand curve for an input.[8] In the very short run, when quantities of other inputs cannot be changed, the demand curve for an input is identical with the value of marginal product (VMP) curve, since the firm will use that input up to the level where the VMP drops to equal the price of the input. To the extent that all firms make these adjustments to changes in input price, the market demand curve for the input will reflect the firm VMP curves, except that now a change in output will alter product price and consequently shift the VMP curves facing the firms. The "very short run" demand relationship for the grain input is thus:

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[7] If producers of the product have some degree of market power, then the argument is not affected except that one should read "Marginal Value Product" for "Value of Marginal Product," and "Marginal Revenue" of the product in place of the price, P_p.

[8] See M. Friedman, Price Theory, Aldine, 1962, Chapters 7 and 9 for a discussion of the demand for inputs, and of the concept of "derived demand."

$$Q_g = f(P_g', Q_o, P_p) \qquad 4.10$$

where the symbols are as before.

If the firm (and hence the industry) can adjust the quantities of other inputs used, in response to a change in grain prices, then the VMP curves, each defined relative to a given level of other inputs and product price, will shift with changes in those quantities. These input levels are in turn influenced by changes in the use of the grain factor, so that observed sets of prices and quantities are the result of a sequence of marginal adjustments. This "short run" demand relationship for an input is expressed as:[9]

$$Q_g = f(P_g', P_o) \qquad 4.11$$

with the symbols as before.

The relationship between 4.10 and 4.11 can be illustrated graphically. Figure 4.1 shows the "very short run" relation of price of grains to quantity demanded, with quantities of other inputs and product price fixed, as D_g--identical with the VMP, of grains. If the price

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[9]The "length of run" of a demand relationship for an input depends on which other inputs are considered in the group called "o." Since in this paper only the short run effects of grain price changes on grain use are considered, this demand relationship and the demand curve associated with it (i.e., the subfunction $Q_g = f(P_g')$) are referred to as "short run" equations. The exclusion of P_p as an argument in equation 4.11 should be noted. To include it would mean that the short run industry demand curve would be defined with product price constant--the simple aggregate of all individual firm demand curves. Such a quasi-industry demand curve is of little use in the present context.

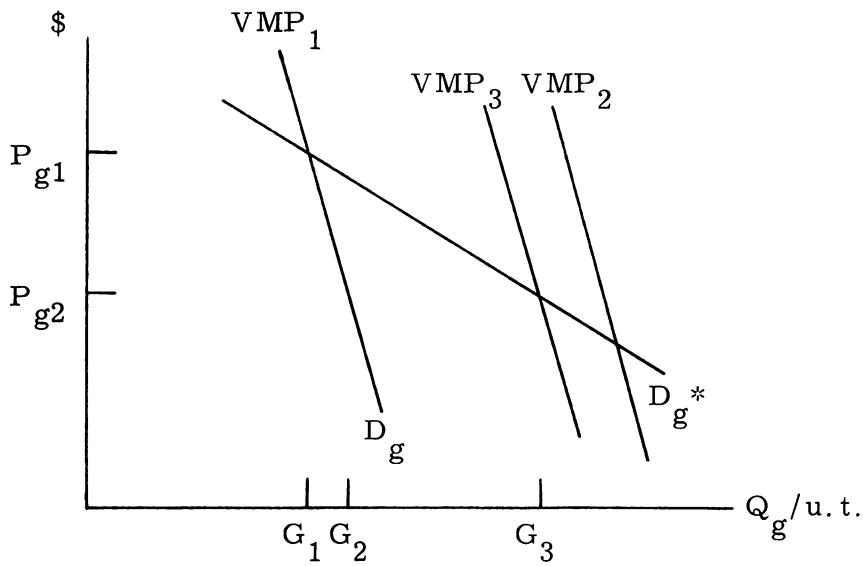

Figure 4.1

of grains is P_{g1}, then G_1 will be demanded. If the price drops to P_{g2}, then initially quantity demanded would increase to G_2. But this will cause the marginal product of substitute inputs to decrease and complementary inputs to increase. For fixed prices of these other inputs, quantity used will either decrease or increase, depending on whether the relationship is one of substitution or complementarity; in both cases, the marginal product of grains will increase.[10] Let the new VMP be VMP_2 in the figure. The relationship between grains and "all other inputs" is presumed to be complementary--this is suggested by the implicit assumption of a decreasing marginal product

[10]The greater response in grain use as price changes is due to the added flexibility in resource combinations, rather than the direction in which other input use is changed.

for grains.[11] Output of the product will be increased when grain prices decline, and this will cause product price to drop. The VMP shifts back to VMP_3 and the quantity of grains used is G_3 . D_g^* is the "short run" demand curve for grains.

This demand curve will be shifted by the price of other inputs--for instance, an increase in the price of a substitute input will shift the demand for grains out to the right. Similarly, changes in the technical relationship between inputs and output will change the marginal product at each input level, and hence shift the demand curves for the inputs. An increase in income, or a change in the price of a related product will also shift the demand curve. Hence the demand relationship can be written:

$$Q_g = f(P_g', P_o, P_s, Y, t) \qquad 4.12$$

where symbols are as in equations 4.6 to 4.9.

The demand for the product, however, may be met in part by imported supplies. In this case, the input demand curves must be interpreted with care. In the case where there are no imports of the product, the demand for both domestic and imported grains is as given above, by equation 4.12. If, on the other hand,

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[11] As the proportion of grain to "all other inputs" increases, marginal product falls. This is accomplished either by an increase in grain use or by a fall in the use of "all other inputs." The two groups of inputs are therefore presumed complementary.

some of the product is imported, then the demand equation refers to the use of the grain (or any other input) by both foreign and domestic producers. It is no longer of use in the analysis of changes in domestic utilization of grains. Changes in the domestic demand for grains will now be a function of changes in comparative advantage in the production of the product.[12] Changes in the demand for the product may affect only the level of imports of the product, leaving the domestic demand for grains unchanged. The derived demand model described below will prove to be convenient for making explicit the determinants of the demand for grains in the case that imports of the product are important.

Import Demand

Armed with the domestic supply equations and the demand relationships for grains (subject to the qualification of the last paragraph), the demand for imported grains is easily derived. If all domestic production is used, this import demand is the excess domestic demand over domestic supply at a given price.

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[12] Comparative advantage as used (rather loosely) here, merely refers to the relative supply prices for various quantities of a commodity at home and abroad. If none of a product is produced domestically, one could infer that the supply curve was, for all quantities, above the equilibrium import price.

$$Q_{gm} = Q_{gd} - Q_{gs}$$

where Q_{gm} is the quantity of imported grains,

Q_{gd} is the quantity of grains demanded, from equation 4.12, and

Q_{gs} is the quantity of grains supplied domestically, from equation 4.4.

Thus $$Q_{gm} = f(P_g, P_a, C, R_f, W\ P_g', P_o, P_s, Y, t) \quad 4.13$$

where the symbols are as described in equations 4.4 and 4.12.

Demand for imports is a function of domestic grain price, P_g', and this curve is shifted by all the variables that shift either the domestic supply or the domestic demand curves.[13] This is illustrated in Figure 4.2.

At price P_g', demand for grains will exceed domestic production by a quantity AB, in Figure 4.2(a). This is the quantity of imports demanded at P_g', and is equal to CD in Figure 4.2(b). If the supply of imports were infinitely elastic at a price P_g', as in Equation 4.5, this represents an equilibrium position.

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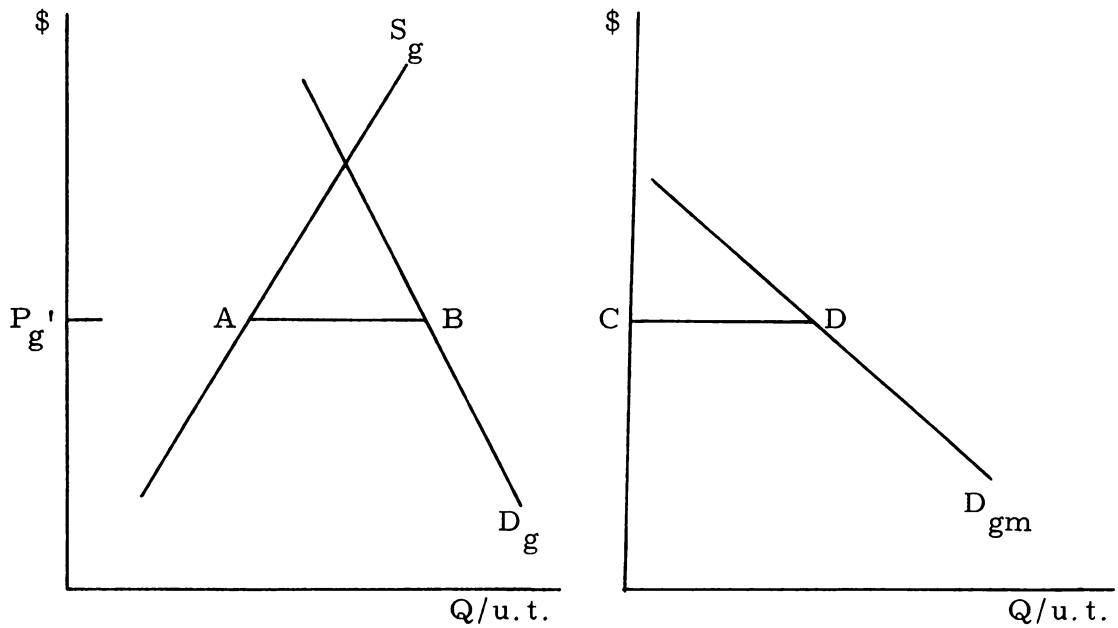
[13]The inclusion of both P_g, the domestic producer price, and P_g', the market price, is intended to pave the way for the set of policies described in the next chapter which isolate farm price from the import determined market price.



(a) Figure 4.2 (b)

Derived Demand

To relate changes in the input market to changes in the product market (or vice versa) requires knowledge of the production function, equation 4.6. If a certain commodity is produced with approximately fixed proportions of inputs, and the ratio of input to output is also constant, then this special type of production function enables one to relate input and product market directly.[14] The demand for an input is simply derived from the demand for the product.

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[14]Even if some substitution were possible between inputs over time, in response to a price change, this simple production function may have validity in short run analysis. Ibid., Ch. 7.

Define

$$A_{gp} = \frac{Q_g}{Q_p}$$

$$A_{op} = \frac{Q_o}{Q_p}$$

$$\frac{A_{gp}}{A_{op}} = \frac{Q_g}{Q_o} = \text{Constant}$$

where A_{gp}, A_{op} are the quantities of input "g" and "o" per unit of output, respectively, and

Q_g, Q_o, Q_p are quantities of "g," "o," and "p,"

so that "g" and "o" are perfect complements--the ratio of these inputs used to produce "p" is technically determined and unresponsive to relative prices.[15] The assumption of fixed values for A_{gp} and A_{op} allows one to incorporate both inputs and output on the same quantity axis, thus establishing correspondence between product and input markets. Assume, further, that there are no imports of the product, and that all variables other than prices and quantities of "g," "o,"

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[15] Of course they need only be very close complements over a certain range of input prices. The similarity of the production function used here and that implied by other linear production models, such as activity analysis, linear programming, and input-output analysis, should be noted.

and "p" remain fixed. The market for both inputs and produce is illustrated in Figure 4.3.

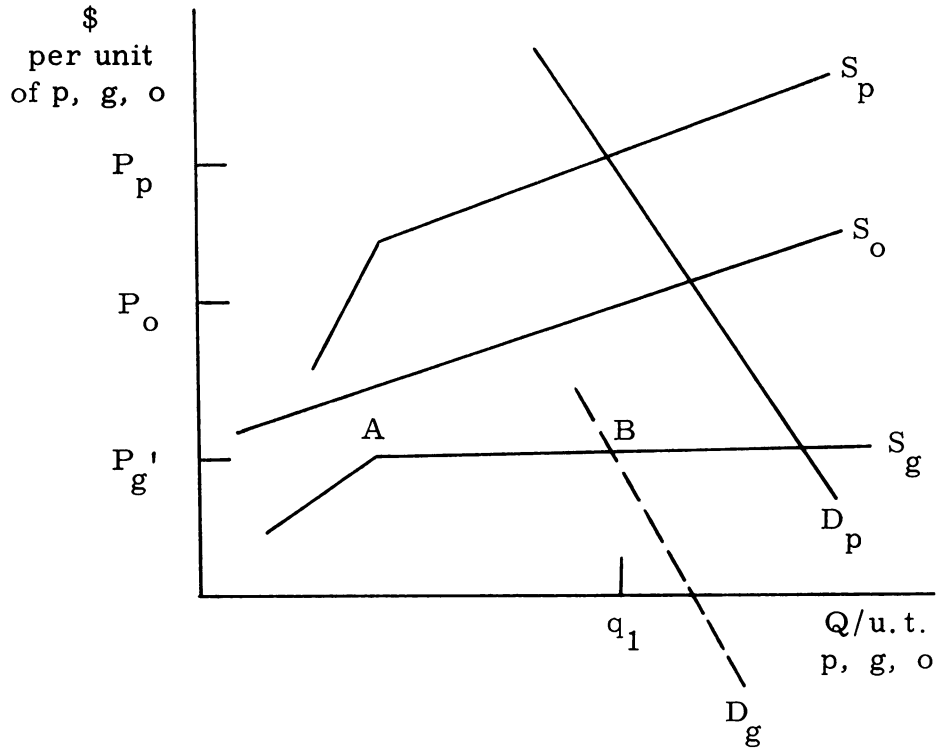

Figure 4.3

The curve S_g represents the supply of grains, any quantity being available at a world price, P_g'. The supply curve for other inputs is S_o, and the supply of "p" is the vertical addition of the input supply curves. Units are chosen for the quantity axis such that:

$$1 \text{ unit of } p = A_{gp} \text{ units of } g = A_{op} \text{ units of } o.$$

For any output, say q_1, the supply price of "g" is P_g', of "o" is P_o,

and for "p" is P_p (= $A_{gp} \cdot P_g' + A_{op} \cdot P_o$), where the supply price is defined as the "minimum price at which that quantity will be forthcoming." Given the supply price of "o" one can, for any quantity, obtain the "maximum price that will be paid per unit" for grains D_g, and is given in Figure 4.3 by the vertical subtraction of S_o from D_p. This assumes that factor "o" is always paid its supply price, but that factor "g" will receive more or less than its supply price at quantities either side of the equilibrium output, in this case q_1. Since one hopes to observe successive equilibria as the market conditions change, the implications of this are not too restrictive. In Figure 4.3, the imports of grain are given by AB (= AB . A_{gp} units of grain); both domestic and imported grain go to produce q_1 units of "p." If D_g were to cut the curve S_g to the left of A, then no grains would be imported.

The model shows clearly the determinants of the demand for grains. The quantity of grains demanded is a function of the price of grains and of all the variables that shift either the demand for the product or the supply of other factors. If the input-output coefficients, A_{gp}, A_{op}, change over time, then this will merely shift the scales and thus shift D_g. The demand for grains can be written as

$$Q_g = f(P_g', P_r, P_s, Y, t) \qquad 4.14$$

where the symbols are as in equations 4.6, 4.7, 4.8, and 4.9.

It is instructive to compare this with equation 4.12. The assumption of fixed input coefficients implies a production surface of rectangular isoquants. Changes in relative price do not change resource allocation. In the general case, 4.12, changes in the price P_o will shift the demand curve for grains directly by encouraging an adjustment in resource combination. In the derived demand model a shift in the relative prices of inputs can occur as output is changed, but it elicits no shift in resource combination. What will shift the D_g curve in this case is a change (say) in the opportunity cost of the input "o," represented by P_r in 4.14, since this will change the demand price for any given quantity of input "g." Since such a change in P_r would normally change P_o, for any given quantity of "o," in both cases, one can regard 4.14 as a special case of 4.12.

In the event that domestic production of "p" competes with imports, the position is complicated somewhat. Figure 4.4 gives the new market equilibrium on the assumption that imports of "p" are freely available at P_p'.

The price-quantity functions are as before, except that now demand for "p" is such that domestic supply cannot meet all the requirements at price P_p', and DE of "p" is imported. D_g is no longer the demand for domestic and imported grains, since $(BC \cdot A_{gp})$ of grains is used abroad in producing DE imports of the product.

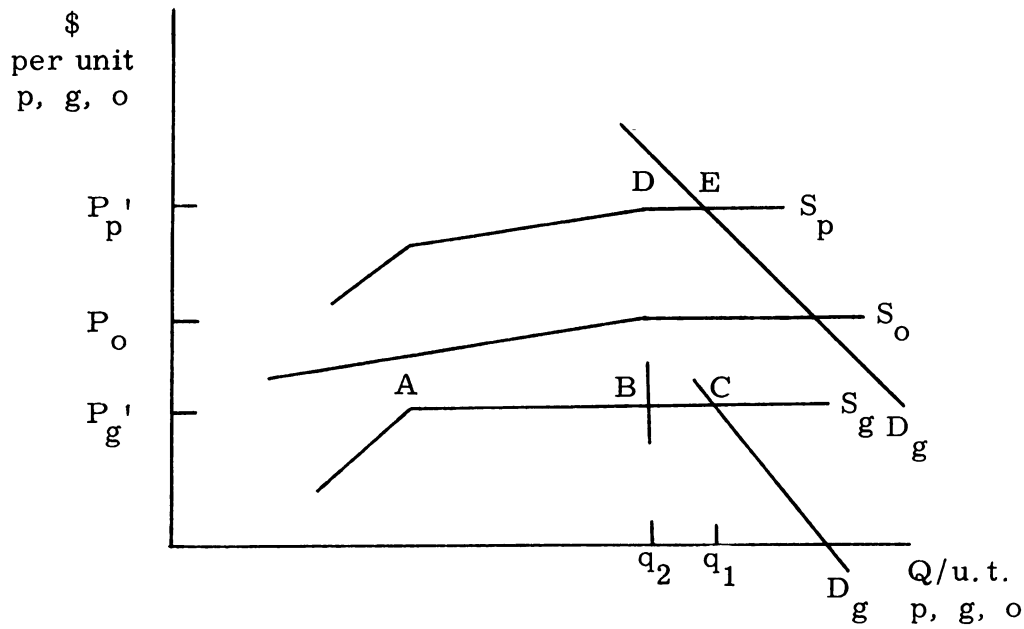

Figure 4.4

The quantity (AB . A_{gp}) of grains is imported, so that total grain usage domestically is (q_2 . A_{gp}), employed in producing q_2 units of "p." Consider a shift in D_p, say because of a change in income, Y. So long as some "p" is still imported, no change in domestic grain utilization is indicated. It is apparent that a change in the price of grain, if applicable to both domestic and foreign "p" producers, will not change the quantity of grain used domestically. The demand for grain is thus completely inelastic. Domestic utilization of grain is, however, a function of any variable that shifts the supply curve for other factors, S_o. The relationship between the supply price of "p" domestically and the import price is, of course, a measure of the comparative advantage in the production of "p." It can be seen that

under the conditions of the derived demand model, this comparative advantage rests upon the relative supply price of cooperating input, "o." Should this rise domestically but not abroad, the S_o will shift to the left and imports AB will be curtailed. Changes in input coefficients in the "p" producing industry over time will also shift the inelastic demand-for-grains-domestically curve. Using the notation of previous equations,

$$Q_g = f(P_r, t) \qquad 4.15$$

where Q_g is the quantity of domestic and imported grains used in domestic production of "p,"

P_r is the price of other products using "o," representing the opportunity cost of using "o" in "p" production, and

t is the trend of productivity in the "p" producing industry.

The import demand functions can be obtained from the domestic supply function and the demand functions, 4.14 and 4.15, just as in the previous section.

The next chapter will consider the effects of introducing policies into the grain market.

CHAPTER V

THE UNITED KINGDOM GRAIN MARKET: THE MODEL WITH POLICY CONSTRAINTS

In order to extract from the model the effects of introducing policy restraints it is convenient to begin with the "free trade" position, as given in the previous chapter, and add policies one by one. This study is concerned primarily with the policy instruments; a deficiency payment scheme such as that in operation for UK cereals since 1954, and a minimum import price superimposed on the domestic plan, as was introduced in 1964. The effect of a change in the exchange rate is also considered, but not as a policy variable that can be changed at will. It is rather taken as a sudden change in relative prices that must be accounted for when discussing future manipulation of import prices or domestic guarantees.[1] The effect

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[1] In other words, the effects of the November 1967 devaluation of the pound are discussed, but devaluation is not (say) compared with deficiency payments as a means for promoting import substitution. Incorporating the direct relative price effect of devaluation presents few problems. The recent devaluation does, however, raise questions as to what the UK government policy will be towards the new International Cereals Agreement, and whether they will renegotiate the minimum import price levels of the Grains Agreement discussed in this paper. These questions are not discussed.

of the standard quantity mechanism on the level of producer price is examined, and it is this effective guaranteed price which is referred to as the "guaranteed price" throughout this chapter, except where otherwise specified.

For simplicity, all variables other than the prices and quantities of the product "grains" are considered to be held constant. The functions relating prices and quantities are taken to be linear. This allows a graphic presentation to accompany the algebra. The chapter is organized as follows. First the policies are introduced and the new equilibria positions are identified. Expressions for budget cost, resource cost, and cost to grain users are derived, as are expressions for levy revenue, foreign exchange outpayments, and return to factors in domestic agriculture. The second section of the chapter derives both the average and the marginal budget, resource, and user cost of saving foreign exchange and transferring income to farm factors. These will depend upon the program (i.e., the set of policy variables) used to achieve the objectives. A third section examines the effect not of a change in policy variables but in the world grain market (a change in the supply price for imports) for a given set of policies; it is in this context that devaluation and the standard quantity mechanism are discussed.

Free Trade Equilibrium

Domestic and import supply and demand relationships were derived in the previous chapter. If all variables other than price and quantity are fixed, and if relationships are linear, then the domestic supply equation, 4.4, can be written:

$$Q_{gs} = a_1 + b_1 P_g \qquad (b_1 > 0) \qquad 5.1$$

where Q_{gs} is the quantity of grains supplied domestically, and

P_g is the relevant producer price of grains.[2]

Similarly, from equations 4.12 and 4.13, one can write:

$$Q_{gd} = a_2 - b_2 P_g \qquad (b_2 > 0) \qquad 5.2$$

$$Q_{gm} = a_m - b_m P_g \qquad (b_m > 0) \qquad 5.3$$

where Q_{gd} is the total quantity of domestic and imported grains used in the UK,

P_g is the price of such grains, and

Q_{gm} is the quantity of imported grains demanded in the UK.

Now the imported quantity is the excess of domestic demand over domestic supply. The import demand curve can be expressed in terms of the domestic parameters as:

$$Q_{gm} = (a_2 - a_1) - (b_1 + b_2) P_g \qquad 5.4$$

If the import supply curve is completely elastic at a price, P_e, then, at equilibrium:

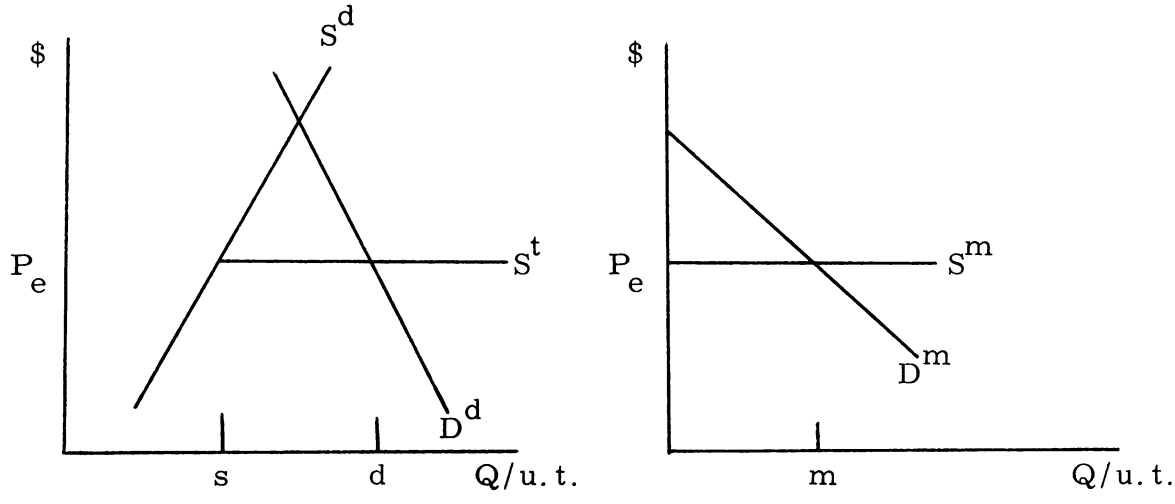
$$s = a_1 + b_1 P_e$$

$$d = a_2 - b_2 P_e$$

$$m = d - s = (a_2 - a_1) - (b_1 + b_2) P_e$$

where s, d, and m are quantity supplied (domestically), demanded, and imported, respectively, at price P_e.

This market equilibrium is illustrated in Figure 5.1.



(a) Figure 5.1 (b)

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[2] Cost of transportation and handling are ignored--the one "market price" is assumed relevant to suppliers and users.

The import demand curve (D^m) is the horizontal distance between the domestic supply (S^d) and demand (D^d) curves. S^t is the total supply curve on the UK market, being the horizontal addition of S^d and S^m, the import supply curve. The domestic industry has, so to speak, a comparative advantage in grain production up to an output of s--above that users supplement domestic grains from foreign sources of supply.

Guaranteed Domestic Prices

If the government introduces a guaranteed producer price, which it secures by means of a deficiency payment to make up the difference between the market and the guaranteed price, then it is presumably this price which will influence producer decisions. Denote this guaranteed price by G; then domestic supply is now:

$$k = a_1 + b_1 G \qquad (G > P_e) \qquad 5.5$$

Imports will be reduced by the same amount as domestic production expands--for market price is unchanged. The import demand curve, for prices below G, is now:

$$Q_{gm} = (a_2 - k) + b_2 P_g \qquad (G > P_g) \qquad 5.6$$

where Q_{gm} is the quantity of imports demanded, and

P_g is the price of grains in the UK market.

The new equilibrium is shown in Figure 5.2. The domestic supply curve ($S^{d'}$) appears to users and importers to be completely inelastic at prices less than G, since producers will base their decisions on this higher guaranteed price rather than the market price. The import demand curve ($D^{m'}$) is consequently kinked at G, and has less slope at lower prices. Both the "apparent" supply curve, $S^{d'}$, and the new import demand curve, $D^{m'}$, are clearly dependent upon the level of G, the guaranteed price to domestic producers.

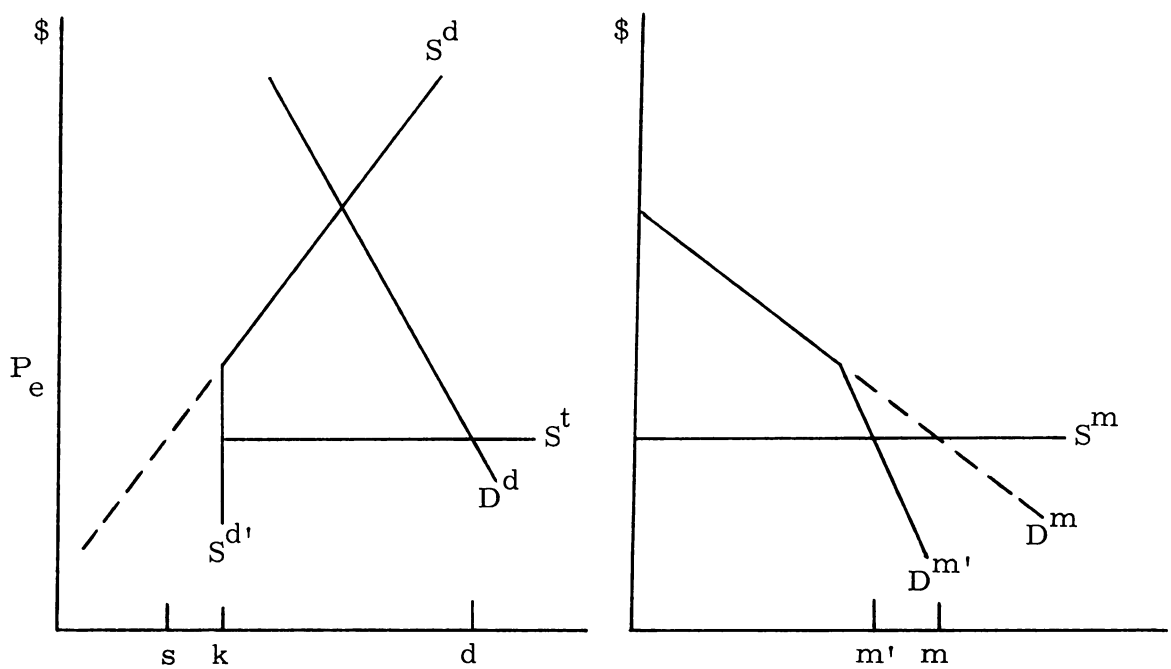


Figure 5.2

The change in imports is m - m', where:

$$m = (a_2 - a_1) - (b_1 + b_2)P_e$$

$$m' = (a_2 - k) + b_2 P_e$$

$$\therefore\ m - m' = -\left[(a_1 - k) + b_1 P_e\right] = b_1 (G - P_e)$$

since $m + s = m' + k = d$

$$k - s = m - m' = b_1 (G - P_e)$$

Import saving and domestic expansion rely solely on the price coefficient of domestic supply.[3] Saving of foreign exchange outpayments is given by:

$$F - F' = b_1 (G - P_e) P_e \qquad 5.7$$

where F is value of imports at free trade, and

F' is value of imports under domestic program.

---

[3]This chapter mentions "price coefficients" often but elasticities hardly at all. One reason is that when using linear relationships it is convenient to have a measure of response to price which is constant. Elasticities are indeed pure numbers, but their scale-free properties are overrated. To be of use in a particular problem, the elasticity value has to be accompanied by the point or range over which it is held to apply. Another reason for not expressing all the relationships in elasticities is that in discussing policy questions a slope coefficient is often more intuitively useful. A statement that a dollar price rise will cut imports by x thousand tons, saving y thousand dollars, has an immediacy which is lost when the proposition is couched in percentages. Both absolute and percentage measures have their uses, of course, but in this study relationships between absolute prices and quantities will predominate.

There is, however, a budget cost of:

$$B = k(G - P_e) \qquad 5.8$$

where B is the total budget cost of deficiency payments to UK producers--$(G - P_e)$ being paid on k units.

No direct burden is placed upon users of grains; they pay for the program through general taxation. There is, however, a cost to the nation in the encouragement of resources into domestic grain production insofar as these resources could have been employed elsewhere. On the assumption that the supply curve of the individual farm (or grain enterprise) approximates the marginal opportunity cost of the variable resources used, and that these individual curves can be summed to give the industry supply curve, then the integral of this function up to any output gives a measure of the total opportunity cost of these variable resources. This is shown in Figure 5.3, where at

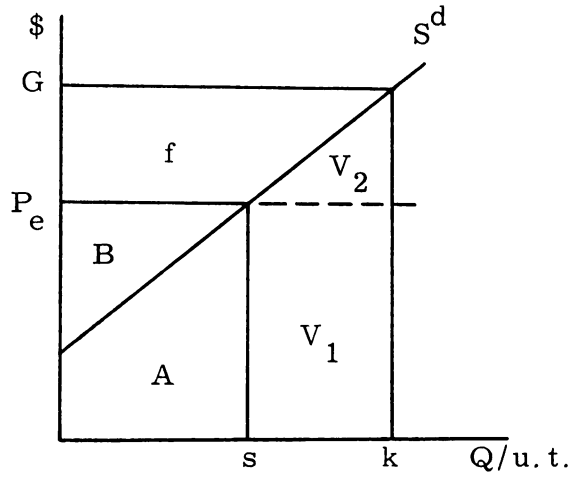


Figure 5.3

a price P_e (and output s) the area A is the (social) cost of the variable resources. B represents the return to fixed resources, usually called rent or producers' surplus. If a guaranteed price of G is instituted and production increases to k, then variable resources worth $(V_1 + V_2)$ enter the industry. Area V_1 is not a loss to the community for this amount would have been paid to <u>foreign</u> resources in the absence of the guaranteed price. The loss is the <u>extra</u> output that these factors would have produced if in other enterprises, and is given by the triangle V_2. In the strictly "partial-equilibrium" sense in which this model is to be taken, V_2 represents the "economic cost" of the program. Call this C, where:

$$C = \frac{1}{2}(G - P_e)(k - s)$$
$$= \frac{1}{2}b_1 (G - P_e)^2 \qquad 5.9$$

where G, P_e the guaranteed and market prices

k, s the domestic output with and without the program, and

b_1 the price resonse coefficient of domestic supply, from 5.1.

The deficiency payment-guaranteed price program has as a primary objective the support of farm income, rather than the reduction of imports. If the addition to producers' surplus, f in Figure 5.3, is taken as a measure of the increased returns to specific

factors brought about by the program, then this rent, R, can be expressed as:[4]

$$R = k(G - P_e) - \frac{1}{2}b_1(G - P_e)^2$$

$$= \frac{1}{2}(k + s)(G - P_e) \qquad 5.10$$

As was stated earlier, the deficiency payment-guaranteed price program places no direct burden on the grain user.

Minimum Import Price

If in addition to the guaranteed price plan the government introduces a minimum import price (enforced by a levy to bring offer prices up to that minimum) then imports are reduced even more. The new market equilibrium is illustrated in Figure 5.4 The administered minimum import price is P_m. Domestic grain use is cut down to d', and imports to m'', where:

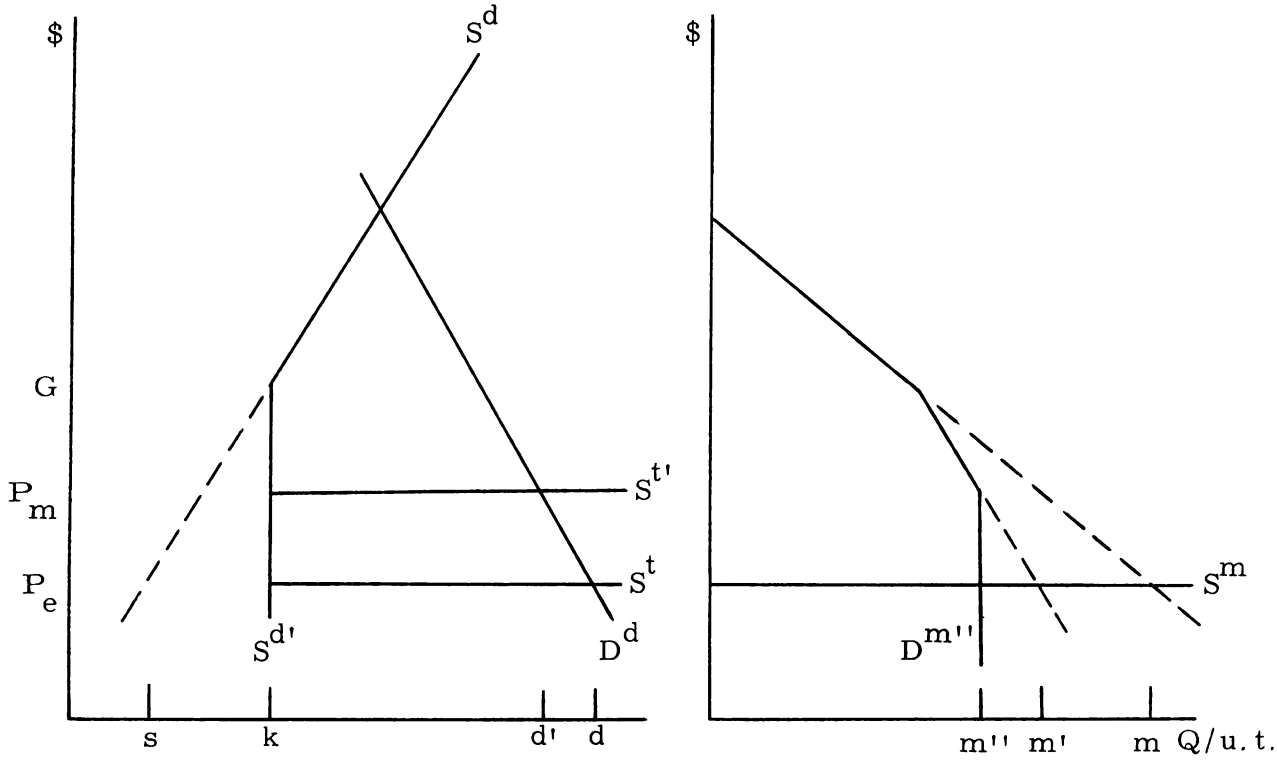
$$m' = d - k = (a_2 - k) + b_2P_e$$

$$m'' = d' - k = (a_2 - k) + b_2P_m$$

$$\therefore m' - m'' = d - d' = -b_2(P_m - P_e)$$

---

[4]The correspondence between net farm income and return to non-variable factors is not exact. For instance, if farm land is taken out of other crops and put down to cereals, then land can no longer be thought of as fixed for a given enterprise. Return on land is, however, an important part of net farm income in predominantly owner-occupied UK agriculture.



(a) Figure 5.4 (b)

The change in imports is determined solely by the price response coefficient of import (and total) demand. The "apparent" import demand curve facing exporters ($D^{m''}$) becomes completely inelastic at the price P_m--no more can be sold by lowering the price below this minimum.

The budget cost of the domestic support program is now:

$$B' = k(G - P_m) \qquad 5.11$$

where B' is the deficiency payment bill in the event of a minimum import price of P_m--the new market price--when $(G > P_m > P_e)$.

There is no change in economic cost, C, as no further resources enter domestic agriculture.[5] The drop in imports does, however, affect the foreign exchange outpayments. Here two possible alternatives must be considered. If exporters raise their offer price to the UK in the face of the imposition of a minimum import price, outpayments will increase if the import demand curve is inelastic, and decrease if it is elastic. If the offer price is raised to the level of P_m, then no levy is collected. If, on the other hand, exporters cannot (or do not choose to) discriminate in price against the UK, then outpayments will decline and a levy will be collected. These two possibilities will be treated separately--they are in fact extremes, and in any given situation the import price might rest between P_m and P_e, some but not the full levy being extracted.[6]

If exporters raise their offer price to P_m, the minimum set by the UK (where $Pm > P_e$), then the new level of foreign exchange outpayments is:

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[5]In the sense that imports now enter at price P_m, it could be argued that domestic economic cost is less under a minimum import price scheme. Given the permanent presence of the minimum import price, the "second best" solution is indeed to produce more than quantity s at home; however, since in the present context domestic and trade policies are considered movable, economic cost will still be measured against the free trade case.

[6]The likelihood of these conditions was discussed in Chapter III, above.

$$F'' = m'' \cdot P_m = (a_2 - k - b_2 P_m) P_m \qquad 5.12$$

where F'' is the value of imports under the minimum import price, P_m,

m'' is the quantity of imports,

k is the domestic output, and

a_2, b_2 are the coefficients in the demand equation $Q_{dg} = a_2 - b_2 P_g$.

If exporters continue to sell at P_e, however, and a levy is assessed on imports, then exchange outpayments are now:

$$F^* = m'' \cdot P_e = (a_2 - k - b_2 P_m) P_e \qquad 5.13$$

with symbols as before, and P_e the world market price outside the UK.

In this case, the levy will amount to

$$L = m'' \cdot (P_m - P_e) = (a_2 - k - b_2 P_m)(P_m - P_e) \qquad 5.14$$

where L is the levy receipts,[7] and other symbols are as before.

The user of grains now has to pay a higher price in the UK market. The total grain cost may decrease or increase, but the returns to other factors will decrease following a rise in grain prices.

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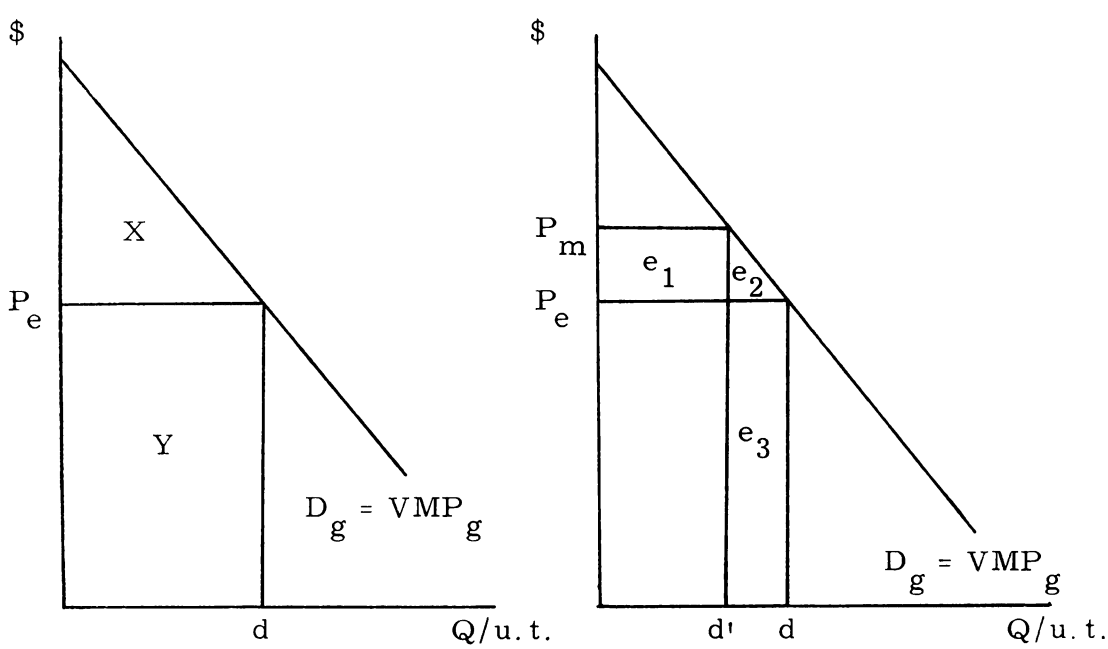
[7] Levy receipts are collected in domestic currency, direct from the importer.

This will be referred to as an "adjustment cost," A. It is not all economic loss to the nation, as some of those factors will move from the grain-using sector to other employment. Nevertheless, it represents an immediate income loss at least until adjustments are made. In Chapter IV, a "very short run" demand curve for grains was identified as the Value of Marginal Product of the input in its production of other goods. Now if the price of these grain-using goods remains constant (perhaps because of the existence of a ready supply of imports, or because of a guaranteed price for UK producers) then the integral of the VMP curve up to an output gives the total value of production. In Figure 5.5 (a), the area (X + Y) is



(a) Figure 5.5 (b)

The total value of production in the grain-using industry. Of this, Y goes to pay for the grain, the quantity d at a price of P_e. The value represented by the area X is thus the returns to other factors, including the producers' surplus. If the price of grains changes, say to P_m in Figure 5.5 (b), then the value of production falls by area $(e_2 + e_3)$ and the returns to other factors falls by $(e_1 + e_2)$. It will be recalled that the identification of the VMP with the demand curve for the input is only valid if the level of use of other factors does not change. The "short run" demand curve of Chapter IV allowed for changes in the level of use of other factors, and also in the price of the final product. Both shift the VMP curve. This is illustrated in Figure 5.6. As grain price rises to P_m, and production is cut back

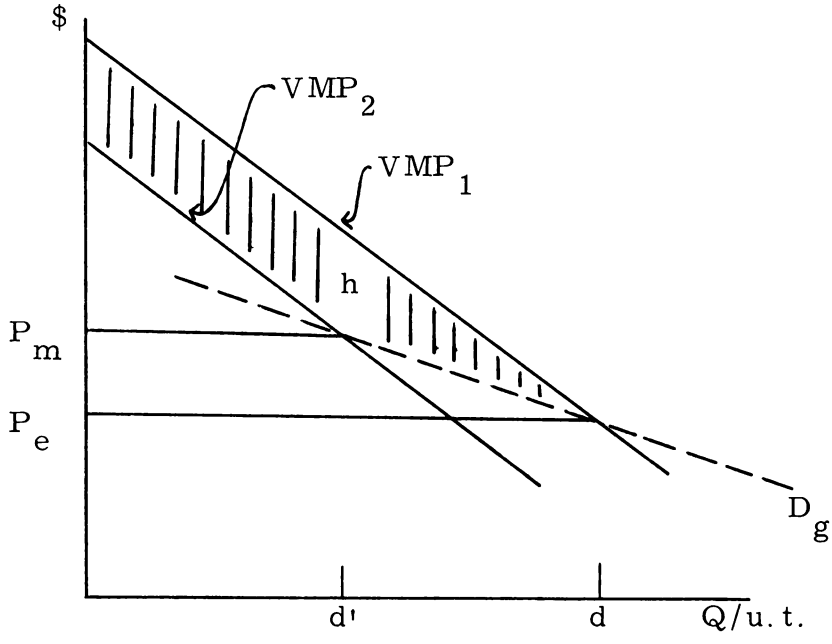


Figure 5.6

in the grain-using industry, the use of other factors is adjusted. Grain use is reduced by more than is indicated by the "very short run" case. Total value product is still given by the area under the VMP, and had one instead calculated the area under the demand curve, D_g, between quantities d and d', the drop in value would have been understated by an area h. Similarly, the drop in returns to other factors is also understated by h, if the area $(e_1 + e_2)$ in Figure 5.5 (b) is computed from a "short run" demand curve rather than a VMP curve. In the event that non-grain factors move into other enterprises, the loss in returns to these factors will in fact be smaller than in the "very short run" case--otherwise they would not have moved. Nevertheless, the "adjustment cost" is defined for present purposes as the change in the returns to non-grain factors in the grain-using industry, and taken to be the area bounded by the two supply curves, the demand curve, and the price axis--i.e., area $(e_1 + e_2)$ in Figure 5.5 (b).[8] This is given by:

$$A = \frac{1}{2}(d + d')(P_m - P_e) \qquad 5.15$$

---

[8] Most of the relevant questions regarding the present use of the minimum import price policy are short run in nature. If the policy were used to restrict imports in all years, rather than in years of low prices, then the longer run measures of adjustment loss would be more appropriate. See Chapter VII, below.

where A is the adjustment cost as just defined

d, d' are the domestic use of grains at prices P_e, P_m, the world price and minimum import price, respectively.

The area $(e_2 + e_3)$ in Figure 5.5 (b) represents the lower limit to the change in value of output in the grain-using sector. This change in value is given by:

$$W = \frac{1}{2}(P_m + P_e)(d - d') \qquad 5.16$$

where W is the change in value of the grain output industry, when grain price rises from P_e to P_m.

The change in value of domestic production of the grain-using commodity may be matched by a change in value of imports of that commodity, if import supply were very elastic.[9] Alternatively, if production were covered by a guaranteed price, then the cost of

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[9]It should be noted that in the case that imports replace the entire value of the reduction in output--i.e., total quantity demanded remains the same, then there will be a net loss of foreign exchange, taking the grain and grain-product markets together. Even in the very short run (with only minimal adjustment of grain-product supply) the area W in equation 5.16 exceeds the area (F' - F*), the maximum gain in foreign exchange saving possible in the cereals market. $(F' - F^*) = (d - d')P_e = e_3$ in Figure 5.5 (b); F', F* are defined as value of imports before and after the introduction of the minimum price, P_m, in the absence of discrimination.

such a support policy may be lowered.[10] The derived demand model of Chapter IV above, with or without imports, would give another indication of the impact of changes in input price upon grain-using products. In view of the many possible combinations of conditions that could obtain in this product market, no attempt will be made to analyse the impact of grain policies in each case. Instead, consideration will be given to some specific product markets in Chapter VII, when the effects of price changes for individual grains are discussed.

Figure 5.7 summarizes the chapter so far; the areas represented by numbers on the graph are dollar values. The corresponding economic meaning of the areas is given below the Figure.

The Costs of the Policies

The policy of encouraging home production by the imposition of a guaranteed price, whether for transferring income to the farm sector or for displacing imports, will have a budget cost and an economic cost. As the guaranteed price is changed, so these costs will change along with the benefits of the policy. Two costs should be distinguished; the average cost of a program which will be

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[10] If the guaranteed price for the product is linked by a formula to the price of grains (or feed) then these results will not hold. Similarly, if a levy were imposed on imports of the grain-product, then the conclusions are changed.

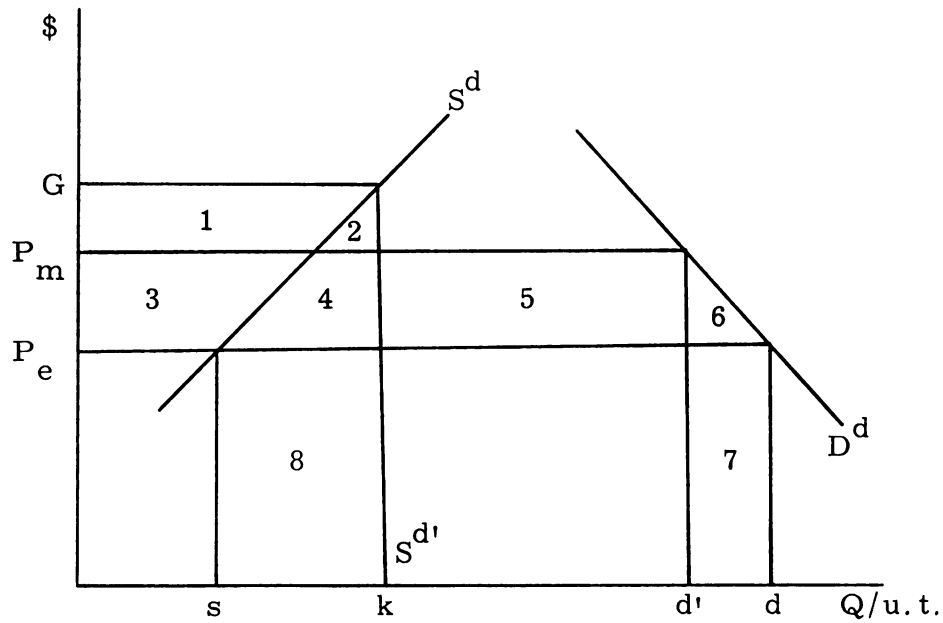

Figure 5.7

Guaranteed Price:

Budget Cost, B	= 1 + 2 + 3 + 4	
Exchange Saved, F - F'	= 8	
Economic Cost, C	= 2 + 4	
Income Transfer to farms, R	= 1 + 3	

Guaranteed Price and Minimum Import Price:

Budget Cost, B'	= 1 + 2	
Exchange Saved, F - F*	= 7 + 8	assuming no discrimination by exporters
Levy Revenue, L	= 5	
Exchange Saved, F - F''	= 7 + 8 - 5	assuming discrimination
Economic Cost, C	= 2 + 4	
Rent to farms, R	= 1 + 3	
Adjustment Cost, A	= 3 + 4 + 5 + 6	
Change in Product Value, W	= 6 + 7	(minimum change)

the total cost for a given level of policy parameters divided by the total benefits, and the marginal cost, which will be the ratio of the change in costs to the change in benefit as a policy parameter is altered.[11] Using the expressions derived in equations 5.7 and 5.8, the average budget cost of a unit of foreign exchange saved is given by:

$$\frac{B}{F - F'} = \frac{k(G - P_e)}{b_1 P_e (G - P_e)} = \frac{k}{b_1 P_e} \qquad 5.17$$

and the marginal cost by:

$$\frac{dB}{d(F - F')} = \frac{dB}{dG} \cdot \frac{dG}{d(F - F')} = \frac{a_1 + 2b_1 G - b_1 P_e}{b_1 P_e} = \frac{k}{b_1 P_e} + \frac{G - P_e}{P_e} \qquad 5.18$$

where B is the budget cost of deficiency payments needed to support a domestic producer price, G, higher than market price P_e,

$(F - F')$ is the change in foreign exchange payments, as domestic output is expanded,

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[11] If the choice was between scrapping or keeping a program, then the average cost of that program, per unit of objective obtained, would be relevant to decision-making. On the other hand, the marginal cost is important if there is some possibility of changing the level of policy parameters within a program. In the UK, the guaranteed price can be changed every year, and the marginal budget or resource cost of exchange saving should therefore be of interest to the decision maker. A policy parameter, in this context, refers to the guaranteed or minimum import prices; policy variables are such measures as budget cost and levy revenue.

k is the level of domestic production under price G, and

b_1 is the price response coefficient in the domestic supply equation.

The marginal cost is larger than average cost--foreign exchange becomes more expensive to "buy" with increased domestic output. For brevity the average and marginal budget and resource (economic) costs are summarized in the table below. The "benefits" are a saving in foreign exchange ($F - F'$) and a transfer of income to farmers (producers' surplus, R).

Table 5.1--Average Budget and Economic Costs of Gaining One Unit of Exchange Saving and Farm Income Transfer.

Cost Benefits	B (Budget Cost)	C (Economic Cost)
$F - F'$ (saving in exchange)	$\frac{k}{b_1 P_e}$	$\frac{(G - P_e)}{2P_e} = \frac{k - s}{2b_1 P_e}$
R (farm income transfer)	$\frac{2k}{k + s}$	$\frac{k - s}{k + s}$

Table to be read thus: Each expression gives the average cost--as given in the column head--per unit of the benefit indicated in each row; e.g., economic cost per unit of income transferred is given by $(k - s)(k + s)^{-1}$.

Table 5.2--Marginal Budget and Economic Cost of an Extra Unit of Exchange Saved and Farm Income Transferred.

Costs / Benefits	B (Budget Cost)	C (Economic Cost)
F - F' (saving in exchange)	$\frac{2k - s}{b_1 P_e} = \frac{k}{b_1 P_e} + \frac{G - P_e}{P_e}$	$\frac{k - s}{b_1 P_e}$
R (farm income transfer)	$\frac{2k - s}{k}$	$\frac{k - s}{k}$

Marginal cost--as given in column head--for an extra unit of the benefit indicated in the row.

G, P_e are guaranteed and market prices,

k, s are domestic output of grain at prices G, P_e,

b_1 is the domestic price response parameter.

Note that $k - s = b_1 (G - P_e)$, since

$k = a_1 + b_1 G$; $s = a_1 + b_1 P_e$

A knowledge of b_1, given the levels of G, P_e, and k, will enable the marginal and average costs of the program to be calculated.

The effects of the minimum import price superimposed on the guaranteed price can be expressed in the same manner. Here the benefits are again the saving in exchange outpayments and the

transfer of income to farmers. The costs are the budget outlay for deficiency payments and the economic resource cost as before, but now there is a revenue (negative cost) from the levy and an adjustment cost to the user of grains. The drop in value of production of grain-using products is only relevant insofar as imports enter to replace some of the domestic output of these products.[12] The levy revenue and the budget cost are additive in that they are both government items. They are kept separate here because it is unlikely that the revenue from levies is taken into account by the political process when deciding on the level of the deficiency payment budget. Table 5.3 gives the average cost, in budget outlay, resources malallocated and direct income loss to grain users, of maintaining a minimum import price between the guaranteed price and the world market price ($G > P_m > P_e$) per unit of the benefits of exchange saving and income transferred to farmers. In the case where exporters offer the grain to the UK at the world market price, the budget costs per unit of foreign exchange are lowered by the introduction of the minimum import price (and so is budget cost per unit of income transfer to farmers). However, there is now a burden of adjustment on grain users

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[12] Because of this dependence upon the product market conditions, of which there are many combinations, no taxonomy is given here of the changes in exchange outflow which might occur. These problems should be tackled in the context of a particular commodity, such as wheat flour.

Table 5.3--Average Budget, Economic, and Adjustment Cost per Unit of Exchange Saving, and Farm Income Transfer.

Cost Benefit	B' (Budget Cost)	L (Levy Revenue)	C (Economic Cost)	A (Adjustment Cost)
F - F'' (Exchange Saving with Discrimination)	$\frac{k(G - P_m)}{(d - s)P_e - m'' P_m}$	n.a.	$\frac{b_1(G - P_e)^2}{2(d - s)P_e - 2m'' P_m}$	$\frac{(d + d')(P_m - P_e)}{2(d - s)P_e - 2m'' P_m}$
F - F* (Exchange Saving without Discrimination)	$\frac{k(G - P_m)}{(d - s - m'')P_e}$	$\frac{m''(P_m - P_e)}{(d - s - m'')P_e}$	$\frac{b_1(G - P_e)^2}{2(d - s - m'')P_e}$	$\frac{(d + d')(P_m - P_e)}{2(d - s - m'')P_e}$
R (Farm Income Transfer)	$\frac{2k(G - P_m)}{(k + s)(G - P_e)}$	$\frac{2m''(P_m - P_e)}{(k + s)(G - P_e)}$	$\frac{k - s}{k + s}$	$\frac{(d + d')(P_m - P_e)}{(k + s)(G - P_e)}$

n.a. = not applicable.

To be read as: Expression is the average cost of the type in the column head, per unit of benefit, as indicated at left of row.

G, P_m, P_e are guaranteed, minimum import, and world market prices,

b_1, b_2 are price response coefficients of domestic supply and demand,

k, s are domestic output under prices G, P_e respectively,

d, d' are domestic grain use under prices P_e, P_m respectively, and

m'' is the new level of imports, $(d' - k)$.

which is larger than the change in budget cost and the revenue from the levy combined. In the event of exporters raising their price in the light of the minimum import price, the effect on foreign exchange saving is ambiguous.

In general, the marginal budget, economic, and adjustment costs are higher than the average costs. Table 5.4 gives the marginal costs of saving an extra unit of exchange and transferring a unit to farm income through changes in the guaranteed price. There is no adjustment cost in this case, as price to the grain-user does not change. Table 5.5 gives the marginal costs of foreign exchange if the minimum import price is changed. Economic cost does not change in this case--no new resources enter the domestic grain producing industry. No extra income is transferred to the farm sector. Once again, one cannot say a priori whether exchange will be saved if exporters raise prices. In the absence of discrimination, both budget cost and exchange are saved at the expense of grain users. Imports of the grain-product can wipe out the exchange savings.

The relationships shown in the tables will be used to analyse various policy alternatives in specific markets in Chapter VII.

Table 5.4--Marginal Budget, Economic, and Adjustment Costs, for an Extra Unit of Exchange Saving and Farm Income Transfer, through Increasing Guaranteed Price.

Cost Benefit	B' (Budget Cost)	L (Levy Revenue)	C (Economic Cost)	A (Adjustment Cost)
F - F'' (Exchange Saving with Discrimination)	$\frac{k+b_1(G-P_m)}{b_1 P_m}$	n.a.	$\frac{G-P_e}{P_m}$	0
F - F* (Exchange Saving without Discrimination)	$\frac{k+b_1(G-P_m)}{P_e b_1}$	$\frac{-(P_m-P_e)}{P_e}$	$\frac{G-P_e}{P_e}$	0
R (Farm Income Transfer)	$\frac{k+b_1(G-P_m)}{k}$	$\frac{b_1(P_m-P_e)}{k}$	$\frac{k-s}{k}$	0

n.a. = not applicable.

Expression gives change in cost, shown at column head, for an extra unit of benefit shown in row.

Symbols as for Table 5.3.

Table 5.5--Marginal Budget, Economic, and Adjustment Costs, for an Extra Unit of Exchange Saving and Farm Income Transfer through Increasing Minimum Import Price.

Cost Benefit	B' (Budget Cost)	L (Levy Revenue)	C (Economic Cost)	A (Adjustment Cost)
F - F' (Exchange Saving with Discrimination)	$\frac{k}{m'' - b_2 P_m}$	n.a.	0	$\frac{d'}{b_2 P_m - m''}$
F - F* (Exchange Saving without Discrimination)	$\frac{-k}{b_2 P_e}$	$\frac{m'' - b_2(P_m - P_e)}{b_2 P_e}$	0	$\frac{d'}{b_2 P_e}$
R (Farm Income Transfer)	--	--	--	--

-- indeterminate; income transfer not changed by minimum import price.

Other symbols as above.

Changes in World Market Price

The last section dealt with the costs and benefits of alter-
g the policy variables of guaranteed price and minimum import
ice. The minimum import price has not, however, been changed
nce the policy was introduced in the UK Grains Agreement of 1964.
deed it was primarily designed to isolate the UK market from very
w world prices, rather than to influence imports in "normal" years.
e average costs given above refer to any set of prices, where
$> P_m > P_e$. It may be interesting to know how the costs and bene-
s change as the world price changes.[13] An increase in world
ice in the absence of a minimum import price (or if the world price
nt above the minimum as has been the case recently) would reduce
budget and economic costs of the program, reduce the income
nsfer to farmers, and either increase or reduce exchange outpay-
nts. There would be an adjustment cost to grain users but not as
esult of the program. If the world price were below the minimum
port price, then changes in this world price would not change bud-
cost. They would, however, change the economic cost of the
gram. The relevant changes are given in Table 5.6 (minimum

[13] For instance, it may be advisable (on economic grounds)
change the minimum import price (or the guaranteed price) as mar-
price changes. This is done automatically by the "target indica-
" price arrangements, discussed in the next section.

port price inoperative) and Table 5.7 (with a minimum import price effect).

ble 5.6--Marginal Budget and Economic Costs of an Extra Unit of reign Exchange and Farm Income Transfer as World Price Level Changes--No Minimum Import Price Operative.

Cost Benefit	B (Budget Cost)	C (Economic Cost)
F - F' (Exchange Saving)	$\frac{-k}{b_1(G - 2P_e)}$	$\frac{-(G - P_e)}{G - 2P_e)}$
R rm Income Transfer)	$\frac{k}{s}$	$\frac{k - s}{s}$

The act of devaluation, in the present context, is merely hange in the relative price of domestic and foreign goods.[14]

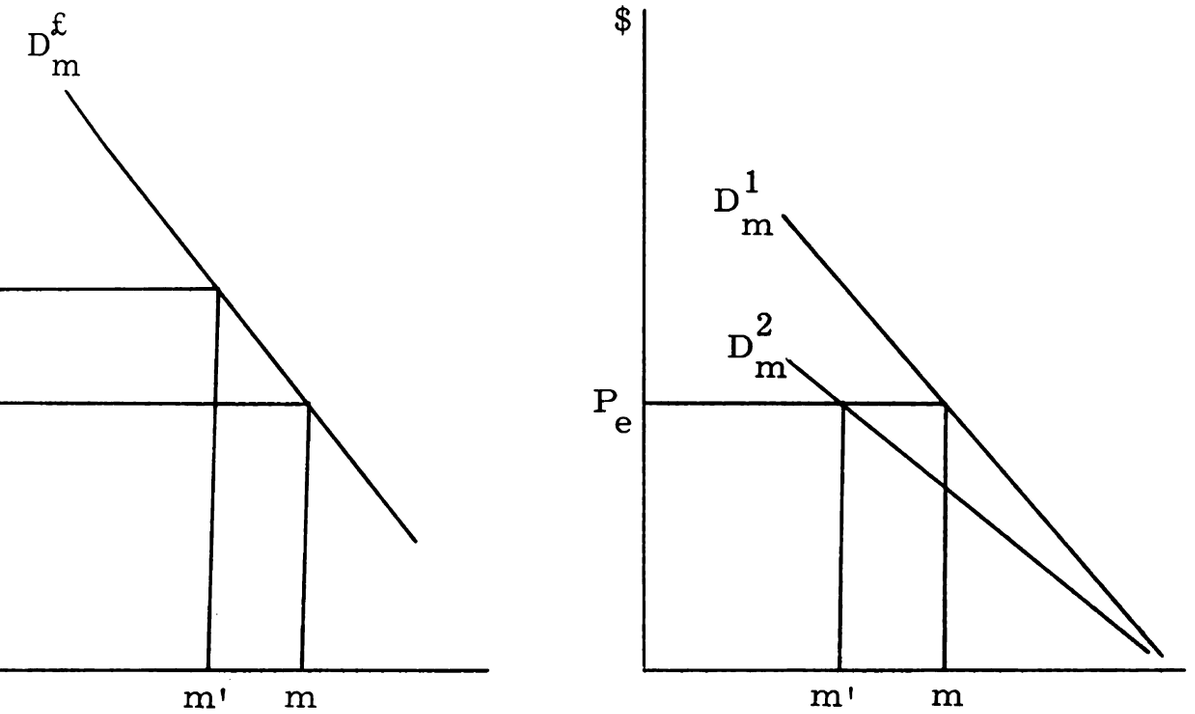
This can be illustrated in Figure 5.8. In (a) is depicted demand for imports, in domestic currency. At the old exchange , this can be translated into the curve shown in (b). If the slope) or price response coefficient is $(b_1 + b_2)$ in domestic currency,[15] $(b_1 + b_2) \div E_1$ in foreign currency, when E_1 is interpreted as the

[14]Discussion of other aspects of devaluation is left until pter VIII.

[15]In the model with a guaranteed domestic price, b_1 is ctively zero, and the "apparent" import demand curve has the e price coefficient as domestic demand, i.e., b_2.

Table 5.7--Marginal Budget, Economic, and Adjustment Costs of an Extra Unit of Foreign Exchange and Income Transfer, as World Price Changes--with Minimum Import Price Operative.

Cost Benefit	B' (Budget Cost)	L (Levy Revenue)	C (Economic Cost)	A (Adjustment Cost)
F - F'' (Exchange Saving with Discrimination)	0	n.a.	$\frac{-b_1(G-P_e)}{(d-s)-P_e(b_1+b_2)}$	$\frac{-d}{(d-s)-P_e(b_1+b_2)}$
F - F* (Exchange Saving without Discrimination)	0	$\frac{(d'-k)}{(d-d')+(k-s)-P_e(b_1+b_2)}$	$\frac{-b_1(G-P_e)}{(d-d')+(k-s)-P_e(b_1+b_2)}$	$\frac{-d}{(d-d')+(k-s)-P_e(b_1+b_2)}$
R (Farm Income Transfer)	0	$\frac{(d'-k)}{k-b_1(G-P_e)}$	$\frac{-b_1(G-P_e)}{k-b_1(G-P_e)}$	$\frac{-d}{k-b_1(G-P_e)}$



(a) Figure 5.8 (b)

e of domestic currency (dollars per pound). Devaluation entails
ring this price, say to E_2. This raises the apparent price re-
se coefficient of the import demand curve in foreign currency
ı D_m^1 to D_m^2 in Figure 5.8 (b)). World price in (say) dollars
ins unchanged, but domestic price of imports is now greater
e proportion of devaluation, rising from P_1 to P_2. The prices
uantities in (a) are relevant for discussing effect on budget
, levies, economic and adjustment costs, and income trans-
d. However, to find the effect on exchange outflow, it is part
Figure 5.8 that is important. Now imports drop by (m - m'),

$$(m - m') = P_1(b_1 + b_2)\left(\frac{E_1 - E_2}{E_2}\right) \qquad 5.19$$

last term being the proportionate devaluation.

Budget cost (in the event that the new price of cereals in estic currency is above the minimum import price) will be re- d because of the higher postdevaluation market price.

$$B^{**} = B^* - k(P_2 - P_1) = k(G - P_2) \qquad 5.20$$

where B^{**} is the new level of budget cost,

B^* is the previous level,

k is the domestic output of grains at guaranteed price G, and

P_1, P_2 are world price P_e in terms of old and new exchange rate.

world price is above the minimum import price (as was the in November, 1967) at the time of devaluation, then the effects dget cost and adjustment cost are identified with the effects of duction of a minimum import price, as described above. Fig- . 9 shows the immediate relative price effect of a devaluation on rain market. Areas are explained below. Guaranteed price is d at this price, output is k. P_1, P_2 are the pre- and post- uation world (market) prices of grains.

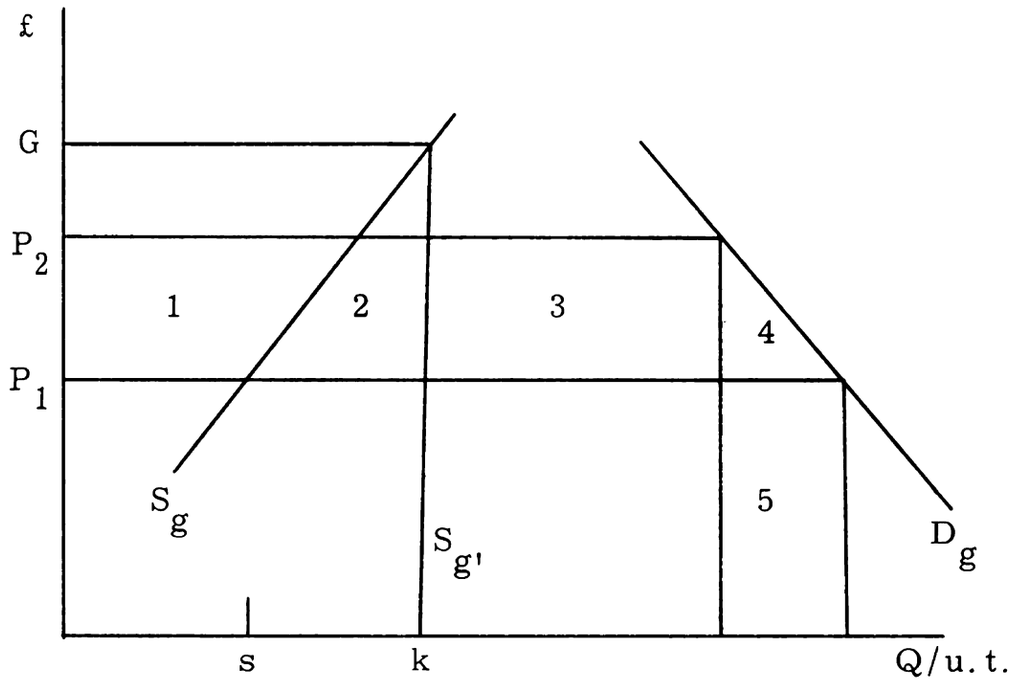


Figure 5.9

Producer income from market rather than deficiency payment; i.e., reduction of transfer, R.

Cost of resources once overemployed in grain production but now "correctly" employed. Gain in real income, C.

2 + 3 + 4 Adjustment cost placed on grain users, A.

Loss in value of production, W.[16]

Throughout the study, changes in the import price are

med to correspond to changes in market price--in other words,

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[16] If the grain-product is imported from a country that has evalued its currency, then there is no way of interpreting this in terms of foreign exchange. If the grain-product exporter has ued as well (such as Denmark and Ireland in November 1967), there is added danger that this area may represent an outflow of gn exchange to pay for increased imports of this grain-product.

domestic and imported grains are close substitutes. In fact, the wo prices have been treated as one, ignoring handling charges and quality differentials. In the UK Grains Agreement (1964), a modification of the method of calculating domestic support was introduced. The standard quantity has been mentioned, but there was also a "target indicator price" set-up which was intended to correspond to the level of the minimum import price. Deviations of the market price om this target price modified deficiency payments.[17] This modification, and a description of the standard quantity mechanism, is ven below.

Standard Quantity Provisions

So far the analysis has been in terms of a guaranteed ce for domestic producers, with or without trade limitations. e Grains Agreement set up a mechanism for reducing the "effective guaranteed price" should domestic production exceed a certain andard quantity." The guaranteed price does not change, but the rage returns to the producer do. Figure 5.10 shows the average urns schedule for a commodity subject to this scheme. If domestic supply is k_1, then the full deficiency payment, $(G - P_m)$, is paid.

[17] This modification was not introduced at the beginning e chapter for the reason that to have done so would have extended lready lengthy taxonomy of market conditions.

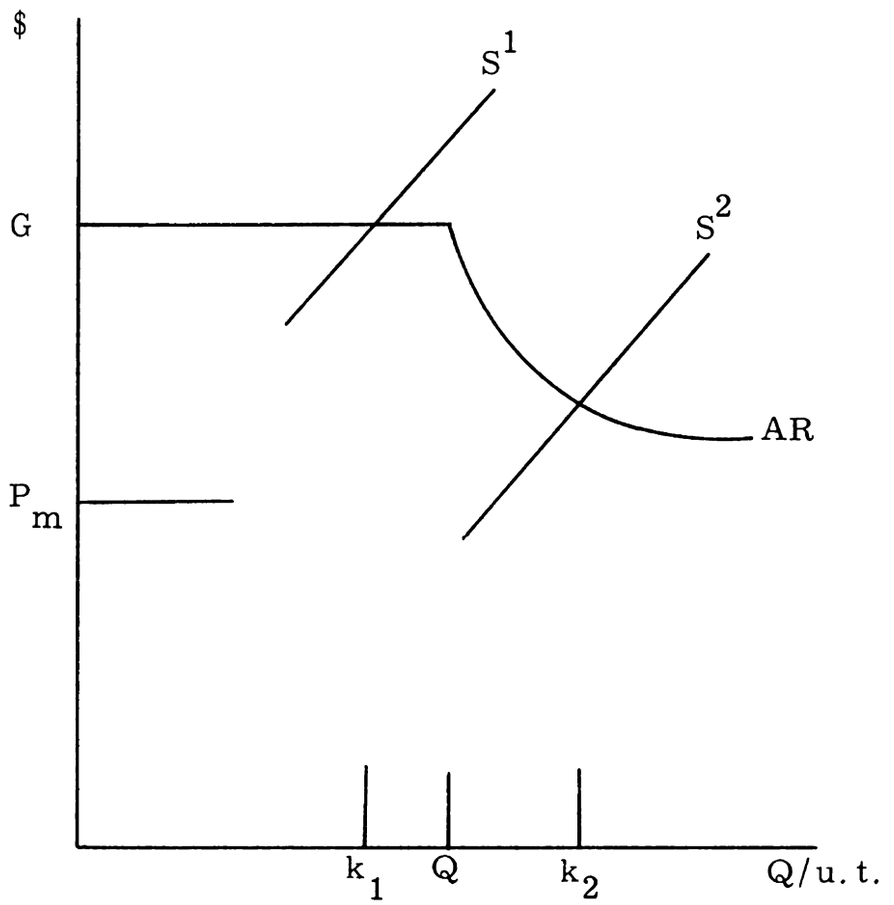

Figure 5.10

hose years when output is greater than Q, say at k_2, then this

ment is reduced proportionately, to $(G - P_m)^*$, where:[18]

$$(G - P_m)^* = (G - P_m) \frac{Q}{k_2} \qquad 5.21$$

The total budget payments are constant for any year with

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[18] As a simple example, if k_2 were greater than Q by 20%, deficiency payment per unit drops by some 16%, and for typical levels this represents a drop of 4% in average revenue to farm- For a short run elasticity of, say 0.5, this implies a drop of 2% in planned output the next year. This 2% reduction is in the of a 20% excess over the standard quantity. This gives some ation as to the effectiveness of the standard quantity mechanism.

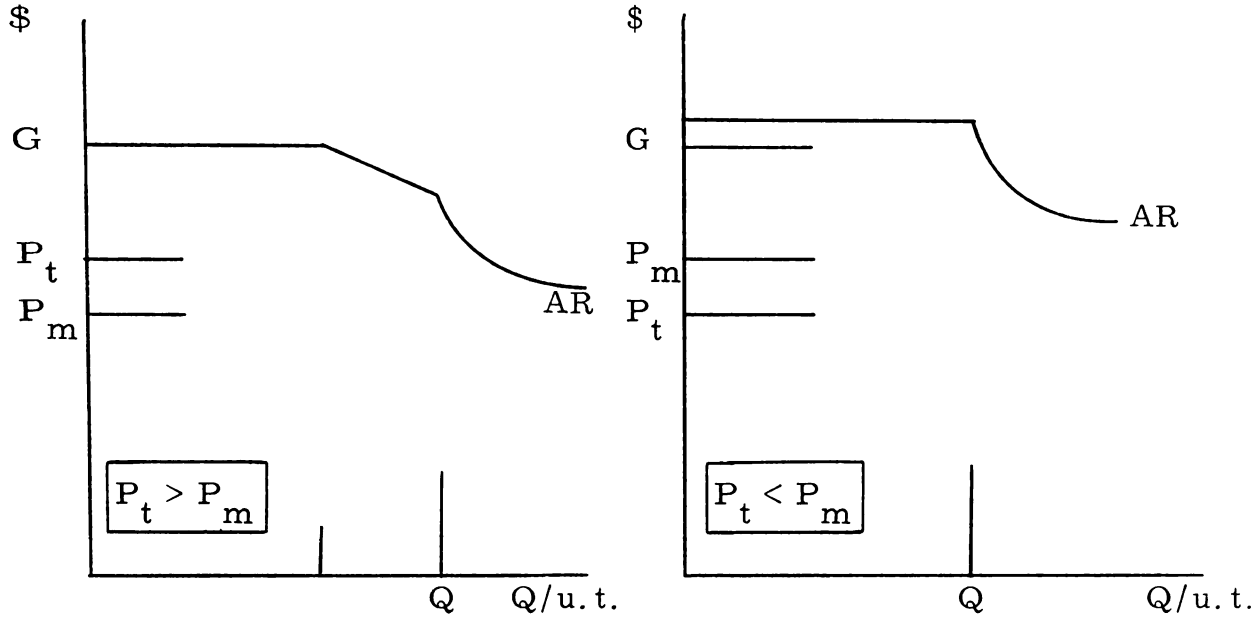
utput above the standard quantity, since:

$$(G - P_m) * k_2 = (G - P_m) Q$$

The system introduced in 1964 was not so simple as just escribed. Another policy variable, the target indicator price was troduced. This was designed to correspond to the minimum import rice, adjusted for handling charges and quality differences. For ose years when the domestic market price is high relative to this rget price, an additional payment is made to producers (of 25% of e difference between target and market price) on crops below the ndard quantity. For crops greater than the standard quantity the get price is of no relevance; the procedure for calculating the de- ency payment being as described in the previous paragraph. If, vever, the market price were to drop below the target price (which ms unlikely if the latter truly represents the import price floor, conceivable if it is varied as a domestic policy instrument), then target price would be used for calculating the payment on large os.

For crops above the standard quantity, this target price sed in place of the market price to calculate the deficiency pay- t. Farmers in this instance receive a payment per unit of the rence between guaranteed and target prices adjusted as before by atio of standard quantity to actual output. For a specified range

below the standard quantity, an "accelerator" mechanism is used to prorate the level of payment according to the difference between target and market price. Below this range, that is for small crops, the simple difference between market and guaranteed price is paid to farmers. These combinations of target and market price, and standard quantity and domestic output, are illustrated in Figure 5.11.



(a) Figure 5.11 (b)

When market price is low relative to target price, it will be seen that the disincentive effect of standard quantity mechanism is brought into operation for crops in a range below the standard quantity (Figure 5.11 (a)), and this disincentive is in fact greater than it would be in the

absence of the target price.[19] An extra incentive is given to farmers in the case where production is below the standard quantity but market price is above the target price (Figure 5.11 (b)). Large domestic crops are discouraged in times of low world prices and output is stimulated when below the standard quantity in times of high world prices. The effect of the standard quantity and target price mechanism on deficiency payment cost and on average farm price is illustrated in Chapter VII; Chapter VI, below, contains estimates of some empirical relationships based on the model of Chapter IV, which appear to indicate that the effect of changes in average producer price on domestic output in the short run is negligible. The standard quantity mechanism should be regarded primarily as a means of regulating government expenditure on deficiency payments.

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[19] Disincentive in this context refers to the difference between the announced guaranteed price, G, and the average producer returns, AR. To get this average price, add the deficiency payment, however calculated, to the market price.

CHAPTER VI

THE UNITED KINGDOM GRAIN MARKET: ESTIMATION OF THE PARAMETERS OF THE MODEL

In Chapter IV, functional expressions were derived which linked supply, demand, and import level of grains to other economic variables. The relations stated there were deterministic. Many other variables are undoubtedly relevant, but have been ignored partly through ignorance of the theoretical reasons for their inclusion. If these omitted variables are random--that is, they can be represented by a disturbance term with a random distribution, then the equations of Chapter IV can be empirically estimated. If, moreover, one assumes the distribution of this disturbance to be normal, of zero mean, homoskedastic, and the individual disturbances for each year to be serially independent, then it can be shown that the estimators produced by the least squares method of regression are unbiased and efficient.[1] These conditions are assumed to hold in

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[1]For the importance of these conditions, see any recent econometrics text such as J. Johnston, Econometric Methods,

this study. No attempt is made to estimate all the parameters of the various equations of Chapter IV. This is primarily because of the limitations imposed by the small number of observations (12) relative to the number of parameters. Neither is the complete set of equations estimated as a whole. This would have entailed the derivation of the reduced form of the structure, and an examination of this reduced form would have been necessary to establish the identification status of any or all equations. The simultaneous approach was rejected for the reason that in the time period from which the data are taken, producer prices have been isolated from world prices by the guaranteed price system. Both guaranteed price and world price are taken as exogenously determined. The major source of interdependence between supply and demand equations--that they are both functions of the same price--is not present in this model. In fact, none of the explanatory variables used in the equations of this chapter are themselves dependent upon variables in other equations

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McGraw-Hill, 1963. That the least squares estimates are efficient under these conditions is only strictly true if all the equations are independent. In the case where the disturbance terms of a group of equations are cotemporaneously related, because, for example, of some excluded variable which affects all the demand equations, then only a "generalized least squares" approach is efficient. Zellner's EFFEST method, for instance, would lead to asymptotically efficient estimates.

of this set. Under these circumstances, the single equation approach is justified.

The time period over which the observations are taken is 1954/55 to 1965/66, referring to crop and trade years.[2] The starting point was chosen because it was the first full year that government restrictions on import purchases and domestic production was relaxed, following the wartime crisis. It is possible that the first few years were atypical, but the number of observations was not enough to allow rejection of any data. Data for 1966/67 were not available at the time the empirical estimates were made. All figures refer to the United Kingdom, and the old exchange rate ($2.80 = £1) is used except where indicated.

Grain Supply Equations

In the discussion of the determinants of the supply of grain it was convenient to separate the acreage of grains from the yield--the former being the most likely to be intentionally adjusted to changing conditions. The same procedure is followed in estimating the supply parameters. Adding a stochastic disturbance, having the standard properties of normality, zero mean, and serial

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[2]The crop year and trade year, for cereals, runs from July to June.

independence, to equation 4.1 and 4.2 gives:

$$A_g = f(P_g, P_a, C, R_f, U_1)$$

where A_g is the planted area of grains,

P_g is the relevant price of grains,

P_a is the price of other inputs used in grain production,

C is the opportunity cost of using land in grain production,

R_f is the fall rainfall, and

U_1 is a stochastic disturbance having the standard properties.

When the equation is applied to any single class of grain, the variable C can be interpreted both as the price of a substitute grain crop and as the cost of not taking the land out of cereals altogether.

Because of the small number of observations, all the relevant variables in an acreage function cannot be used at a time. The procedure used for selecting the equations out of a number of similar combinations of explanatory variables was partly the explanatory power (the $\bar{R}^2$, which is the coefficient of multiple correlation adjusted for degrees of freedom), and partly the significance of the coefficients of the explanatory variables. The results of the regression analyses are presented below a brief comment on each.

Total Cereal Acreage

The total cereal acreage in the United Kingdom appears to be a function of the price of inputs other than land (reflected in the agricultural wage) and the opportunity cost of using land in other ways (represented by the cost of imported grain).[3] The regression analysis gave the following results:[4]

$$\begin{array}{lccc} \text{ACWBON} = & 631.56 & + 35.32\ \text{PMC} & + 23.08\ \text{AGWAGE} \\ & (712.41) & (\ 7.79) & (\ 1.47) \end{array} \qquad 6.1$$

$$\bar{R}^2 = 0.96$$
$$d = 2.3$$

$$\begin{array}{lccc} \text{ACWBON} = & -4067.76 & + 73.651\ \text{ARW} & + 29.29\ \text{AGWAGE} \\ & (3948.24) & (37.562) & (\ 5.35) \end{array} \qquad 6.2$$

$$\bar{R}^2 = 0.91$$
$$d = 1.9$$

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[3] Where grain and livestock enterprise exist on the same farm, the price of purchased feed will affect the decisions as to what crops to plant. The opportunity cost of planting non-grain crops has changed. It should be noted that this is not a "shift in the demand" for grain--that demand is given by the guaranteed price which is applicable to barley retained on farms and wheat which is sold to an accredited merchant. It "shifts the supply" by making alternative crops more or less attractive.

[4] Standard errors are given below the parameter estimates. Adjusted coefficients of multiple correlation ($\bar{R}^2$), and Durbin-Watson statistics (d) are given for each equation. A "d" statistic lower than 1.2 indicates the strong possibility of serial correlation.

where ACWBON — is the total acreage of cereals (wheat, barley, and oats) in the United Kingdom, in the next year (thousands of acres),

ARW, PMC — are the average producer price of wheat and the average unit price of imported corn, respectively ($ per metric ton),

AGWAGE — is the adult agricultural worker wage (shillings per week).

Wheat Acreage

Of the individual grains, the wheat acreage proved the most difficult to explain, as the following results show:

$$\begin{array}{l} ACWN = \underset{(1255.51)}{429.95} + \underset{(50.41)}{83.22}\ GPW - \underset{(34.52)}{59.08}\ GPB \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \bar{R}^2 = 0.08 \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad d = 1.9 \end{array} \qquad 6.3$$

$$\begin{array}{l} ACWN = \underset{(172.37)}{2582.16} + \underset{(16.24)}{23.18}\ PRWB - \underset{(19.23)}{53.79}\ FR \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \bar{R}^2 = 0.35 \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad d = 1.5 \end{array} \qquad 6.4$$

$$\begin{array}{l} ACWN = \underset{(818.39)}{1845.85} + \underset{(12.10)}{27.57}\ PIWW - \underset{(9.41)}{21.56}\ PIWB - 33.90\ FR \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \bar{R}^2 = 0.48 \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad d = 2.1 \end{array} \qquad 6.5$$

where ACWN — is the acreage of wheat in the UK in the next year (thousands of acres),

GPW, GPB — are the guaranteed price of wheat and barley in the UK, respectively ($ per metric ton),

PRWB	is the ratio of wheat price to barley price, including deficiency payments, UK,
FR	is the accumulated rainfall in the UK for the months September to November (in inches),
PIWW, PIWB	are the price indices for whole wheat and whole barley, feeding quality, UK (1954/55 to 1956/57 = 100).

Guaranteed prices alone only explained about 10 percent of wheat acreage variation (6.3), and average producer prices of wheat and barley had even less influence on acreage. Fall rain, which inhibits the planting of winter wheat, accounts for about a third of this variation; together with the market price (index) for feed grains (equation 6.5), one-half of the changes in wheat acreage is explained. From equation 6.4 it appears that the price ratio of wheat to barley is unimportant in this context--a one unit increase in this variable represents a doubling of the price of wheat relative to barley, and that apparently would change wheat acreage only marginally.[5]

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[5]To be able to interpret the coefficient of a price ratio variable in terms of supply response, some care must be taken in constructing the model (equation). For instance, the individual farmer may allot his acreage according to the relative prices of wheat and barley. To suggest that the industry behaves similarly is to assume no changes in total resource use. If one "allows" for these scale changes, then what emerges is a measure of substitution in production which does not answer the relevant questions about supply response to changes in price.

It is possible that the lack of response of wheat producers to short run price changes is due to the fact that the farmers may not know when they make their planting decisions what the returns will be from the crop that they have just harvested. The deficiency payment scheme has a system of graduated payments which encourage "orderly marketing" over some months, and farms have invested in grain storage facilities. However, an average price lagged two years does not explain any more of the variation in acreage; neither does a three year moving average price. Wheat acreage is not adequately explained by the simple models used here.[6]

Coarse Grain Acreage

Changes in barley and oat acreage are somewhat easier to explain. The results of the regression analysis are given below.

$$\begin{array}{lllll} ACBN = & 1346.08 + & 39.78\ RRBW + & 404.23\ T & - 404.67\ DUM \\ & (214.53) & (42.21) & (32.62) & (240.66) \end{array} \qquad 6.6$$

$$\bar{R}^2 = 0.97$$
$$d = 1.8$$

---

[6] Other models that were tried and found unsuccessful were a formulation using distributed lags and one employing first differences of the variables. It is to be hoped that a study in progress at Manchester University, England, will provide some more useful estimates of supply response in wheat.

$$\begin{array}{lllll} \text{ACBN} = -1021.26 + & 47.43\ \text{PIWB} - & 22.08\ \text{PIWW} + & 403.32\ \text{T} & \\ \quad (1073.38) & (16.29) & (15.65) & (\ 23.22) & \end{array} \qquad 6.7$$

$$\bar{R}^2 = 0.98$$
$$d = 2.1$$

$$\begin{array}{lllll} \text{ACBN} = & 262.86 + & 0.86\ \text{ACB} + & 56.55\ \text{PRBW} + & 83.49\ \text{T} \\ & (423.63) & (\ 0.26) & (151.30) & (\ 81.93) \end{array} \qquad 6.8$$

$$\bar{R}^2 = 0.98$$
$$d = 2.9$$

$$\begin{array}{lllll} \text{ACON} = & 2837.86 + & 2.14\ \text{PROB} - & 164.85\ \text{T} & \\ & (\ 46.11) & (\ 5.63) & (\ 5.69) & \end{array} \qquad 6.9$$

$$\bar{R}^2 = 0.99$$
$$d = 1.9$$

where ACBN is the acreage planted to barley in the next year, in the UK (thousands of acres),

ACON is the acreage planted to oats in the next year, in the UK (thousands of acres),

RRBW is the ratio of the rate of return per acre of barley to wheat, UK,

T is a trend variable, T = 1, . . . , 12 (1954/55 = 1),

DUM is a dummy variable (1954/55 to 1957/58 = 0; thereafter = 1),

PIWW, PIWB are price indices of whole wheat and whole barley, feeding quality, UK (1954/55 to 1956/57 = 100),

PRBW is the ratio of producer price of barley to wheat, UK,

PROB is the ratio of producer price of oats to barley, UK,

ACB — is the acreage of barley in the UK, in the year current with the price variables: It is ACBN lagged by one year (thousands of acres).

Guaranteed prices and average producer returns did not have much effect on acreage decisions. The price of bought-in feed was, as in the case of wheat, an important supply shifter (equation 6.7). A time trend is very noticeable in barley acreage. This is primarily due to the radical changes in crop husbandry that has taken place on many cereal farms in the last decade. Established views about the maximum number of barley crops in a rotation were discarded as advances in crop science reduced the risk of disease and reduced the value of the traditional break crop.[7] If, at existing guaranteed price levels, there was a difference between intended and actual barley acreage (because of rotational restraints), then one can picture the change in barley acreage in recent years as being a process of partial adjustment towards the desired level. For this reason, equation 6.8 is "distributed lag" supply curve, where each year

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[7] The traditional notion of the west of England being grassland and the east being arable is rapidly changing. Much of the increased cereal acreage has been due to (a) changing rotational patterns on light chalk soils, where organic matter content was always thought to limit such practices, and (b) the expansion of cereals into the grasslands of the west, aided by stiffer strawed varieties and improved methods of weed control. It should be pointed out that cereal acreage now is back to the level at the end of the war. Few would suggest that the limit to expansion of cereal acreage is being approached.

producers move 14 percent (1 - 0.86) towards the long run desired output at recent barley price levels.[8] Long run elasticity is, in other words, some seven times the short run (annual) value. Oat acreage in the UK has been declining steadily, with virtually no regard to direct or relative producer prices (equation 6.9).[9] In summary, no evidence of a positive short run response in cereal acreage to price is found, though equations 6.3 and 6.8 suggest that there is considerable response to changes in guaranteed price that persist for some time. Conditions in the feed grain market affect the supply of cereals, even though the returns are assured at a higher level by the government program.

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[8]For the original reference to the use of a distributed lag structure in supply analysis, see: M. Nerlove, The Dynamics of Supply: Estimation of Farmers' Response to Price, John Hopkins Press, 1958. Numerous studies have used it since, some perhaps more because it increases the coefficient of multiple correlation when a trend is present than because the assumptions of the model are met. In this case, however, the expansion of barley acreage as technical restrains are eased would seem to indicate that a lagged adjustment model is appropriate.

[9]The reasons usually given for this are (a) the increased use of the combine harvester, which can only be used where the ear is ripe, at which time the straw has lost much of its fodder value, (b) the declining relative yield of oats as compared with barley, and (c) the decrease in the number of horses, the traditional consumer of oats. This last reason is odd in the face of the government decision to ensure a guaranteed price for oats--a sharp decline in the market price for this grain should not deter the producer who is assured of a higher price. The first reason given above is probably better expressed in terms of labor cost--it is the expense of binding and threshing that has required the use of the combine in oat harvesting.

Grain Yield

Equation 4.3 represents grain yield as a function of weather and time. Assuming the weather effects to be random, and adding a disturbance term, this can be written:[10]

$$Y_g = f(t, U_2)$$

where Y_g is the yield of grain,

t is a time trend, representing changes in variety and in husbandry practice,

U_2 is a stochastic disturbance with the standard properties.

The result of fitting this equation for the individual grains is given below:

$$WY = \underset{(0.0575)}{1.1380} + \underset{(0.0077)}{0.0469}\ T \qquad \bar{R}^2 = 0.77,\ d = 2.6 \qquad 6.10$$

$$BY = \underset{(0.0433)}{1.0951} + \underset{(0.0057)}{0.0340}\ T \qquad \bar{R}^2 = 0.75,\ d = 2.0 \qquad 6.11$$

$$OY = \underset{(0.0316)}{0.9247} + \underset{(0.0045)}{0.0227}\ T \qquad \bar{R}^2 = 0.71,\ d = 1.8 \qquad 6.12$$

where WY, BY, OY are the yield of wheat, barley, and oats in the UK, (metric tons per acre),

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[10] It would presumably have been possible to account for yield changes by including measures of rainfall, temperature, and so on. Since there appears no way of predicting the value of these variables, their effect is left in the constant and error terms. For any value of t outside the data these effects will automatically "average," on the assumption that the disturbance, U_2, has a zero mean.

T is a trend variable representing changes in variety and husbandry practice, T = 1, . . . , 12 (1945/55 = 1).

Yields of all three UK cereal crops have been increasing steadily, though oat yield seems to be growing at only half the rate of wheat.

Grain Demand Equations

In Chapter IV, a general demand equation for the demand for the import grain was derived. Adding a stochastic disturbance term, one can write:

$$Q_g = f(P_g', P_o, P_s, Y, t, U_3)$$

where Q_g is the quantity of grains demanded in the UK, at world price P_g',

P_o is the price of other factors used in cooperation with grain,

P_s is the price of products competing with the grain-product,

Y is relevant income,

t is a trend representing changes in factor/product relationships, and

U_3 is a stochastic disturbance with the standard properties.

When this equation is used to explain demand for an individual grain, the price of "other factors," P_o, must include the price of other grains competing closely with the grain in question. No

attempt was made to include the price of substitute products, P_s, in the regressions. The demand for livestock use was separated from the demand for industrial (food) use.

Wheat Demand

The results for wheat are as follows:

$$\begin{array}{lrrrrr} WHT = & 423.30 & + 1.28\ FD & - 3.23\ PHW & + 0.03\ FOOD & \\ & (1319.31) & (0.34) & (6.78) & (0.05) & \end{array} \qquad 6.13$$

$$\bar{R}^2 = 0.67 \qquad d = 0.9$$

$$\begin{array}{lrrr} WHT = & 1076.12 & + 1.14\ FD & - 3.07\ PHW \\ & (772.54) & (0.25) & (6.54) \end{array} \qquad 6.14$$

$$\bar{R}^2 = 0.70 \qquad d = 0.9$$

$$\begin{array}{lrr} WHT = & 1122.82 & + 1.08\ FD \\ & (735.58) & (0.20) \end{array} \qquad 6.15$$

$$\bar{R}^2 = 0.72 \qquad d = 0.8$$

$$\begin{array}{lrrr} WFHT = & 7479.25 & - 6.36\ PHW & - 0.29\ FOOD \\ & (829.30) & (10.49) & (0.07) \end{array} \qquad 6.16$$

$$\bar{R}^2 = 0.70 \qquad d = 2.4$$

$$\begin{array}{lrr} WS = & 14.77 & + 0.0711\ ACWN \\ & (11.06) & (0.0128) \end{array} \qquad 6.17$$

$$\bar{R}^2 = 0.94 \qquad d = 1.2$$

$$WFL = \underset{(3917.06)}{-5380.42} - \underset{(18.43)}{35.78}\ PIWW + \underset{(6.49)}{21.36}\ PMUSC + \underset{(1.05)}{1.75}\ FOOD - \underset{(181.81)}{208.89}\ T$$

$$\underset{6.18}{}$$

$$\bar{R}^2 = 0.62$$

$$d = 2.0$$

where WHT, WFHT are quantities of "wheat" and "wheat and flour" for food use, in the UK (thousands of metric tons),

WS, WFL are quantities of wheat used for seed and for livestock feed, respectively, in the UK (thousands of metric tons),

PHW is the price of milling wheat, UK (delivered, London, $ per metric ton),

PIWW is the price index of feeding quality wheat, UK (1954/55 to 1956/57 = 100),

FOOD is total expenditure on food, UK (£ million),

PMUSC is the price of imported corn (US #3 yellow, $ per metric ton),

FD is domestic production of flour using home and imported wheat, UK (thousands of metric tons),

ACWN is the acreage of wheat in the UK, in the next year (thousands of acres),

T is a time trend, T = 1, . . . , 12 (1954/55 = 1).

In the case of the use of wheat for flour, since the proportion of wheat to flour is likely to be steady and imports of flour are significant, the "derived demand with imports" model of Chapter IV would seem to be appropriate. If so, one would expect changes in wheat price and variables that shift the demand to be unimportant in explaining wheat use. This is confirmed by equations 6.13, 6.14, and 6.15, where omitting such variables (the price of wheat, PMW, and

food expenditure, FOOD) "improves" the regression result. It is possible that the insignificance of the price and food expenditure terms could be due to a near-zero price and income elasticity for the grain-product, flour. However, equation 6.16 is effectively the demand for flour expressed in wheat equivalents;[11] the price effect is more marked and the (negative) income elasticity significantly differs from zero. Wheat for seed is easily explained in terms of anticipated acreage, and wheat used for feed appears to be responsive to prices of feed wheat and corn, as well as to changes in the demand for livestock. No distinct time trend is suggested in the use of wheat for feed.

Coarse Grain Demand

The results obtained for the demand for coarse grains were:

$$\begin{array}{lcccc} BH = & 135.32 & + & 3.98\ PLB & + & 0.0445\ CONEX \\ & (116.77) & & (1.41) & & (0.0024) \end{array} \qquad 6.19$$

$$\bar{R}^2 = 0.98$$
$$d = 2.4$$

$$\begin{array}{lcccc} BS = & 6.022 & + & 0.0649\ ACBN \\ & (2.321) & & (0.0014) \end{array} \qquad 6.20$$

$$\bar{R}^2 = 0.99$$
$$d = 1.3$$

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[11] In other words, WFHT measures domestic production of flour from home and imported wheat, plus imports of flour--all expressed in wheat equivalents at a 72 percent extraction rate.

$$BL = -2165.86 + 8.00\,PLB + 42.83\,PMC + 424.15\,T \quad (6.21)$$
$$(1323.15)\ (22.44)\ (16.59)\ (30.04)$$
$$\bar{R}^2 = 0.96$$
$$d = 1.8$$

$$OH = 200.92 - 5.92\,T - 0.23\,PMC \quad (6.22)$$
$$(58.64)\ (1.62)\ (0.81)$$
$$\bar{R}^2 = 0.61$$
$$d = 2.4$$

$$OS = 32.78 + 0.0603\,ACON \quad (6.23)$$
$$(7.92)\ (0.0040)$$
$$\bar{R}^2 = 0.95$$
$$d = 1.2$$

$$OL = 3207.32 - 125.28\,T - 10.00\,PMC \quad (6.24)$$
$$(483.23)\ (13.35)\ (6.65)$$
$$\bar{R}^2 = 0.91$$
$$d = 1.9$$

$$CH = 704.77 + 55.77\,T - 6.07\,PMC \quad (6.25)$$
$$(136.23)\ (3.78)\ (1.89)$$
$$\bar{R}^2 = 0.98$$
$$d = 2.6$$

$$CL = 5784.18 - 72.11\,PMC + 6.45\,PIWW + 64.57\,T \quad (6.26)$$
$$(1002.48)\ (11.86)\ (12.29)\ (19.57)$$
$$\bar{R}^2 = 0.93$$
$$d = 1.7$$

$$CL = 5510.08 - 74.98\,PMC + 11.17\,PIWB + 73.22\,T \quad (6.27)$$
$$(1021.48)\ (12.09)\ (13.04)\ (21.82)$$
$$\bar{R}^2 = 0.93$$
$$d = 1.7$$

$$CL = \underset{(1116.01)}{3710.52} + \underset{(0.052)}{0.217}\ FEED - \underset{(10.96)}{67.80}\ PMC + \underset{(13.29)}{17.31}\ PLB \qquad 6.28$$

$$\bar{R}^2 = 0.95$$
$$d = 1.9$$

where BH, OH, CH are quantities of barley, oats, and corn used for industrial (non-feedstuff) purposes, UK (thousands of metric tons),

BS, OS are quantities of barley, oats used for seed in the UK (thousands of metric tons),

BL, OL, CL are quantities of barley, oats, and corn used for livestock feeding, UK (thousands of metric tons),

PLB, PMC are prices of feed barley and imported corn, UK ($ per metric ton),

CONEX is total consumer expenditure, UK (£ million),

FEED is production of compound feed, in UK (thousands of metric tons),

ACBN, ACON are acreages of barley and oats, in the next year, UK (thousands of acres),

PIWW, PIWB are price indices for feed wheat and barley, UK (1954/55 to 1956/57 = 100),

T is a time trend, 1954/55 = 1.

Demand for barley for malting (equation 6.19) seems to be growing with increases in consumer spending. There is some positive correlation with the price of feed barley.[12] Barley in

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[12]A consistent average price for malting barley was not available from the regular sources. Had such a series been used it

livestock feeding substitutes well for corn, (equation 6.21), but changes in feed wheat prices have no impact on barley use; nor does the price of barley. The assumption made throughout the study of exogenously determined prices is questionable in the case of barley, where imports are small. There may be problems of identification in this case. The strong time trend probably picks up the rapid adoption of intensive feeding methods (mostly barley) in a sizable sector of the beef fattening industry. When a short supply of suitable calves is overcome, this trend is likely to continue.[13] Oat usage, for food and feed, is declining steadily over time; prices of oats or other grains do not appear to change this trend (equations 6.22, 6.24).

Use of corn for feed in the UK appears to be highly responsive to price, (6.26, 6.27, 6.28), both barley and wheat substituting for this grain as the price increases. Other use of corn, for breakfast cereals and industrial products, is increasing over time

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would have required some assumptions as to the relation between malting and feeding barley prices in Chapter VII. The alternative taken here was to use the price of feed barley directly in the demand for non-feed barley. Feeding barley has increased over the last decade from about one-half to over three-quarters of the total domestic barley crop.

[13]The so called "barley beef" system of feeding, where up to 80 percent of feed intake is barley for the last few months up to slaughter, caught on rapidly after its introduction in about 1961. Within three years, 10 percent of domestic beef was intensively fed. This growth appears to have slowed down primarily because high calf costs have eroded the profit margin enjoyed by the early pioneers.

(6.25). It is apparent that the price of corn, the primary imported feed grains, is important in influencing the production and use of other grains.

Import Demand Equations

If both domestic demand and domestic supply equations have been estimated, then the import demand equations can be derived by subtraction of supply from demand at every price. In the case of corn, the import demand is just the domestic demand, since there is no domestic production. For wheat, where hard wheats enter with no competition from domestic wheats, the import demand is a little different from that implied by this model. Imports will be the difference between soft wheat requirements and domestic wheat production, plus a certain quantity of hard wheats. For this reason, the import demand for wheat was estimated separately. In Chapter IV, the import demand was said to be a function of all the variables that shifted either the supply or demand relations domestically. Under the derived demand model, with imports, price was found to be unimportant in demand; under the guaranteed price scheme, market price did not alter production. The domestic demand for such a grain was a reflection of the production of the grain-product, this relationship changing over time. On the assumption that wheat for milling closely conforms

with the conditions under which the derived-demand-with-import model holds, the following relationship was estimated:

$$Q_{mw} = f(Q_{sw}, Q_f, t, U_4)$$

where Q_{mw}, Q_{sw} are the quantity of wheat for milling imported into the UK, and domestically produced, respectively,

Q_f is the output of flour from UK mills,

t is a time trend, for changes in input-output relationships over time, and

U_4 is a stochastic disturbance with the standard properties.

The result was as follows:

$$\begin{array}{l} WHM = \underset{(946.71)}{96.53} - \underset{(0.098)}{1.268}\ WHD + \underset{(0.258)}{1.427}\ FD + \underset{(8.198)}{14.581}\ T \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad 6.29 \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \bar{R}^2 = 0.96 \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad d = 2.2 \end{array}$$

where WHM, WHD are quantities of imported and domestic wheat for milling (thousands of metric tons),

FD is domestic flour production (thousands of metric tons),

T is a trend variable, 1954/55 = 1.

As domestic wheat use expands, so imports are cut down. An extra ton of flour appears to call for 1.4 tons of wheat to be imported, and

the import demand seems to be rising over time, ceteris paribus.

Many of the relationships in equations 6.1 to 6.29 will be used in the next chapter, to answer questions as to the potential effects of the minimum import price policy embodied in the UK Grains Agreement, 1964.

CHAPTER VII

POTENTIAL EFFECTS OF THE UNITED KINGDOM GRAINS AGREEMENT (1964)

The three year history of the Agreement does not allow one to make direct observations as to the effects of such a policy. The minimum prices were set at a level below the prevailing world price for all the specified grains. Since that time these minimum prices have remained unchanged. With the exception of some soft wheat from Continental Europe, no grains have as yet incurred a levy. The main effect of the policy has been to exclude marginal quantities of such low priced grain, which presumably stabilized domestic prices for short periods of time and benefited the signatory exporters somewhat. The levies have only amounted to £0.137 million in three years, none relating to supplies from the four original signatories.

The introduction of standard quantities as a part of the Agreement has reduced payments to domestic producers. Table 7.1 gives the guaranteed prices, standard quantities, and average producer returns for recent years. It is apparent that barley production

Table 7.1 -- Domestic Prices and Production of Wheat and Barley, United Kingdom, 1963/64 to 1967/68.

	1963/64	1964/65	1965/66	1966/67	1967/68
I. WHEAT					
Guaranteed Price ($/m.t.)	73.02	73.02	70.06	70.06	71.43
Target Price ($/m.t.)	*	55.11	56.50	56.50	56.50
Average Producer Price ($/m.t)[a]	73.92	71.88	68.12	**	**
Standard Quantity (million metric tons)	*	3.35	3.46	3.71	3.81
Domestic Production (million metric tons)	3.05	3.79	4.17	3.55	**
II. BARLEY					
Guaranteed Price ($/m.t.)	73.50	73.50	69.80	69.80	69.80
Target Price ($/m.t.)	*	52.36	52.36	52.36	52.36
Average Producer Price ($/m.t.)[a]	73.44	71.74	68.40	**	**
Standard Quantity (million metric tons)	*	6.60	6.86	7.47	7.98
Domestic Production (million metric tons)	6.71	7.52	8.19	8.95	**

[a]Average producer prices can be above guaranteed prices because of the system of scales deficiency payments used to influence the seasonality of marketing.

* not applicable

** not available

Source: U.K. Annual Review, various years.

has continued to increase despite the operation of the standard quantities. Levels of cereal imports have fallen below the 9 million (long) tons mentioned in the Agreement as satisfactory,[1] though this may have been an unrealistic target in the sense that 1961/62 imports were exceptionally high. In only three years of the past ten have grain imports exceeded 9 million tons. The drop in imports in 1964/65 (see Table 7.2) was not continued in 1965/66. Imports as a proportion of total use has, on the other hand, declined steadily since 1964, in line with the trend since 1958.

Table 7.2 -- Imports of Grain into the United Kingdom, in thousands of long tons, 1961/62 to 1966/67.

	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67[a]
Wheat and Wheat Flour	4,609	4,182	4,534	4,120	4,590	4,280
Barley	531	292	412	274	192	120
Corn	3,938	3,831	3,431	3,140	3,490	3,485
Total Cereals	9,675	8,757	8,671	7,947	8,825	8,530

[a] Figures for 1966/67 are provisional.

Source: U.K. Annual Review, various years.

[1] But see the discussion in Chapter III, above.

Table 7.3 indicates the level at which the minimum import prices were set in the 1964 Agreement. Grain prices had been rising steadily since 1959, though they dipped a little in 1962/63. The minima that were set were well below the prevailing prices (1963/64). Strong demand has kept world prices up until recently, and there is no evidence that import prices would in general have dropped in the absence of the UK policy. Two recent events have changed the possible relevance of the minimum import price. First, during the summer of 1967 world wheat prices began to fall. A sequence of large crops and the successful replenishment of stocks in various countries were the primary reasons. Indeed there is some doubt as to whether the new International Cereals Agreement (see Chapter II, above) will be ratified if price levels drop further. These events would suggest that the UK minimum import price might have become important at least in wheat trade in the coming months. The devaluation of the pound of November 1967 has changed this outlook somewhat. Grain prices will undoubtedly rise sharply in terms of domestic currency.[2] The chance of prices falling to the minimum import price, which is given in sterling, is remote. The last column of Table 7.3 shows

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[2] If a country such as Australia were to devalue too, then UK price of Australian wheat might not rise so much.

Table 7.3 -- Import Prices of Grains, c.i.f. UK, 1961/62 to 1965/66.[a]

	1961/62	1962/63	1963/64	1964/65	1965/66	MIP[b]	MIP[c]
WHEATS							
Canadian #2, Man.	78.0	76.8	80.5	80.4	81.9	73.0	62.6
US #2, hard winter	76.2	76.9	79.2	76.3	73.1	69.6	59.7
US #2, sort red winter	66.1	63.2	69.8	67.6	67.7	64.8	55.5
Argentine, up river nfs	72.3	68.8	75.4	70.5	70.4	69.6	59.7
Australian, f.a.g.	70.1	69.0	74.7	69.9	72.4	67.5	57.9
French, milling	65.3	59.1	64.4	64.7	65.3	62.0	53.1
UK milling wheat[b]	64.4	54.5	63.1	63.3	61.2	56.5[d]	48.4[d]
FEED GRAINS							
US #3 yellow corn	55.4	57.2	61.5	64.5	63.4	57.9	49.6
UK feed barley[b]	62.8	56.0	57.6	61.7	59.9	52.4[d]	44.9[d]

[a]Prices in dollars per metric ton.

[b]Minimum import prices, and prices of domestic grain converted to dollars at $2.80 = £1.

[c]Minimum import prices, at new exchange rate of $2.40 = £1.

[d]Target prices, not minimum import prices.

Source: IWC, World Wheat Statistics, various issues.

the minimum prices at the new exchange rate.[3]

Although direct observation of the effect of minimum import prices is ruled out, it is possible to calculate what the costs and benefits would have been if world prices had in fact been below the minima. The objectives stated at the beginning of the study were to determine the potential impact upon the following:

i) cereal producers in the UK

ii) livestock producers in the UK

iii) millers and other grain users

iv) UK budget cost

v) UK balance of payments

vi) real resource cost

In the light of the analysis of Chapter V, it is clear that those objectives correspond to finding values for changes in R (cereal producers' surplus), A (adjustment cost to livestock feeders and millers), B (government deficiency payment bill), changes in F (foreign exchange outflow), and C (economic cost of resource malallocation). For any given set of policy parameters (guaranteed price, G, and minimum import price, P_e), these quantities are functions of the parameters of supply and demand, and of the world market price. The aim of

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[3]There is, of course, the possibility that the minimum import prices will be raised in the light of the new situation.

this chapter is to do three things. First, the analysis of the policy as laid out in Chapter V is applied to the circumstances in the market for grains in two recent years, on the assumption that the minimum import price policy was in effect. The years are 1961/62, when corn prices were low, and 1962/63, when wheat prices were depressed. The Agreement of 1964 was presumably stimulated by conditions in these years. In other words, the objective is posed as "what would the effects of the program have been in those two years had the policy been in operation?" Secondly, the sensitivity of these effects to different estimates of the supply elasticity for domestic cereals is discussed. Thirdly, in view of the emphasis on the Grains Agreement on limiting financial assistance to UK farmers, the standard quantity provisions of the policy are examined with the aim of detailing the extent to which payments to farmers would have been controlled in the event that this plan had been in operation for the last few years. The next chapter summarizes the implications for and the relevance of this policy to the rapidly changing conditions in temperate agricultural trade.

Policy Effects Quantified

In this section the question is asked, "If in the years 1961/62 and 1962/63 the UK Grains Agreement, with its schedule of

minimum import prices, had been in existence, then what would have been the levels of production, imports, and use of grains in those years?" From these levels can be ascertained budget cost, exchange outlay, and adjustment costs. If domestic production in the absence of any guaranteed price program is estimated, then economic cost and farm income transfer can be calculated. A convenient way of expressing the various costs and advantages of a program is to calculate the ratios--in other words, the average cost of one unit of "benefit."[4] In the context of making a decision as to whether to continue a program, these average costs are informative. If, on the other hand, the decision-maker had to ponder changes in the levels of the policy parameters--in this case guaranteed price and minimum import price--then a more relevant piece of information is the marginal cost of obtaining an objective. There will in fact be three marginal costs corresponding to changes in the two policy parameters and the autonomous change in world market conditions. The relationship between these should be elaborated. Assume a simple domestic policy of a guaranteed price supported by deficiency payments to producers. There will be an economic resource cost,

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[4]The word "benefit" is used here to mean the policy objectives, saving of foreign exchange and transfer of income to grain producers, which are quantified in the model.

as shown in Chapter V, above. If the world market price drops, then the economic cost of protecting the domestic industry is increased (the cost, that is, of transferring income to grain farmers and of saving foreign exchange). The increase in cost is a measure of how sensitive the policy is to changes in market price.[5]

The Market for Coarse Grains, 1961/62, with 1964 Minimum Import Price Policy

Prices of corn on the UK market were depressed in and around 1961/62.[6] They were lower than the minimum import price introduced in 1964.[7] The implications of a minimum import price policy can be studied by examining the market conditions which would have prevailed if the 1964 minimum import price had been in operation in 1961/62.[8] The steps are as follows:

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[5]Of course, this measure is not a decision-making variable in itself; to decide what steps to take in the light of the change in market conditions, one still has to look to the marginal costs associated with small changes in the policy parameters.

[6]The import price for corn had dropped from a high of over $74/ton in 1956/57 to a low of $56/ton in 1961/62 and 1962/63 but rose again to $66/ton by 1965/66.

[7]The minimum price for US #3 yellow corn was set at $57.9/ton.

[8]This technique of "backcasting" has the advantage over simulating future market conditions in that it places much less reliance upon extrapolations from the regression analysis. For instance, grain supply can be assumed given at the actual 1961/62 levels, as this

i) Isolate the grain or groups of grains to be studied;

ii) Express the demand relationships for this group in terms of one price;

iii) Determine the corresponding domestic supply price, market price, and the relevant minimum import price;

iv) Estimate the hypothetical domestic output at world market prices (i.e., without guaranteed price program);

v) Express the resulting model in terms of the parameters of Chapter V, above; and

vi) Calculate the relevant expressions.

It is convenient at present to isolate the group of coarse grains--barley, oats, and corn. Imports of sorghum grains will be ignored, as will imports of feed wheat.[9] The relevant demand relationships, having substituted actual 1961/62 values for all the non-price explanatory variables, are:

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supply will have been influenced by previous price levels. In view of the unsatisfactory nature of the supply response relationships for wheat, as given in Chapter VI, forecasting future market conditions with and without a minimum price policy was rejected. Reenforcing this decision was the fact that the recent devaluation has made it very unlikely (in the absence of a change in policy) that the minima will ever become operational.

[9]Imports of feed wheat were small at this time. To the extent that they might have increased with higher corn prices, the exchange saving is overstated in the text.

BH = 930 + 3.98 PLB		from 6.19
BS = 265		from 6.20
BL = 1227 + 8.00 PLB + 42.38 PMC		from 6.21
OH = 154	- 0.23 PMC	from 6.22
OL = 2205	- 10.00 PMC	from 6.23
OS = 135		from 6.24
CH = 1151	- 6.07	from 6.25
CL = 5655 + 17.31 PLB - 67.80 PMC		from 6.28

where BH, BS, BL are usage of barley for industrial purposes, seed, and livestock feed (000 metric tons),

OH, OS, OL are usage of oats for industrial purposes and livestock feed (000 metric tons),

CH, CL are usage of corn for industrial and livestock purposes (000 metric tons), and

PMC, PLB are prices of imported corn, and UK feeding quality barley ($/metric ton, UK price converted at old exchange rate).

In 1961/62, the price of barley was about $56/ton, and corn $55.4/ton. The minimum prices introduced in 1964 were, for barley and corn, $52.4/ton and $57.9/ton respectively.[10] The minimum

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[10]Market prices refer to "average producer price--ex deficiency payment" for barley, and c.i.f. price of US #3 yellow in the case of corn. Minimum prices are "target price" for barley, designed to correspond to the minimum import price, and the price set for US Yellow Corn.

for barley would thus have been inoperative--the market price prevailing. At this barley price ($56.0/ton) the total demand for coarse grains can be written as a function of the corn price.[11]

$$CGT = 13,362 - 41.27\ PMC \qquad 7.1$$

where CGT is the total quantity of oats, barley, and corn demanded (000 metric tons), and

PMC, PLB are corn and barley prices as before.

Domestic supply of oats and barley was 6,905 thousand metric tons in 1961/62. If the market price for barley ($56.0/ton) is taken as an indication of the equilibrium price level, in the absence of the program, then the reduction in price from a guaranteed price of $76.0/ton represents a drop of 26 percent. The supply curves reported in the last chapter were estimated from time series over a period where guaranteed price did not change greatly. In a report for the U.S.D.A. a team of Oxford economists calculated (inter alia) the long run supply elasticity of barley as 1.32, and of oats as 0.85.[12]

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[11] Some problems are glossed over here regarding the validity of reducing the demand curve down to a function of one price, and then varying one of the other prices assumed fixed. In other words, increases in the price of barley along with corn, as will be encountered below, should shift the demand curve for corn and oats. The size of this shift appears small and will be ignored.

[12] See USDA, United Kingdom, Projected Level of Demand, Supply and Imports of Farm Products in 1965 and 1975, ERS-Foreign-

The elasticity for coarse grains will be taken as 1.2. Using this elasticity value as being relevant over the range between market price ($56.0/ton) and guaranteed price ($76.0/ton), the domestic output in the absence of such a guarantee would have been 4,751 thousand metric tons instead of the actual output of 6,905 thousand tons of coarse grains.

In Chapter V the policy variables, the costs and benefits of the program under consideration, were expressed in terms of the parameters of domestic supply and demand, and of the guaranteed, market, and minimum import prices. For convenience, these expressions are listed below.

Guaranteed Price Program:

Budget Cost	(B)	$= k(G - P_e)$	from 5.8
Exchange Saving	$(F - F')$	$= b_1(G - P_e)P_e$	from 5.7
Economic Cost	(C)	$= \frac{1}{2}b_1(G - P_e)^2$	from 5.9
Farm Income Transfer	(R)	$= \frac{1}{2}(k + s)(G - P_e)$	from 5.10

Guaranteed Price and Minimum Import Price Program:

Budget Cost	(B')	$= k(G - P_m)$	from 5.11

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19. The research was done at the Institute for Research in Agricultural Economics of Oxford University, Oxford, England, under the leadership of Colin Clark. Unfortunately no standard errors are reported for the estimates, and no indication appears to be given of the time period used for the time series analysis.

Levy Revenue	(L)	$= m''(P_m - P_e)$	from 5.15
Exchange Saving			
with Discrimination	$(F - F'')$	$= (d - s)P_e - m''P_m$	from 5.12
without Discrimination	$(F - F^*)$	$= (d - s - m'')P_e$	from 5.13
Adjustment Cost	(A)	$= \frac{1}{2}(d + d')(P_m - P_e)$	from 5.15

where G, P_e, P_m are the guaranteed, free market, and minimum import prices,

a_1, a_2 are the constant terms in the domestic supply, demand equations,

b_1, b_2 are the price response coefficients of domestic supply, demand,

k, s are the domestic grain output under guaranteed and free market prices ($k > s$),

d, d' are domestic demand for grains under market and minimum import prices ($d \geq d'$),

m'' is the level of imports under the minimum import price,

so that

$$k = a_1 + b_1 G$$

$$s = a_1 + b_1 P_e$$

$$d = a_2 - b_2 P_e$$

$$d' = a_2 - b_2 P_m$$

$$m'' = a_2 - k - b_2 P_m$$

Now from the assumption about supply elasticity and from the demand equation derived above (7.1), one can assign values to these parameters and variables, for the given set of prices.

b_1	= 107.7 (000 tons/$)	k	= 6,905 (000 tons)
b_2	= 41.6 (000 tons/$)	s	= 4,751 (000 tons)
G	= 76.0 ($/ton)	d	= 11,076 (000 tons)
P_e	= 55.4 ($/ton)	d'	= 10,972 (000 tons)
P_m	= 57.9 ($/ton)	m''	= 4,067 (000 tons)

Table 7.4 shows the values of the expressions for the costs and benefits of the guaranteed price program, together with changes in these values as the level of price guarantee and the market price change by $1/ton. The economic cost, for example, appears to increase by just over two million dollars as the guaranteed price for

Table 7.4 -- Value of Cost and Benefit Variables, and Changes in These Variables, as Guaranteed Price and Market Price Change; Coarse Grain Market, United Kingdom, 1961/62.

Variable	Value, in Thousands of Dollars	Effect, in Thousands of Dollars, of a One Dollar per Ton Change in	
		Guaranteed Price (G)	Market Price (P_e)
Budget Cost (B)	142,243	9,123	-6,905
Exchange Saving (F - F')	119,332	5,967	-3,749
Economic Cost (C)	22,833	2,218	-2,218
Farm Income Transfer (R)	119,410	6,905	-4,687

coarse grains is increased by one dollar a ton. The policy objectives of exchange saving and income transfer also benefit, by about six and seven million dollars respectively. In Chapter V it was suggested that two measures of a policy were appropriate. The average cost is the ratio of cost to benefit (such as budget cost per dollar of exchange transfer), and is meaningful when considering the dissolution of the program. The marginal cost refers to the extra cost per unit of extra benefit (such as the added economic cost of an extra dollar transferred to farm income), and is relevant when changes in policy (such as the level of guaranteed price) are considered. It is also of interest to measure the sensitivity of costs to changes in market price (extra cost per unit of added benefit, as a result of a change in market price by one dollar).

Table 7.5 summarizes all these measures. A dollar's foreign exchange, on average costs $1.19 in budget outlay for domestic programs, and another $0.19 in resources employable elsewhere. However, an extra dollar of exchange will entail an extra $1.53 in budget outlay, and $0.37 in resource cost. By coincidence, a dollar transferred to farm income through the guaranteed price scheme also costs, on average, $1.19 in budget expense, and $0.19 in resources. The marginal dollar transferred, by raising guaranteed price, costs $1.32 in budget cost and $0.32 in resource "wastage."

Table 7.5 -- Average and Marginal Budget and Economic Costs of Changes in Exchange Saving and Income Transfer; Coarse Grain Market, United Kingdom, 1961/62, in the Absence of a Minimum Import Price.

Benefits	Costs	
	Budget Cost (B)	Economic Cost (C)
I. Average Cost; Dollar Cost per Dollar of Benefit		
Exchange Saving (F - F')	1.19	0.19
Income Transfer (R)	1.19	0.19
II. Marginal Costs; Addition to Costs in Dollars of an Extra Dollar of Benefit as the Level of Guaranteed Price (G) Is Changed		
Exchange Saving (F - F')	1.53	0.37
Income Transfer (R)	1.32	0.32
III. Marginal Costs; Addition to Costs in Dollars of an Extra Dollar of Benefit as the Level of Market Price (P_e) Changes.		
Exchange Saving (F - F')	1.84	0.59
Income Transfer (R)	1.47	0.47

As market price rises (Table 7.5 Part III) budget cost is more sensitive to such changes than either exchange saving or income transfer; economic cost, however, is relatively insensitive.

The introduction of a minimum import price for corn at $57.9/ton, with the world price at $55.4/ton, would have reduced imports of coarse grains from 4,171 thousand tons to 4,067 thousand tons. If a levy had been collected (of some $10 million) then outpayments of foreign exchange would have been reduced by $5.8 million. In the event that exporters discriminated against the UK by raising their offer price, more foreign exchange would have been paid out (by some $4.4 million) for imported grains than before the minimum price was instituted. Government cost of the domestic deficiency payment scheme is decreased by $17 million, but there is a loss in producers' surplus in the grain-using sectors (compounding and livestock feeding, chiefly) of about $27 million. Table 7.6 gives the new levels of the cost and benefit variables under the minimum import price, and their sensitivity to price changes.

In order to analyse, rather than merely describe, the effects of the minimum import price policy, one must look at the average and marginal costs of exchange saving and income transfer. Table 7.7 gives these relative effects. Average budget cost of both exchange saving and income transfer are lower than in the absence of the minimum import price program. The average resource costs have changed only slightly, but there is now an adjustment cost borne by the grain-using industry of $0.23 for each dollar transferred to

Table 7.6 -- Value of Cost and Benefit Variables, and Changes in these Variables as Guaranteed, Market, and Minimum Import Prices Change; Coarse Grain Market, 1961/62, United Kingdom, under 1964/65 Minimum Import Price.

Variable	Value in Thousands of Dollars	Effect, in Thousands of Dollars, of a One Dollar Change in		
		Guaranteed Price (G)	Minimum Import Price (P_m)	Market Price (P_e)
Budget Cost (B')	124,980	8,854	-6,905	0
Levy Revenue (L)	10,168	-269	3,953	-4,067
Economic Cost (C)	22,833	2,218	0	-2,218
Adjustment Cost (A)	27,560	0	10,972	-11,076
Exchange Saving				
With Discrimination (F - F'')	114,926	6,236	-1,658	-1,947
Without Discrimination (F - F*)	125,093	5,967	2,305	-6,014
Income Transfer (R)	119,410	6,905	0	-4,687

Table 7.7 -- Average and Marginal Budget, Economic, and Adjustment Costs of Changes in Exchange Saving and Income Transfer; Coarse Grain Market, United Kingdom, 1961/62, with 1964/65 Minimum Import Price.

	Budget Cost (B)	Levy Revenue (L)	Economic Cost (C)	Adjustment Cost (A)
I. Average Cost; Dollar Cost per Dollar of Benefit				
Exchange Saving				
With Discrimination (F - F'')	1.09	n.a.	0.20	0.24
Without Discrimination (F - F*)	0.99	0.88	0.18	0.22
Income Transfer (R)	1.05	0.09	0.19	0.23
II. Marginal Cost; Addition to Costs in Dollars of an Extra Dollar of Benefit, as the Level of Guaranteed Price (G) is Changed				
Exchange Saving				
With Discrimination (F - F'')	1.42	n.a.	0.36	0
Without Discrimination (F - F*)	1.48	-0.05	0.37	0
Income Transfer (R)	1.28	-0.04	0.32	0

Table 7.7 -- Continued.

	Budget Cost (B)	Levy Revenue (L)	Economic Cost (C)	Adjustment Cost (A)
III. Marginal Cost; Addition to Costs in Dollars of an Extra Dollar of Benefit, as the Level of Minimum Import Price (P_m) Is Changed				
Exchange Saving				
With Discrimination (F - F'')	4.16	n.a.	0	-6.62
Without Discrimination (F - F*)	-3.00	1.71	0	4.76
Income Transfer (R)	----	----	0	----
IV. Marginal Cost; Addition to Costs in Dollars of an Extra Dollar of Benefit, as Market Price (P_e) Changes				
Exchange Saving				
With Discrimination (F - F'')	0	n.a.	1.14	5.69
Without Discrimination (F - F*)	0	0.68	0.37	1.84
Income Transfer (R)	0	0.87	0.47	2.36

n.a. = not applicable

farm income, on average, and a cost of about the same magnitude for every dollar of exchange saved by the protection of domestic cereal production. These cereal users are in effect being "taxed" to pay for about one-quarter of the farm income and import-substitution policies (for coarse grains).

Marginal budget costs of meeting objectives by changing guaranteed price are lowered by the introduction of the import price floor (Table 7.7 Part II), but only slightly; marginal resource cost does not change. Changing the guaranteed price imposes no extra cost on grain users. There is now, however, another policy alternative to consider. Changes in the minimum import price depend crucially for their impact upon the behavior in the export market; if exporters raise their prices to the UK, then the cost of a dollar of foreign exchange is over $4 in budget outlay. This exchange saving could be accomplished by reducing the minimum import price. This would also have the effect of relieving the burden on grain users by some $6.60. In the event that a levy is extracted--implying that exporters have not discriminated against the UK market--then raising the minimum import price saves foreign exchange, yields a levy (of $1.70 for each dollar saved) and does not waste resources (economic cost is not increased). The burden, however, is borne by the grain user. Adjustment cost is seen to be relatively sensitive to changes in world market

price. Budget cost is insulated from such changes (Table 7.7 Part IV) --which, of course, is one of the major aims of the policy.

The policy has the effect, therefore, of transferring some of the burden of income support and export displacement from the government to the user of the grains. Livestock enterprise on farms is likely to be hard hit, and imports of pigmeat may erode any exchange saving that accrues in the cereals sector.

The Market for Wheat, 1962/63, with 1964 Minimum Import Price Policy

Grains were still priced low on the UK market in 1962/63. Though the price of corn was up somewhat from 1961/62, the price of wheat was as low as at any time since 1954. The average "unit value" price to wheat farmers (ex government payments) was $48.0/ton. The "target price" which is designed to correspond to the minimum import price, adjusted for handling and quality, was set for domestic wheat at $56.5/ton following the 1964 Agreement. If it is assumed that this minimum price was in effect in 1962/63, then the impact of the policy can be assessed.

Following the procedures of the last section, and restricting the analyses to wheat for flour and feed, gives the demand conditions:

WHT = 5583 from 6.15

WFL = 5204 - 35.78 PIWW from 6.18

where WHT, WFL are total wheat use for flour and for livestock feed, in UK (000 metric tons), and

PIWW is the price index of whole wheat, 1954/55 to 1956/57 = 100.

Now the value for PIWW at a market price of $48.00 is 81.1, and at $56.5 is 93.8. The USDA sponsored study, referred to above, gives a supply elasticity in the long run for wheat of 1.23. Domestic production of wheat in 1962/63, under a guaranteed price of $75/ton, was 3,974 thousand tons. A market price of $48/ton would, therefore, have elicited only 2,158 thousand tons. The market conditions can be summarized as:

b_1	= 67.3 (000 tons/$)	d	= 7885 (000 tons)
b_2	= 53.4 (000 tons/$)	d'	= 7431 (000 tons)
m''	= 3457 (000 tons)	G	= 75.0 ($/ton)
s	= 2158 (000 tons)	P_e	= 48.0 ($/ton)
k	= 3974 (000 tons)	P_m	= 56.5 ($/ton)

where b_1, b_2 are price coefficients of supply and demand,

s, k are domestic supply, under prices P_e, G,

d, d' are demand under prices P_e, P_m,

m'' is the level of imports, with price P_m, and

G, P_e, P_m are guaranteed, world market, and minimum import price of wheat, respectively.

From these parameter values and price levels, the value and rate of change of the policy (cost and benefit) variables can be calculated, as before. Table 7.8 lists these values.

Table 7.8 -- Value of Cost and Benefit Variables, and Changes in These Variables, as Guaranteed Price and Market Price Change; Wheat Market, United Kingdom, 1962/63.

Variable	Value, in Thousands of Dollars	Effect, in Thousands of Dollars, of a One Dollar Per Ton Change In	
		Guaranteed Price (G)	Market Price (P_e)
Budget Cost (B)	107,298	5,791	-3,974
Exchange Saving (F - F')	87,168	3,230	-1,409
Economic Cost (C)	24,531	1,817	-1,817
Farm Income Transfer (R)	82,767	3,974	-2,157

The wheat program, in 1962/63, appeared to cost about $107 million, saving some $87 million in foreign exchange over the cost of imports in the absence of a guaranteed price. $83 million is transferred to farm income, and at a resource cost of some $25 million. Again, the average and marginal costs are informative. These are given in Table 7.9. Foreign exchange saved by the stimulation

Table 7.9 -- Average and Marginal Budget and Economic Costs of Changes in Exchange Saving and Income Transfer; Wheat Market, United Kingdom, 1962/63.

Benefits	Costs	
	Budget Cost (B)	Economic Cost (C)
I. Average Cost; Dollar Cost per Dollar of Benefit		
Exchange Saving (F - F')	1.23	0.28
Income Transfer (R)	1.30	0.30
II. Marginal Costs; Addition to Costs in Dollars of an Extra Dollar of Benefit as the Level of Guaranteed Price (G) Is Changed		
Exchange Saving (F - F')	1.79	0.56
Income Transfer (R)	1.46	0.46
III. Marginal Costs; Addition to Costs in Dollars of an Extra Dollar of Benefit as the Level of Market Price (P_e) Changes		
Exchange Saving (F - F')	2.82	1.29
Income Transfer (R)	1.84	0.84

of domestic wheat production cost, on average, about $1.23 in budget outlay and $0.28 in resource "waste." Similarly, domestic transfer of income to wheat farmers cost some $1.30 in government payments and a further $0.30 in resource loss. Again, marginal

cost is greater than average cost. An extra dollar of exchange saved, through stimulation of domestic production by raising guaranteed price, costs about $1.80 in budget outlay, and $0.56 in real resource cost. Transferring extra income to farmers through the guaranteed price mechanism is also costly--the extra dollar of such income support costing $1.46 in deficiency payments and losing $0.46 worth of real income. Again, budget cost is sensitive to market price changes (Table 7.9 Part III). In the wheat market, the economic cost appears to change more with changes in market price than does exchange saving.

If a minimum import price for wheat of $56.5 is introduced, then the new values (and rates of change) of the policy variables (costs and benefits) are as given in Table 7.10. Budget cost is reduced by about $34 million; a levy of $29 million would be extracted from importers if exporters did not raise their prices. In that case, an extra $21 million of foreign exchange is saved. If exporters discriminate in pricing, this potential gain is turned to a loss of $8 million in scarce foreign currency. To assess the program it is useful to look at the average and marginal costs, as shown in Table 7.11. Average budget cost of saving foreign exchange is now less--$0.67 to $0.92 per dollar with the minimum import price as against $1.23 per dollar in the absence of that program. Similarly, budget cost of

Table 7.10 -- Value of Cost and Benefit Variables, and Changes in these Variables as Guaranteed, Market, and Minimum Import Prices Change; Wheat Market, 1962/63, United Kingdom, under 1964/65 Minimum Import Prices.

Variable	Value in Thousands of Dollars	Effect, in Thousands of Dollars, of a One Dollar Change in		
		Guaranteed Price (G)	Minimum Import Price (P_m)	Market Price (P_e)
Budget Cost (B')	73,519	5,219	-3,974	0
Levy Revenue (L)	29,385	-572	3,003	-3,457
Economic Cost (C)	24,531	1,817	0	-1,817
Adjustment Cost (A)	65,094	0	7,431	-7,885
Exchange Saving				
With Discrimination (F - F'')	79,575	3,802	-440	-66
Without Discrimination (F - F*)	108,960	3,230	2,563	-3,523
Income Transfer (R)	82,767	3,974	0	-2,157

Table 7.11 -- Average and Marginal Budget, Economic, and Adjustment Costs of Changes in Exchange Saving and Income Transfer; Wheat Market, United Kingdom, 1962/63, with 1964/65 Minimum Import Price.

	Budget Cost (B')	Levy Revenue (L)	Economic Cost (C)	Adjustment Cost (A)
I. Average Cost; Dollar Cost per Dollar of Benefit				
Exchange Saving				
With Discrimination (F - F'')	0.92	n.a.	0.31	0.82
Without Discrimination (F - F*)	0.67	0.27	0.23	0.60
Income Transfer (R)	0.89	0.36	0.30	0.79
II. Marginal Cost; Addition to Costs in Dollars of an Extra Dollar of Benefit, as the Level of Guaranteed Price (G) Is Changed				
Exchange Saving				
With Discrimination (F - F'')	1.37	n.a.	0.48	0
Without Discrimination (F - F*)	1.62	-0.15	0.56	0
Income Transfer (R)	1.31	-0.18	0.46	0

Table 7.11 -- Continued.

	Budget Cost (B')	Levy Revenue (L)	Economic Cost (C)	Adjustment Cost (A)
III. Marginal Cost; Addition to Cost in Dollars of an Extra Dollar of Benefit, as the Level of Minimum Import Price (P_m) Is Changed				
Exchange Saving				
With Discrimination (F - F'')	9.03	n.a.	0	-16.89
Without Discrimination (F - F*)	-1.55	1.17	0	2.90
Income Transfer (R)	----	----	----	----
IV. Marginal Cost; Addition to Costs in Dollars of an Extra Dollar of Benefit, as Market Price (P_e) Changes				
Exchange Saving				
With Discrimination (F - F'')	0	n.a.	27.53	119.47
Without Discrimination (F - F*)	0	0.98	0.52	2.24
Income Transfer (R)	0	1.60	0.84	3.66

n.a. = not applicable

supporting farm income is now $0.89 instead of $1.30 per dollar--but this "burden" is placed on the grain-user, who now faces an adjustment cost of $0.79 per dollar of income transfer. The loss to the user of grains per dollar of exchange saving is between 60 and 82 cents, depending upon exporters' pricing policy. Resource cost, on average, is not greatly affected by the minimum import price.

The marginal budget cost of saving foreign exchange and of transferring income to the wheat sector is lowered by the introduction of a minimum import price. Marginal resource cost is relatively unchanged. Once again there is now the alternative policy measure of altering the minimum import price. As before, it is crucial to know whether exporters attempt to discriminate against the UK. If discrimination exists, then it is very costly to maintain a minimum import price at this level. A reduction of this minimum will save $9 of foreign exchange for every dollar of extra government payment to farmers, and will save the grain-using industry nearly $17 in adjustment cost. If, however, exporters do not discriminate, and the minimum import price is raised, then both budget outlay and exchange will be saved, at the expense of the grain user. Table 7.11 Part IV shows how sensitive is this adjustment cost, relatively, to changes in market price--especially if any significant degree of discrimination is present. Resource cost also increases sharply,

relative to exchange saving, when exporters raise their prices to "cooperate" with the minimum import price.

Sensitivity to Supply Elasticity

In considering the effects of the guaranteed price and minimum import price schemes, in both the wheat and the coarse grain markets, an assumption was made about the elasticity of supply of these cereals in the UK. The coarse grain elasticity was assumed to be 1.20 and that for wheat 1.23, in the face of change in guaranteed price. In Chapter VI it was found that variations in average revenue from year to year do not seem to affect the planting decisions of farmers in the next year. Changes in guaranteed price level that persist for some time will influence production more. The estimates of elasticities cited above refer to long run supply adjustments to price. The short run elasticities may be much less. To indicate the effect on the analysis of the previous sections of a different elasticity of domestic supply, the calculations were redone assuming an elasticity of supply of 0.5 both in the coarse grains market and also for wheat.

If the domestic supply of barley and oats is relatively inelastic (0.5), then the guaranteed price program becomes considerably less effective at saving foreign exchange and more successful

at transferring income to producers. Economic cost in 1961/62, with no minimum import price, would have been $9.6 million; income transferred would have been $132.6 million, and exchange saved $51.8 million. These figures are to be compared with $22.8, $119.4, and $119.3 million, respectively, in the case analysed above, when elasticity of supply is 1.2. The average budget cost per dollar of foreign exchange is $2.75, as compared with $1.19 for the case when supply is more elastic. Economic cost of exchange saving does not change; a lower elasticity entails less resource cost and saves less exchange, but does not alter the ratio of cost to benefit. Budget cost of transferring income to producers is now $1.07, as compared with $1.19, and economic cost is on average only $0.07 per dollar. Marginal budget cost of exchange saving is $3.12, over twice the cost under the previous elasticity assumption. Marginal resource cost is unchanged. Income transfer is again less expensive, the marginal unit costing $1.14 of budget outlay and 14 cents in "wasted" resources. Once again, budget cost per unit of exchange saving is very sensitive to changes in market price.

Introduction of a minimum import price has the same qualitative effects as before. Average budget costs are reduced, economic costs are not greatly affected, and grain users are subject to an adjustment cost, in this case between 53 and 66 cents per dollar

of exchange saved. This can be compared with 22 to 24 cents per dollar under the assumption of higher elasticity. User adjustment cost is, on average, 21 cents per dollar of income transfer. Marginal budget cost of an extra dollar of foreign exchange is about $3.00 --twice as high as under the assumption of a higher elasticity of supply. Marginal budget cost of transferring income is somewhat less ($1.12 as opposed to $1.28) than under the alternative assumption. Again, marginal economic (resource) costs are unaffected by the elasticity assumption.

The marginal costs of exchange saving attained through changes in one minimum import price are not affected by the elasticity of domestic supply. Budget and adjustment costs are as in Table 7.7 Part III.

The situation in the wheat market is similar. The assumption of a lower elasticity of domestic supply (0.5 instead of 1.23) shows the guaranteed price program as being much less efficient in saving exchange, but more effective in transferring income to wheat producers. Average budget cost per unit of exchange saved is $3.12 instead of $1.23; marginal budget cost is $3.90 as compared with $1.79. Resource costs of exchange saving are not changed. Income transfer costs only $1.10 per dollar on average in budget outlay, as against $1.30; economic cost is now 10 cents rather than 30 cents per

dollar of transfer. At the margin budget cost is $1.18 instead of $1.46, resource cost 18 cents instead of 46 cents, per dollar of income transferred.

As before, a minimum import price for wheat reduces marginal and average costs of exchange saving and income transfer through guaranteed price changes. Costs incurred when minimum import price is changed are again insensitive to domestic supply elasticity.

If domestic supply is quite inelastic in the short run, then the marginal resource cost of transferring income by raising guaranteed price is nil; the marginal budget cost is unity. No exchange is saved if domestic production does not expand. The effect of changes in minimum import price is as before, since this minimum does not rely for its effect on domestic import substitution.

In summary, it is clear that the smaller the elasticity of domestic supply, the more expensive both in budget and economic (resource) cost is the saving of exchange. On the other hand, the domestic income support objectives are obtained at less cost.[13]

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[13]It may be useful to think of the results of marginal changes under the lower elasticity assumption as being short run changes, and the long run elasticity estimates as being appropriate for the calculation of average costs. One may be interested in the short run effect of a one dollar change in guaranteed price, and in the long run effect of scrapping the program altogether.

Supply elasticity does not alter the effectiveness of the minimum import price--since this depends upon the import demand elasticity and upon the pricing policies of exporters.

Standard Quantities and Budget Saving

The last section indicated the effect of the introduction of a minimum import price on the budget outlay for deficiency payments. The UK Grains Agreement also set up a standard quantity mechanism to limit budget cost in another way. The scheme, together with the concept of a "target indicator" price, was discussed in Chapter V. In order to demonstrate the budget saving effect of a standard quantity, it is convenient to calculate what the budget cost would have been over the last few years (prior to the Agreement) had the standard quantity and target price plan been in effect. Table 7.12 gives the results of such calculations for 1959/60 to 1963/64, with the comparable costs for 1964/65 and 1965/66. The procedure for assigning a standard quantity to the years before 1964/65 was to look at the average change over the period 1964/65 to 1967/68 of the announced standard quantities, and to project that rate of change back over the previous years. Thus the change in barley standard quantity is about 0.5 million tons each year, and the wheat standard quantity is increased about 0.1 million tons each year. The market prices

Table 7.12 -- Potential Cost Saving of Standard Quantity and Target Price Program, Wheat, United Kingdom, 1959/60 to 1965/66.

	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66
Average Market Price ($/m.t.)	54.8	50.2	57.8	48.0	57.1	57.7	56.4
Guaranteed Price ($/m.t.)	76.0	75.0	75.0	75.0	73.0	73.0	70.1
Target Price ($/m.t.)[a]	55.1	55.1	55.1	55.1	55.1	55.1	56.5
Standard Quantity (million metric tons)[b]	2.86	2.95	3.04	3.13	3.24	3.35	3.46
Domestic Production (million metric tons)	2.83	3.11	2.61	3.95	3.05	3.79	4.17
Average Producer Revenue ($/m.t.)[c]	76.0	73.7	75.7	69.4	73.5	71.2	67.8
Budget Cost, without Program ($ million)	60.00	77.13	44.80	106.65	48.50	57.99	57.13
Budget Cost, with Program ($ million)	60.00	73.16	46.72	84.51	50.02	51.26	47.40
Budget Saving, Due to Program ($ million)[d]	0.00	3.97	-1.83	22.14	-1.52	6.73	9.73

[a] Actual target price for years after 1964/65; same target price assumed for previous years.

[b] Actual standard quantity for years after 1964/65; rate of change extrapolated back to earlier years.

[c] Mechanism for computing deficiency payment was described in Chapter V, above.

[d] Loss in farm receipts is, of course, the same as saving in government payments.

are the "unit value" of wheat and barley to producers, excluding the payments. The guaranteed price is that announced at the Annual Review; it differs from actual total average receipts by farmers because of various schemes for encouraging on-farm storage and "orderly marketing" of grains. When market price is above target price, and the crop is short of the standard quantity, then added incentive is given to farmers and budget costs rise. If market prices are low, on the other hand, farmers get on the average somewhat less than the guaranteed price. Comparing the average producer revenue with the guaranteed price, in Tables 7.12 and 7.13, it can be seen that a combination of high world price and low domestic output, such as occurred in 1961/62, could raise the average producer price up to $0.7/m.t. for wheat and $0.9/m.t. for barley above the guaranteed price.

For years when output exceeds the standard quantity the average price to the producer is reduced substantially. In 1962/63, a wheat crop 25 percent above the (hypothetical) standard quantity would have dropped producer price by $5.6/m.t. The saving in government cost in that year on wheat alone would have been $22 million, but this is the only year of the seven considered when savings on wheat payments would have been substantial. The plan has appeared to save about $26 million in actual barley deficiency payments since its inception

Table 7.13 -- Potential Budget Cost Saving of Standard Quantity and Target Price Program, Barley, United Kingdom, 1959/60 to 1965/66.

	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66
Average Market Price ($/m.t.)	56.2	52.5	56.0	53.4	56.2	57.4	59.5
Guaranteed Price ($/m.t.)	80.0	79.0	76.0	76.0	73.5	73.5	69.8
Target Price ($/m.t.)[a]	52.4	52.4	52.4	52.4	52.4	52.4	52.4
Standard Quantity (million metric tons)[b]	4.30	4.76	5.22	5.68	6.14	6.60	6.86
Domestic Production (million metric tons)	4.08	4.31	5.05	5.87	6.71	7.52	8.19
Average Producer Revenue ($/m.t.)[c]	81.0	79.1	76.9	75.3	72.1	71.5	63.1
Budget Cost, without Program ($ million)	97.10	113.95	101.00	132.66	116.08	121.03	84.36
Budget Cost, with Program ($ million)	101.18	114.65	105.55	128.37	106.22	106.22	70.66
Budget Saving, Due to Program ($ million)[d]	-4.08	-0.70	-4.55	4.29	9.86	14.81	13.70

[a] Actual target price for years after 1964/65; same target price assumed for previous years.

[b] Actual standard quantity for years after 1964/65; rate of change extrapolated back to earlier years.

[c] Mechanism for computing deficiency payment was described in Chapter V, above.

[d] Loss in farm receipts is, of course, the same as saving in government payments.

in the year 1964/65. The average savings on wheat program costs over the seven years would have been $40 million, or $5.7 million each year. This represents a 10 percent reduction in government cost, and a 2 percent reduction in farm income. The corresponding cuts in the cost of the barley program are $33 million, an average of $4.8 million a year, or 4.5 percent of government cost. Barley producers' revenue suffers by something less than 1 percent.

In view of the uncertainty as to future output levels, and the relative lack of response to short run changes in average revenue (see Chapter VI), the conclusion seems to be that although the standard quantity mechanism is an effective way of stabilizing government payments, and the reduction of payments is a direct reduction of farm income, the effect on average price is fairly small, and the impact on area planted in the next season probably negligible.

CHAPTER VIII

SUMMARY: THE AGREEMENT IN PERSPECTIVE

The two main features of the UK Grains Agreement (1964) have been discussed above.[1] These features, the minimum import price and standard quantity, were analysed with respect to their impact on domestic objectives. The Agreement was signed by the exporters primarily to try to maintain access to the UK market.[2] The Agreement, however, has proved powerless to stop the expansion of UK cereal production; with a drastic change in UK guaranteed prices unlikely, and the standard quantity modification only marginally effective, the exporters could hardly have hoped otherwise.[3] The exporter does,

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[1] No attention will be given in this study to such other parts of the Agreement as the annual review by the signatories, though this is of interest in the context of international trade policies.

[2] Since the exporters were arguing for access agreements within the context of the Kennedy Round talks, it is natural that they should have been attracted to this Agreement--or alternatively, been embarrassed to refuse it.

[3] From the empirical relationships of Chapter VI, it would appear that cereal production is expanding, at constant prices, by some 520 thousand tons each year, and that use is increasing at about 450

however, get the opportunity to sell to the UK at a higher price--to discriminate in pricing. The economic power of the exporters is apparently legitimated in the Agreement. If the minimum import prices are not renegotiated in the face of the British devaluation, then these advantages are likely to be short-lived, as the world price will probably stay well above the UK minimum.[4] The world wheat price, if the new ICA discussed in Chapter II is approved, will at recent levels of freight charges, correspond to around $78/ton for Canadian #1, Northern. The present minimum import price for this wheat is $63/ton, when expressed at the new exchange rate. Most other wheats will similarly be priced some $10/ton above the UK minimum. Feed grain prices, though not covered in the ICA, will no doubt be kept up by the high wheat prices.[5]

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thousand tons a year. This disparity has increased in the last four years. To halt the expansion of UK agriculture would require changes in domestic guaranteed prices larger than the four percent set down as a statutory maximum reduction in any one year in the 1957 agriculture act.

[4]It is interesting to note that UK agriculture will become nearly competitive at world prices. A guaranteed price of $73 at the old exchange rate now looks to an American competitor like $62, which is around the import price level of comparable wheats. The UK may further expand barley exports in the coming years, if this advantage is retained.

[5]Although this study does not set out to evaluate the impact of devaluation, the model will provide certain rough approximations to the value of imports saved. In the wheat model of Chapter VII,

From the exporters' viewpoint the Agreement must be considered a disappointment. The problem of ensuring access has not been solved. The UK Agreement appeared to bind, rather indirectly, the support levels to UK farmers with the standard quantity device. Announced guaranteed prices as well as the "effective" prices (i.e., modified by the standard quantity provision) were lower in 1964/65 and 1965/66, but output increased inexorably. If there is a way of ensuring traditional market shares in the UK without dismantling the price support program, it has not been found.

From the domestic viewpoint, the policy has had some qualified success. The standard quantity mechanism appears to be reducing budget cost at the expense of the grain farmer without jeopardizing the expansion of domestic output. The minimum price has not been adequately put to the test--as all major grains have been priced above this minimum since its installation. Should the price have fallen below this minimum (or alternatively, had the minimum been placed at a rather higher level), then budget cost would again have been saved. Thus the predominant policy objective for the UK

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a 16.6 percent rise in wheat prices would cut imports by about 450 million tons, and, therefore, represent a direct outpayment saving of $22 million. Similar figures for the coarse grain model are 380 million tons, and $20 million. Budget cost is less by a total of $66 million in cereal payments. Savings in resource cost, and extra cost to grain-users, could be easily calculated from Figure 5.9 and the data given for the two market situations in Chapter VII.

embodied in the Agreement, namely to close the "open-ended" subsidy bill, has been achieved. In spite of the rhetoric about "obligations as a major importer," to have actively used domestic policy to maintain import shares would have been extremely costly in terms of domestic farm income.

The major problems with the minimum import price scheme in terms of domestic policy is the burden that it puts upon industries that use the commodity as an input. Not only do they provide some of the return to farmers formerly transferred through government payments, but they now pay a levy (or if not collected, pay scarce foreign exchange to the exporting country) on their imports. This direct income loss was seen in the last chapter to be substantial. If the government were to raise the grain-product price either by levy or by raising the guaranteed price, as would happen in the case of flour, eggs, and pigmeat, then there would be a loss to the consumer insofar as prices rise, and to the taxpayer if the burden were borne by deficiency payments on these other commodities. The increase in domestic prices will tend to harm the competitive position of exports from the UK. It was shown in Chapter V that if imports of the product using grains entered freely, then the maximum exchange saving from grains could easily be outweighed by outpayments for the grain-product. This is more likely to be true for corn and

barley--fed mainly to pigs and cattle--than for feed wheat, which goes largely into poultry rations. Britain exports few eggs and little poultry meat, but large amounts of beef, pigmeat, and manufactured dairy products. A rise in the domestic price for food wheat, as was demonstrated with the derived demand model of Chapter IV, will tend to increase flour imports, unless a counteracting levy is placed on this product. The effects on the various grain-using industries cannot be discussed further without a study of (a) feed grain utilization by type of livestock and type of grain--to include the grain composition of compounded feeds, and (b) detailed analysis of the product markets and the impact of grain cost on product prices. Both are far outside the scope of the present study, which can only point out that such policies as this not only have a much greater effect on the grain-using industry than on the grain-producing sector, but that the whole question as to whether a protected domestic industry saves foreign exchange hinges upon conditions in these secondary industries.

The same point can be made in the terminology of tariff theory. A tariff on an input in the absence of a tariff on the product is equivalent to a negative tariff on the product. To place a trade restriction on the grain input without restricting beef imports is equivalent to paying a subsidy to foreign beef producers. In the absence of

corrective domestic policy, it is hard to see how exchange can be saved when grain-product imports are available to replace domestic production.

The effect of a policy on the balance of payments of a country is not easily determined. This study has concentrated on one part of the picture, namely the foreign exchange outpayments. Even if outpayments decrease, demand conditions on the export market may be such as to reduce inpayments (export earnings) as, for instance, food prices rise and increase wages. Similarly, the resources in domestic grain production that would leave if the producer received a price nearer to the world price may be better employed in an export industry. Exchange saving in the sense used in this study may correspond to a net loss in foreign exchange and a worsening of the balance of payments deficit. Several studies have considered the contribution made by agriculture to the balance of payments, and this is not intended to add to their number,[6] but the introduction in Chapter V of the marginal change in costs and exchange savings as policies are varied would appear to be relevant in this connection.[7]

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[6] See: J. M. Slater and D. R. Colman, "Agriculture's Contribution to the Balance of Payments," District Bank Review, September 1966, and the references there made to other articles.

[7] The economist can do little more than state these various costs; to determine the level at which such costs are politically unacceptable is more intractable.

Recent studies which have tried to quantify such measures as economic loss due to resource inefficiency or consumers' surplus, have usually concluded that such losses are small, relative to some measure such as Gross National Product. In the case of an economic loss relating to a specific sector, the comparison with GNP is unfortunate since this yardstick would probably condemn to irrelevance the large majority of a nation's problems along with those of economic efficiency. The economic losses measured in the last chapter for coarse grains and wheat were only about 4 percent and 6 percent of market value of the product respectively, although the actual amounts, $22 million and $24 million, would seem to be worth considering.[8] What is often overlooked, and what is brought out clearly in the analysis of the last chapter, is that marginal economic costs may be substantial. When the decision as to the level of domestic production desired, and hence the level of guaranteed price to set is made, it is the marginal effects of the program that should be taken into account.

This chapter has summarized the results of the study. In the discussions leading up to the Grains Agreement in 1964, the UK was looking primarily for a means of "closing" the subsidies whose

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[8]The real question is not whether striving for more efficiency will increase real income, but whether the same effort could not be applied with greater returns elsewhere. High levels of "economic" efficiency in the sense of resource allocation may be costly in a given social setting.

cost fluctuated embarrassingly. The exporters welcomed the apparent assurance of access, and a bargain was struck. The standard quantity provisions reduce income to cereal growers somewhat, but probably don't affect production; the minimum import price, if world conditions were such as to make it operative, would place a heavy burden on grain-users. Both parts of the program save budget cost and make this outlay more predictable. Exchange payments may be saved, but this is crucially dependent upon exporters' reactions and changes in the imports of grain-using products. No general statement is made about the balance of payments. The real costs are small, but are important as domestic production is varied. The implications for other products appear to be that access can only be assured when an effective method of domestic supply control is practiced, that governments should consider seriously the impact created by restrictions in an input market, and that in cases where undue burden is placed upon one sector in the name of "stabilizing budget cost" in another the desirability of such stability be examined closely.

The recent devaluation has made it unlikely that this set of minimum import prices for cereals entering the UK will become effective. The study of such a program is nevertheless of value in pointing out the possible implications with respect to both domestic and international objectives.

SELECTED REFERENCES

Articles and Books

1. Abel, M. E. "Price Discrimination in the World Trade of Agricultural Commodities," Journal of Farm Economics, May 1966, p. 194.

2. Brunthaven, C. G. "UK Grain Agreement: Format for an International Grain Agreement?" Journal of Farm Economics, February 1965, p. 51.

3. Dardis, R. "The Welfare Cost of Grain Protection in the United Kingdom," Journal of Farm Economics, August 1966, p. 711.

4. Friedman, M. Price Theory. Aldine, Chicago, 1962.

5. Hathaway, D. E. The Search for New International Arrangements to Deal with the Agricultural Problems of Industrialized Countries. Agricultural Economics Report No. 5, East Lansing, March 1965.

6. H. M. S. O. Exchange of Notes, Cmnd 2339, 1964.

7. Johnson, D. G. "Agriculture and Foreign Economic Policy, Journal of Farm Economics, December 1964, p. 915.

8. Johnson, H. G. Economic Policies Toward Less Developed Countries. Brookings Institution, Washington, D. C., 1967.

9. Johnston, J. Econometric Methods. McGraw-Hill, 1963.

10. Longsworth, J. W. "The Australian Wheat Industry Stabilization Scheme: An Analytical Model," Economic Record, June 1966, p. 244.

11. McCalla, A. F. "A Duopoly Model of World Wheat Pricing," Journal of Farm Economics, August 1966, p. 711.

12. Reed, G. V. "The Import Saving Effect of a Guaranteed Price Subsidy," Farm Management Notes, University of Nottingham, England, Spring 1965, p. 21.

13. Slater, J. M. The World Wheat Economy; Implications for the Consumption and Trade of United States Wheat. Unpublished Ph.D. Dissertation, Univ. of Ill., 1966.

14. Slater, J. M., and Colman, D. R. "Agriculture's Contribution to the Balance of Payments," District Bank Review, September 1966.

15. UK Ministry of Agriculture, Fisheries, and Food. Cereals: Minimum Import Prices, and Levy Arrangements. London, 1964.

16. U.S. Department of Agriculture. Foreign Agriculture, June 7, 1967, p. 1.

17. U.S. Department of State. Trade: Cereals, Cereal Products and By Products, Treaties and Other International Acts Series 5581, Washington, D.C., 1964.

18. Warley, T. K. "Organizing World Trade in Temperate Agricultural Products," Farm Management Notes, Univ. of Nottingham, England, Spring 1965, p. 31.

19. Wehrewein, C. F. "Government Grain Programs of Canada, Australia, Japan, and the United Kingdom," Journal of Farm Economics, November 1965, p. 993.

20. Witt, L. W. Towards Trans-Atlantic Agricultural Policy Bargaining, Agricultural Economics No. 953, East Lansing, Michigan.

APPENDICES

APPENDIX A

TEXT OF THE AGREEMENT

The text of the Agreement signed by the United Kingdom and the United States on April 15, 1964, is reproduced below. The treaties with Argentina, Australia, and Canada were identical, except for the appropriate name changes.

> I should like to refer to previous exchanges and discussions between representatives of the Government of the United Kingdom of Great Britain and Northern Ireland (hereinafter referred to as "the Government of the United Kingdom") and of the Government of the United States of America (hereinafter referred to as "the Government of the United States") regarding the changes which the Government of the United Kingdom propose to introduce in their production and trade policies relating to cereals. In framing their proposals the Government of the United Kingdom have had in mind their responsibility for maintaining conditions under which a stable and efficient agricultural industry in the United Kingdom can develop its prosperity and also their responsibility as one of the major importers of cereals in the world towards their overseas cereals suppliers.
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> 2. The Government of the United Kingdom have also taken into account that they, and the Governments of other countries who are major importers and exporters of cereals, are at present taking part in discussions in the Cereals Group of the General Agreement on Tariffs and Trade convened for the negotiation of appropriate international arrangements for cereals under the terms of the resolution of Ministers at the Ministerial Meeting of the General Agreement on Tariffs and Trade, 21st May, 1963. It was not the desire or intention of the Government of the United Kingdom to put forward proposals which might in any way hamper

that work, but rather to introduce arrangements so designed as to further the main objectives which both the Government of the United Kingdom and the Government of the United States desire to achieve.

3. Our two Governments are agreed that these main objectives are that the world market for cereals should be improved through the establishment of a better and more economic balance between world supplies and commercial demand, and that to this end there should be the provision of acceptable conditions of access into world markets for cereals in the furtherance of a significant development and expansion of world trade in cereals. We are also agreed on the importance of the assurance of supplies of cereals, cereal products and by-products at equitable and stable prices; and of the creation of greater stability in the levels of international prices for them. These objectives should be sought in such ways as would take into account the interests both of producers and consumers and of importing and exporting countries.

4. Pending the conclusion of long-term international cereals arrangements, the Government of the United Kingdom have declared their intention of introducing adaptations into their existing cereals policy with the objectives of promoting greater stability in the United Kingdom cereals market, and of maintaining a fair and reasonable balance between home production and imports. This balance would be broadly based upon the present supplies to the United Kingdom market from domestic production on the one hand and cereals imports on the other, and as regards the future growth of the United Kingdom market would provide the opportunity for both domestic producers and overseas suppliers to share in this in a fair and reasonable way. The intentions of the Government of the United Kingdom with respect to the balance between domestic production and imports and the domestic guarantee arrangements for the year 1964-65 are set forth in paragraph 6 below. The balance for subsequent years will be reconsidered in the light of supply and marketing conditions, including the relative efficiency of suppliers, and changes therein, and to this end the Government of the United Kingdom shall consult with the Government of the United States and the Governments of other principal co-operating countries in accordance with the review procedure in paragraph 10.

5. The measures which the Government of the United Kingdom intend to introduce for securing the objectives in paragraph 4

above are: first, to restrain financial assistance so as to discourage the increase of domestic cereals production above a level consistent with these objectives, and second to operate, in co-operation with their principal overseas suppliers, a system of minimum import prices for the main cereals, cereal products, and by-products.

6. The Government of the United Kingdom have decided that any necessary restraint of financial assistance should be applied through the effective reduction of guaranteed prices by means of the price mechanisms described in the United Kingdom White Paper on the Annual Review for 1964-65. These mechanisms would in the case of wheat start to operate when production exceeded 3.2 million tons and would operate fully when production exceeded 3.3 million tons and in the case of barley would start to operate when production exceeded 6.3 million tons and would operate fully when production exceeded 6.5 million tons. The range of wheat and barley production aimed at would therefore be from 9.5 to 9.8 million tons. Other cereals production, which is declining, is at present about 1.5 million tons. Total consumption of cereals (including wheat equivalent of flour) is expected to rise to 20.5 million tons in 1964-65 and to continue increasing thereafter. In accordance with the objectives in paragraph 4 above, the annual volume of imports of cereals (including wheat equivalent of flour) should, on average taking one year with another, increase above the present level of about 9 million tons as the United Kingdom market expands. On the basis of the above estimate of consumption, the volume of imports of cereals (including wheat equivalent of flour) in 1964-65 would, if domestic production did not exceed the ranges for wheat and barley stated above, be about 9.2 to 9.5 million tons. Changes in the above data shall be considered each year under the review procedure in paragraph 10 with a view to securing a fair and reasonable balance between home production and imports. It is the intention of the Government of the United Kingdom that changes in their domestic guarantee arrangements should be made as necessary so that these arrangements are effective for the purposes described in paragraph 4 above.

7. The Government of the United Kingdom, after consultation with the Government of the United States and other co-operating Governments, have advised the Government of the United States of the cereals, cereal products and by-products for which, subject to the approval of Parliament, it is proposed initially to specify minimum import prices, and these are set

out in the attached agreed Annex. As regards the minimum import prices to be applied to the initial range of products the Government of the United Kingdom have consulted the Government of the United States and other co-operating Governments and it is understood that if the prices prescribed are as agreed, they will be acceptable to the Government of the United States. Any subsequent changes shall be a matter for joint consultation between the Government of the United Kingdom and the principal co-operating Governments, and as regards any changes which affect the particular interests of the Government of the United States, the Government of the United Kingdom shall seek the agreement of the Government of the United States. In addition, the Government of the United Kingdom shall not make any significant change in the general level of minimum import prices except after agreement with the Government of the United States and other principal co-operating Governments.

8. The Government of the United Kingdom shall take action to maintain the levels of the prescribed minimum import prices by such levies on imports as may be necessary for this purpose. Subject to your confirmation of the willingness of the Government of the United States to co-operate in these arrangements, the Government of the United Kingdom shall exempt from levies all imports of products in the attached Annex which originate in and were consigned from the United States of America to the United Kingdom except in the following circumstances:--

(i) When the general level of offering prices to the United Kingdom market from the United States of America for any product in the attached Annex is (after taking into account any customs duty chargeable) below the appropriate prescribed minimum import price for that product, the Government of the United Kingdom may, after notifying the Government of the United States, apply a levy generally equivalent to the difference between the two to that product for so long as such conditions make it necessary.

(ii) When an individual parcel of any product in the Annex originated in and was consigned from the United States of America to the United Kingdom and the price paid for that parcel, together with any customs duty chargeable and any levy applicable under sub-paragraph (i) above is less than the appropriate minimum price, a levy equal to the difference between the two may be applied.

In the circumstances described in sub-paragraphs (i) and (ii) above such levies may be applied by the Government of the United Kingdom notwithstanding their commitments to the Government of the United States with respect to the products listed in the Annex, as specified in Schedule XIX annexed to the General Agreement on Tariffs and Trade. It is also the intention of the Government of the United Kingdom that in the implementation of these arrangements suitable provision shall be made to avoid prejudice to normal trade practices of forward contracting.

9. The Government of the United Kingdom shall review the minimum import price arrangements before the beginning of each crop year commencing on the 1st July, or on request during a crop year, in consultation with the Government of the United States and other co-operating Governments.

10. The Government of the United Kingdom shall, not later than the beginning of December in each year, start to review in consultation with the Government of the United States and other principal co-operating Governments the extent to which the objectives set out in paragraphs 3 and 4 of this Note are, having regard to all relevant factors, being achieved.

11. If it is found as a result of a review of the minimum import price arrangements under paragraph 9 that they have resulted in an appreciable distortion of the pattern of trade in the products which this Note covers between co-operating Governments supplying the United Kingdom and in consequence have damaged or threaten to damage the trade interests of the Government of the United States, the Government of the United Kingdom shall take effective corrective action in consultation with the Government of the United States and other co-operating Governments and in accordance with the procedures outlined in paragraph 7 to remedy the situation. In addition, consultation will take place between the Government of the United Kingdom and co-operating Governments and if it is thereby found that the total imports of cereals (including the wheat equivalent of wheat flour) have shown or threaten to show an appreciable decline below the average volume of such imports during the three years preceding 1st July, 1964, and that this decline has taken place or threatens to take place because the changes outlined in paragraph 5 have failed to be effective for the purpose of maintaining that volume of imports, the Government of the United Kingdom shall take effective corrective action at the earliest practicable time to remedy the situation.

12. The Government of the United Kingdom believe that the introduction of the measures outlined in this Note for the purpose of attaining the objectives in paragraph 4 above would further the prospects of attaining the longer term objectives set out in paragraph 3 for the attainment of which the Government of the United Kingdom and the Government of the United States will be working. Accordingly, any arrangements contained in this Exchange of Notes shall be without prejudice to, and indeed are intended to facilitate the negotiation of, international cereals arrangements embodying more comprehensive commitments by all participating countries, whether importing or exporting. Moreover, it is understood that any measures taken as a result of this Exchange of Notes shall be terminated in so far as it is mutually agreed that they may be inconsistent with, or superseded by, the provisions of such later international arrangements to which both the Government of the United Kingdom and the Government of the United States are parties.

13. It is the intention of the Government of the United Kingdom so to operate the minimum import price system that it shall not result in an impairment of the benefits enjoyed by preferential suppliers from their existing preferences in the United Kingdom market. Moreover in the case of wheat flour it is the intention of the Government of the United Kingdom not to provide under minimum import price arrangements any additional advantages to millers in co-operating countries or in the United Kingdom. If it is found that either of these intentions is not fulfilled or threatens not to be fulfilled, the Government of the United Kingdom shall take effective corrective action after consultation with other co-operating Governments.

14. In the light of all these considerations it is the understanding of the Government of the United Kingdom that the Government of the United States will co-operate so far as practicable in the operation and observance of minimum import prices prescribed for the products covered in the Annex to this Note subject to the understandings set out herein.

15. If the foregoing is acceptable to the Government of the United States, I have the honour to suggest that this Note, together with its Annex, and Your Excellency's reply to that effect, shall be regarded as constituting an agreement between the two Governments which shall enter into force on this day's date and shall be terminable in the circumstances envisaged in paragraph 12 or by either Government giving not less than four months'

notice in writing to the other. Consultations regarding the operation of this agreement may be held at any time at the request of either Government.[1]

[1]U. S. Department of State, Trade: Cereals, Cereal Products, and By-products, Treaties and Other International Acts, Series 5581, pp. 7-12.

APPENDIX B

DATA USED IN THE REGRESSION ANALYSES

Year (July/ June)	Acreage Grown in United Kingdom (000 acres)				Guaranteed Price ($/m.t.)		Average Producer Price ($/m.t.)		
	Total Cereals ACWBO	Wheat ACW	Barley ACB	Oats ACO	Wheat GPW	Barley GPB	Wheat ARW	Barley ARB	Oats ARO
1954/55	7,106	2,456	2,063	2,587	60.1	58.2	87.25	74.73	69.44
1955/56	6,822	1,947	2,296	2,580	63.3	56.7	83.36	67.98	64.19
1956/57	7,181	2,293	2,323	2,565	63.3	60.0	83.02	72.12	68.91
1957/58	7,079	2,123	2,622	2,345	78.0	79.9	78.37	79.92	75.52
1958/59	7,178	2,209	2,755	2,214	77.2	79.9	77.22	79.92	75.52
1959/60	7,010	1,930	3,057	2,024	76.0	79.9	75.15	79.92	75.52
1960/61	7,445	2,103	3,373	1,969	75.0	79.2	74.17	79.23	74.71
1961/62	7,383	1,826	3,828	1,730	75.0	76.0	73.72	76.00	75.52
1962/63	7,757	2,256	3,986	1,515	75.0	76.0	75.38	76.00	75.52
1963/64	7,929	1,927	4,712	1,290	73.0	73.5	73.89	73.50	75.52
1964/65	8,359	2,207	5,031	1,121	73.0	73.5	71.76	71.82	75.52
1965/66	8,944	2,535	5,395	1,014	70.1	70.1	67.92	68.43	75.52
Source[a]	W.C.S.	W.C.S.	W.C.S.	W.C.S.	A.R.	A.R.	A.R.	A.R.	A.R.

APPENDIX B--Continued

Year (July/ June)	Price Index (1954/55 to 1956/57 = 100)		Domestic Wholesale Prices ($/m.t., Delivered, London)		Imported Grain Prices (c.i.f., UK $/m.t.)		Yield of Grain, UK, (m.t. per Acre)			Fall Rain, UK, (Inches, Sept., Oct., Nov.)
	Whole Wheat PIWW	Whole Barley PIWB	Milling Wheat PHW	Food Barley PLB	All Corn PMC	US Corn PMUSC	Wheat WY	Barley BY	Oats OY	
1954/55	97.6	104.8	65.0	73.5	73.01	73.58	1.15	1.10	0.96	10.6
1955/56	101.3	97.7	66.9	68.2	74.00	72.76	1.36	1.30	1.07	7.4
1956/57	101.1	97.5	67.1	68.3	74.26	69.18	1.26	1.23	0.98	7.3
1957/58	87.7	87.6	59.4	58.7	69.00	57.32	1.29	1.15	0.93	10.5
1958/59	91.4	91.9	61.1	61.5	57.42	58.70	1.25	1.17	0.98	10.3
1959/60	90.7	85.7	62.3	59.8	58.33	58.15	1.46	1.34	1.10	8.4
1960/61	83.9	78.4	55.1	53.8	58.33	54.57	1.44	1.28	1.06	17.9
1961/62	95.1	87.9	64.4	62.8	55.90	54.57	1.43	1.32	1.07	10.4
1962/63	81.1	80.7	54.5	56.0	55.60	58.89	1.76	1.47	1.17	8.5
1963/64	93.8	83.2	63.1	57.6	60.03	61.18	1.58	1.42	1.13	11.4
1964/65	93.3	86.2	63.3	61.7	62.74	65.04	1.68	1.49	1.20	5.9
1965/66	91.8	88.6	61.2	59.9	65.99	63.94	1.65	1.52	1.22	11.1
Source[a]	A.A.S.	A.A.S.	R.W.W.S.	R.W.W.S.	Var.	R.W.W.S.	W.C.S.	W.C.S.	W.C.S.	A.A.S.

APPENDIX B--Continued

Year (July/ June)	Use of Wheat for Food ('000 Metric Tons)				Use of Coarse Grains for Food and Industrial Purposes ('000 Metric Tons)			Production of, in '000 Metric Tons	
	Wheat & Flour WFHT	Wheat WHT	Domestic Wheat WHD	Imported Wheat WHM	Barley BH	Corn CH	Oats OH	Flour FD	Compound Feed FEED
1954/55	6,000	5,080	1,575	3,505	980	320	183	3,822	5,937
1955/56	5,937	5,140	1,381	3,759	991	362	165	3,769	6,433
1956/57	5,895	5,391	1,202	4,189	1,008	421	162	3,910	6,659
1957/58	5,840	5,232	1,245	3,987	1,047	508	168	3,720	6,347
1958/59	5,755	5,145	1,075	4,070	1,032	621	173	3,672	7,189
1959/60	5,633	5,041	1,100	3,941	1,094	688	143	3,632	8,515
1960/61	5,813	5,112	1,242	3,870	1,125	783	139	3,693	8,646
1961/62	5,604	5,005	1,409	3,596	1,192	776	139	3,592	8,958
1962/63	5,583	4,870	1,192	3,678	1,173	839	143	3,530	9,427
1964/64	5,560	5,038	1,561	3,477	1,238	979	128	3,645	9,202
1964/65	5,246	4,967	1,630	3,337	1,338	920	91	3,589	9,317
1965/66	5,704	5,067	1,614	3,453	1,400	950	140	3,675	9,742
Source[a]	G.C.	G.C.	G.C.	G.C.	G.C.	G.C.	G.C.	A.A.S.	A.A.S.

APPENDIX B--Continued

Year (July/ June)	Cereal Use for Seed, UK ('000 m.t.)			Use of Cereals for Livestock Feed ('000 m.t.)				Agri-cultural Wage (Shilling/ Week) AGWAGE	Food Expendi-ture (£ mill.) FOOD	Con-sumer Expendi-ture (£ mill.) CONEX
	Wheat WS	Barley BS	Oats OS	Wheat WFL	Barley BL	Corn CL	Oats OL			
1954/55	149	155	191	1,968	2,193	1,300	2,077	151.0	3,707	12,170
1955/56	175	161	190	1,756	2,251	1,302	2,400	162.8	4,045	13,111
1956/57	164	177	172	1,946	2,724	1,252	2,198	174.6	4,274	13,829
1957/58	169	185	161	1,836	3,014	1,618	1,981	184.2	4,448	14,588
1958/59	150	201	146	1,979	2,995	2,331	2,015	194.8	4,547	15,373
1959/60	162	220	141	1,565	3,213	2,464	1,904	199.6	4,701	16,170
1960/61	152	254	153	1,683	3,732	2,387	1,842	209.3	4,779	16,971
1961/62	178	265	135	1,480	3,844	3,123	1,615	219.6	4,944	17,871
1962/63	152	312	116	2,332	4,436	3,183	1,547	229.9	5,174	18,892
1963/64	173	335	100	1,886	5,483	2,589	1,254	245.4	5,328	20,023
1964/65	198	356	90	2,417	5,996	2,590	1,187	255.8	5,566	21,334
1965/66	175	402	81	2,938	5,897	2,320	1,043	276.1	5,765	22,708
Source[a]	G.C.	G.C.	G.C.	G.C.	G.C.	G.C.	G.C.	A.A.S.	A.A.S.	A.A.S.

[a]Data Sources:

A.A.S. U.K. Central Statistical Office, Annual Abstract of Statistics, London, H.M.S.O., various years.

A.R. U.K., Annual Review and Determination of Guarantees, London, H.M.S.O , various years.

G.C. Commonwealth Economic Committee, Grain Crops: A Review, London, various years.

R.W.W.S. International Wheat Council, Review of the World Wheat Situation, London, various years.

W.C.S. Food and Agriculture Organisation of the United Nations, World Crop Statistics, Rome, various years.

Var. Food and Agriculture Organisation of the United Nations, Trade Yearbook, Rome, various years.

Food and Agriculture Organisation of the United Nations, Production Yearbook, Rome, various years.

Food and Agriculture Organisation of the United Nations, World Grain Trade Statistics, Rome, various years.