Ministry of Agriculture and Agrarian Reform

NAPC

National Agricultural Policy Center

TRAINING MATERIALS

Agricultural Policies in Developing Countries

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Foreword

The present volume is part of the series "Training Materials", published by the National Agriculture Policy Center (NAPC) with the support of the FAO Project GCP/SYR/OO6/ITA. The series includes notes and handouts produced as part of the training activities carried out at the NAPC by the international experts recruited by the Project. Even though they cannot be considered as comprehensive textbooks, the NAPC decided to make these materials available for a wider public, considering them as a useful reference for the study and the practice of agricultural economics and policy analysis.

The FAO Project, which is generously funded by the Italian Government and executed in close coordination with the Syrian Ministry of Agriculture and Agrarian Reform (MAAR) has been supporting the establishment of a cadre of professional agricultural policy analysts for the NAPC and other institutions involved in the Syrian agricultural policy making process. This undertaking encompassed an intensive training activity articulated over two programs involving, in a five year period, a total of about 130 officials of the MAAR. Each training program comprised a set of intensive courses to provide theoretical background and familiarize with issues, concepts, methods and tools needed to carry out policy analyses. The set of courses was completed by on-the-job research experiences on issues of relevance for Syrian agricultural development, whose results have been published by the NAPC's Working Papers series. The formal training programs were also accompanied by seminars, shorter intensive courses and participation in research activities, which are still on-going as part of NAPC's staff capacity building process.

Training was part of a wider undertaking in institutions' building for agricultural policy analysis. Indeed, the Project has been providing support to the institutional development of the NAPC, its technical capacity to analyze, formulate and monitor agricultural policies, and its capacity to maintain and develop a comprehensive set of statistical information for the economic analysis of policies (the Syrian Agriculture Database).

This volume presents part of the training material of the program of study on "Agricultural Policies in Developing Countries" delivered by Dr Carlo Cafiero. The objective of this training material is to acquaint the reader with the phenomena, problems, concepts and present setting of agricultural policy making in developing countries. It provides a comprehensive conceptual framework and an overview of country experiences concerning agricultural policy design, analysis and implementation in developing countries. Furthermore, it introduces the reader to the use of standard analytical tools (namely PAM and graphical partial equilibrium analysis), applying these tools to the concepts illustrated.

Available at NAPC, the training material also includes in electronic format the slides of the seminar delivered by Dr Carlo Cafiero on *storage and commodity market equilibrium: implications for policy analysis*.

Damascus, December 2003

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Chapter 1 - The role of agriculture in the economy

Agriculture is broadly conceived as the set of activities that use land and other natural resources to produce food, fiber and animal products that can be used for direct consumption (self-consumption) or for sale, either as food or as input to the manufacturing industry.

Forestry, fishing and hunting are usually included in the agricultural sector.

Agriculture is a fundamentally different production activity than manufacture (what we call also industrial production). What makes it different is the unavoidable dependence on the natural environment for production. Production in agriculture is mainly the result of biological phenomena, whose evolution is mainly out of the direct human control. Crop production, for example, takes time and there is very little men can do to change it, given that the vegetative cycle of many crops is defined by the natural cycle of daylight and temperature. Also, animal production requires the growing cycle of livestock, which is pretty much defined by nature.

This timing of production and its dependence on natural phenomena has consequences on the economic outcome of the production that deserve to be underlined. First, agricultural production is sensibly more uncertain than that in any other sector of the economy. Input in the production process need to be committed well in advance, and there is little or no power for farmers to reverse the decisions on the inputs when they discover that output production may be either less than expected or valued less of what it was supposed to be. Only if agricultural products can be stored there exists some flexibility, for example, in avoiding marketing the product in periods of low demand. And even in such cases, storing always present an additional cost. (Compare this with the industry, where production is carried on according to cycles which do not depend on nature and which can be tuned according to the evolution of demand.)

Second, the schedule of phases in the vegetative or animal growing cycle does not permit workers' specialization, as it is possible, for example, in industrial production.

In other words, especially in family farms (see below), workers need to move from one task to another during the year, and they cannot exploit the increase in productivity of labor common of the industrial production activity, when workers can specialize in one single activity.

Moreover, there may be period of the year in which the requirement of labor is below the family's supply, and this may have negative consequences on the overall productivity of agricultural labor, especially when employment opportunities outside the farm are limited or inexistent[1].

[1] A discussion of the characteristics of agricultural production relevant to the policy can be found in: N. Georgescu Roegen, *The Agrarian Economy*.

1.1. The contribution of agriculture to the whole economy

The relative weight of the agricultural sector in the economy varies from country to country and in general is between 3 and 40 % of the total value of production, and may count for as much as 70% of total labor.

Why there is such a relationship between the value of agricultural production and the level of income? The answer is linked to the so-called Engel's law according to which: *"the poorer a family is, the greater the proportion of the total expenditure which must be used to procure food"*.

Whereas at very low income levels, all of the income must be spent in providing for basic needs (such as food, basic clothing and housing), as personal income increases, a smaller proportion of it will be devoted to basic needs, and part of it will be diverted to more luxurious goods (for example education, communication, transportation, personal care, travel, etc.)

One other interesting observation is that the incidence of agriculture in terms of labor force is always higher than the incidence in terms of GDP. (*What does that mean in terms of the relative level of income for agricultural laborer?*)

Agriculture is more important than what might appear from the figures in the previous table, even for developed countries. The reasons are to be found in the role that agriculture plays within the broader economy. It is only when agriculture is able to provide abundant food for the entire population of a country that the country can start a process of economic development. Moreover, modern agriculture is usually an important component of the demand for industrial products and for other services. Finally, agriculture provides inputs to the food industry.

When considered in its entirety, the *agribusiness* weighs for more than 30 percent even in highly industrialized economies.

Table 1. Relative weight of the three main sectors in the economy

Measure	*Bangladesh*	*Low-Income Economies*	*Lower Middle-Income Economies*	*Upper Middle-Income Economies*	*High Income Industrial Market Economies*
Average GNP per capita (1982 dollars)	*140*	*280*	*840*	*2,490*	*11,070*
Proportion of GDP by sector					
- *agriculture*	*47*	*37*	*23*	*11*	*3*
- *industry*	*14*	*32*	*35*	*41*	*36*
- *services*	*39*	*31*	*42*	*48*	*61*
Proportion of labor force by sector					
- *agriculture*	*74*	*72*	*56*	*30*	*6*
- *industry*	*11*	*13*	*16*	*28*	*38*
- *services*	*15*	*15*	*28*	*42*	*56*

Source: Stevens and Jabara, tables 3.5 and 3.6 pages 50-51. Data from the World Bank's World Development report 1984.

When studying agricultural policies, it is very important to understand the characteristics of the *agricultural system*. How production is organized in terms of number and size of farms, availability of infrastructures, technology level, institutional settings, marketing arrangements, availability of reliable outlets for farm's resources, etc. (See Stevens and Jabara, table 4.1 page 86 - see also the project report entitled: *Country Profile: the state of food and agriculture in Syria*.)

The reason why it is so important to understand the structure of the agricultural sector, is that the same policy action can have very different effects depending upon how the production sector is organized. For example, if there are limited infrastructures for processing and transporting vegetables product, high prices for vegetables may not be sufficient in effectively stimulating vegetable production.

Two main aspects are common to many traditional agricultural systems across the World:

- family production organization
- size of operations

Family production organization (peasant organization) means that agriculture gives employment opportunities to members of the household, which may or may not have other employment opportunities available to them, and the output of the production process can be self consumed before being destined to the market for sale. You have probably already seen the characteristics of agricultural household production in one of the previous courses, so it is not necessary to repeat them here. What is relevant from the point of view of this course are the implications that household production can have for policy:

- when self-consumption is a relevant share of production, output price policies may be less effective in enhancing farmers' income
- economy wide policies or industrial sector policies aimed at developing other sectors, such as industry or services, may have the indirect effect of releasing labor force from the farm sector and thus increase incomes for those who remain
- reaction to price policies may be different by peasants when compared to fully commercial farms (see Ellis, pages 13-14)

The second point I wish to underline is that traditional agriculture usually operates through small size farms. Dimension of the operation can be measured in several ways: amount of land, value of production or number of labor units employed. While the amount of land per farm or the value of total production per farm varies, the number of labor unit employed is quite constant over time and space, i.e., in different regions of the world and in different periods in time.

Small farms mean that the agricultural sector is highly competitive. In other words, farmers usually cannot exercise market power to increase prices or profits, and this have strong consequences on how the rents generated by high consumption prices may be appropriated by the various actors in the food marketing chain.

1.2. Agriculture and economic development

Agriculture plays a crucial role in the development of an economy. In the past, this role has been incorrectly intended simply as that of a provider of surplus labor and capital to the industry, which was seen as the real engine of economic development.

This view was supported by the observation that progress in agriculture productivity could allow workers to leave the sector without penalizing agricultural production. Moreover, at early stages of economic development, agricultural products are the only products that can be exported to earn foreign exchange needed for investments in the industrial sector.

Trying to accelerate the growth of the industrial sector has led to an implicit taxation on the agricultural sector, and the level of real prices for agricultural product have been declining to the point that, today, many countries are struggling to try and arrest such decline.

Sometime agricultural incomes have declined to the point that farmers have been brought into poverty conditions.

The experience of many countries has now shown that such a strategy to economic development is usually inferior to a different approach to economic development, where agriculture takes central stage.

In fact, by directly supporting agriculture growth, the entire economy can benefit, first, towards alleviation of poverty in both the rural and urban sectors, and second, because income in rural sector has a higher multiplier that income in the urban sector, given the higher propensity to

spend of rural populations and the composition of their expenditure, oriented towards domestic products (Norton, page 1-9)

This explains the emphasis that virtually all countries, both developing and developed, put today on their agricultural policies.

A successful agricultural policy, however, needs to be carefully designed and implemented to be effective. To do so requires a sound understanding of the objectives that such a policy wants to pursue and of the constraints that the sector faces. Only with such knowledge it is possible to choose the appropriate instruments that constitute the actual policy.

In this course, you will learn how to analyze agricultural policy. The main objective will be that of providing you with the analytical skills required to understand the effects of various policy interventions.

Chapter 2 - Economic analysis of public policies

2.1. The neoclassical view of market economies

The extent of public intervention in agriculture may vary from direct control of the means of production, as in centrally planned economies, to indirect intervention via the market, by creation of incentives. We will discuss mainly of policies as types of state intervention in the market economy.

What we mean by market economy needs for some clarification. The "market" is a broad concept that includes the activities of purchase and sale transactions of commodities which together leads to price formation, therefore, it has not to be intended as the actual physical place where the transactions is realized. Market economies are those where prices are the result of the interaction of production and consumption decisions of households and individuals, rather than being institutionally set values.

Nevertheless, there are large numbers of ways in which the government can affect, and in some ways effectively set the price levels even in market economies. We will discuss some of them and will see how many of those policies will have unavoidable side effects, in terms, for example, of public expenditure or of inducing a difference between the price paid by consumers and that received by producers.

Consider a very simple economy, made of just two individuals, say A and B. Each of them is endowed with a given amount of one of two goods, X and Y, so that X^A and Y^A are the endowments of individual A, and X^B and Y^B are the endowments of individual B.

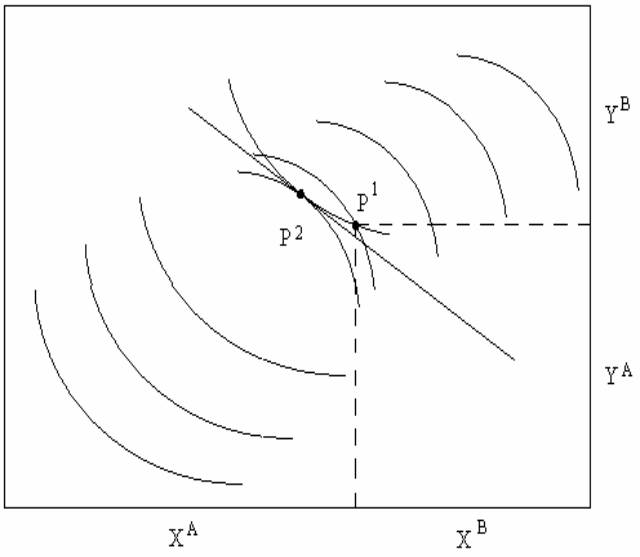
The total wealth of this economy will thus be given by the quantities $X = X^A + X^B$, and $Y = Y^A + Y^B$.

Let us assume also that the two individuals have preferences over the two goods, defined by the respective utility functions $U^A(X,Y)$ and $U^B(X,Y)$. How can we describe a possible equilibrium of this economy? In other words, if these people are left free to exchange their possessions, will they find an agreement on a rate at which to exchange, say, good X for good Y, (that is, a *price* for Y in terms of X) and how much will they actually trade?

The answer can be found by using the usual theory of consumer behavior you have been presented and an analytical device named the Edgeworth Box.

Imagine to draw a rectangular box whose dimensions are exactly X and Y. Then, the initial endowment can simply be represented by a point in the box where with coordinates X^A and Y^A (when measured from the lower left corner) or X^B and Y^B (if measured from the upper right corner).

Figure 2.1. The Edgeworth Box



If you consider the origin in the lower left corner, the box can be considered simply as the space of consumption opportunities for individual A, and you could draw the indifference curves for A as you learned in the microeconomics course. When instead the origin is put in the upper right corner, the indifference curves for individual B can be depicted as if they were "upside down", because moving from right to left and from up to down would mean to increase the availability of goods for individual B, and thus making him better off.

With reference to Figure 2.1, the initial endowment for our simple economy is represented by point P^1.

There will be indifference curves passing through point P^1 for both individual A and individual B. Imagine now moving along the indifference curve of individual A from point P^1 to point P^2.

What does it means in terms of *re-allocation* of the two goods? Well, it means that some of good X has been transferred from A to B in exchange for some of good Y.

In fact, at point P^2, A will have more of Y and less of X.

But notice that we are still on the same indifference curve for A, which means that A's level of utility is not changed. Individual A is as better off at point P^2 as he was at point P^1. However, point P^2 corresponds to a higher indifference curve for individual B than before. Moving from point P^1 to point P^2 has caused an increase in the utility level for B.

This simple example was meant to show that point P^1 was not an *optimal* allocation of the resources, because there are other points, such as P^2, in which the utility of one of the members of the economy can be increased without reducing the utility of the other member.

Points such P^2 are called *equilibriums* of the economy, or also *optimal allocation* points.

The attribute *optimal* corresponds exactly to what is defined as a "Pareto optimum" point, that is a point from where it is impossible to move without reducing the utility of at least one individual.

At point P^2, the marginal rate of substitution of good X for good Y is the same for both A and B. In other words, the two members of our simple economy have found an agreement on a rate at which to exchange X for Y, that is, they have found an equilibrium *price*.

The fundamental view of a market economy, according to neoclassical economics, is a condition for which all people in the economy are left free to exchange of whatever they want in order to

increase their individual utility. If nothing prevents the exchanges from taking place, whenever two individuals would find it *profitable* to engage in an exchange (as it was for our individuals A and B in moving from point P^1 to point P^2) they will do so.

Once there are no opportunities left for mutually beneficial exchanges, the economy would reach what is called a *competitive equilibrium*, which is optimal (according to the Pareto criterion) by definition.

2.2. Fundamental theorems of welfare economics

The analytical model we have presented in the previous section has been extended to more complex cases in which there are more than 2 individuals, in which *production* is allowed, in the sense that the original endowments of factors of production (land, labor, natural resources) can be used for transformation in other goods which are then used for consumption. A competitive equilibrium, in such more general case, implies that

- The rate of transformation of any two factors of production is the same in all production activities;
- The marginal rate of substitution of any two consumption goods is the same for all consumption activities;
- The set of those rates of transformation and marginal rates of substitution constitutes the equilibrium set of competitive prices of the economy.

We will not go into the details of the analytical proofs of such statements, but the basic concept is the same which characterizes our simple example above: ***if nothing prevents individuals from engaging in exchange and production activities, they would do so until all opportunities for additional mutually advantageous exchanges are exhausted***. When this happens, a ***competitive equilibrium*** has been reached and, by definition, it will correspond to a Pareto optimal allocation of the resources in the economy.

Sometimes, this last concept is presented in economics books as a "theorem". It is named the *first fundamental theorem of welfare economics*, and reads more or less as:

"Under a set of specific assumptions, any competitive equilibrium is Pareto optimal".

It should be clear, however, that the correspondence between competitive equilibrium and Pareto optimality is warranted by definition of the competitive equilibrium, and does not need to be demonstrated, as a real theorem would need.

More interesting is probably the second fundamental theorem of welfare economics, according to which: "for any initial endowment of resources, there exists at least one competitive equilibrium", meaning that it does not matter where you start from, in terms of initial endowment of the resource, the economy can always reach a competitive equilibrium, that is an "optimal" allocation of the resources.

I am putting the word optimal between quotes, because I want to emphasizes that it is a very specific kind of optimality, and something that may correspond to situations that none of us will probably consider "optimal" by any means.

As an example, let us return for a moment to our economy made of only two people, and consider an initial endowment of $X^A = X$, $X^B = 0$; $Y^A = Y$ and $Y^B = 0$. (In other words, A gets everything, and B gets nothing). This allocation would correspond to the point at the upper right corner of the Edgeworth box. It is easy to see that such a point is indeed a "competitive equilibrium", because given the total availability of resources, it is never going to be in A's individual interest to move from there. It would mean to give up of one or both of the goods, with nothing in exchange for it. In other words, there is no way of moving from such a point without making

A worse off, and in this sense the point is Pareto optimal. Yet, I am sure that none of us would consider such a situation as "optimal"[2].

The concept of Pareto optimality, in practice, corresponds to a concept of ***economic efficiency***: a situation that is not Pareto optimal, is certainly an inefficient arrangement, in the sense that there exist alternative distributions and uses of the resources that can lead to overall higher levels of aggregate utility for the society as a whole.

The above discussion is meant to illustrate how limited the concept of competitive equilibrium might be. It is only concerned with efficiency, and cannot accommodate possible concerns about the ***distribution of utility*** among individuals, something that is included under the category of equity concerns.

Nevertheless, the concept of economic efficiency has been repeatedly invoked by some economists as the fundamental justification for the *laissez faire* view of state intervention in the economy, a view that dates back at least as far as the time when Adam Smith wrote his treaty on the wealth of the nations.

Since then, it has been the flag of many politicians and economists, especially of those critics of the centrally planned economies of the communist type. A number of other politicians and economists have opposed such view, and have instead proposed an active role for the state in the economy. Next session will illustrate the arguments brought to sustain such alternative view of the role of the state intervention.

2.3. Market failures and reasons for public intervention

It is a fact that free market and *laissez faire* types of economic policies have often led to situations considered sub-optimal from many points of view, even from purely efficiency considerations.

Some economists then, by fundamentally accepting the theoretical argument included in the neoclassical theory of competitive equilibrium, have tried to study in more detail, possible reasons for why the claimed superiority of the free market may fail to manifest itself.

The reasons that have been found that prevent the economy to settle on efficient, competitive equilibriums, have been termed as ***market failures***, which imply the existence of something that prevents the agents in the economy from engaging in all of the actually profitable trades.

As a result, whenever one of this failures exists, the economy will reach equilibriums which are not competitive, and thus, not necessarily efficient.

Some of the market failures recognized in the economic literature can be listed as:

- Lack of competition
- Presence of externalities and incomplete property rights
- Presence of public goods and common property resources
- Incomplete and asymmetric information

2.4. Non-competitive markets

Whenever there is market power on one side of the transaction, the resulting price does not equates the marginal cost of production, something that is needed to achieve competitive efficiency. Part of the revenues from selling the product when in a monopoly position, will be pure

[2] The reason why none of us would consider a situation in which one gets everything and the other one gets nothing as optimal is because, when considering human life, we would also take a certain degree of equity as a fundamental requirement. For extended discussions on the debate over equity and efficiency in economics, see the work of the Indian economist and philosopher Amartya Sen.

rent, rather that normal returns to the factors of production, so that one of the needed conditions for efficiency breaks down. As a result, less of the product is sold and at a higher price.

2.5. Presence of externalities and incomplete property rights

An externality is the effect of some production or consumption activity on other agents that those directly involved in the transaction. Usually, the external benefit or costs associated with the externality are not recognized or borne by the agents involved in the transaction, and as such, their existence is not reflected in the equilibrium price, which fails to capture the external benefits or the external cost, resulting in a socially inefficient allocation of the resources.

Ronald Coase has connected the problem of externalities to the problem of incomplete property rights by suggesting that any inefficiency induced by the presence of externalities could be corrected by the appropriate definition of property rights, which would allow the internalization of external effects.

The most common example is that of a factory whose activity releases pollution in the air, which cause damage to the population. This is an externality if the firm owner is not held responsible for the damages caused on the general population by the pollution. The inefficient outcome is that too much pollution will be produced because who produced it does not pay the relative cost for the society, and society cannot force the firm to reduce the pollution because there is no such thing as the property right over clean air.

2.6. Public goods and common property resources

When a good is characterized by non-excludability, non-rivalry is defined as a *public* good, as opposed to *private* good. For public goods it is not possible to define private property rights, and thus the incentives to trade them are inexistent. If left to the private initiative, there will be under-provision of public goods such as public defense, schooling and generalized health care (such as immunization programs), natural environment protection, etc. The reason is that no private operator will find it profitable to provide a good that other people can enjoy without paying for it.

2.7. Incomplete and asymmetric information

The theorems of welfare economics are based on the assumption that individuals are aware of all of the trade opportunities that there exist in the economy, so that they can recognize and exploit those mutually beneficial.

This is a very strong assumption that is not true in practice. For example, the *uncertainty in production* we discussed yesterday may prevent producers from making the most efficient decision regarding the use of inputs. And that is simply because of incomplete information on the probability of occurring of the bad weather. Also, when some goods' benefits extend over long period of time (for example, the exploitation of forestry or other natural resources such as oil reserves) ignorance on the potential *future benefits* of those resources may lead to over exploitation in the present.

These are all cases of incomplete information, when the benefits or the costs of a given economic action are not fully known by the agents that have to decide.

Very common is also the presence of *asymmetric information*, namely the fact that the two agents involved in the transaction might have different levels of knowledge about the benefits and costs involved in the transaction.

Asymmetric information leads to the phenomena known as *moral hazard* and *adverse selection*, which are studied extensively for the design of contracts in general, and insurance and la-

bor contracts in particular. The presence of asymmetric information causes additional costs, related to the need for *monitoring* the activity of the insured or of the worker, which would not exist if information were symmetric.

2.8. Government intervention in the economy

Government intervention may be justified to correct for market failures and to increase efficiency. Levying taxes on polluting activities, for example, may be intended to correct for the presence of externalities. Public provision of public goods may correct for the under provision of such goods by private operators. Public contracts and subsidized insurance may correct for the presence of asymmetric information, and so on. For any market failure, one can think of a form of public intervention that in principle might compensate for the negative effect.

Notice, however, that correction of market failures only allows for achieving *efficiency* in the use of the resources. These types of intervention do not address problems of unequal distribution of the net benefits – i.e. the *equity* concern.

This leads to a whole range of other possible forms of public intervention whose objective is direct or indirect *redistribution* of income to achieve a higher level of equity in the society.

To summarize, it is clear that the *laissez faire* or non-intervention of the government in the operation of the market is very unlikely to achieve even just the efficient economic use of the resources, not to mention equity. For this reason, even in capitalistic economies, the extent of state involvement in the economy can be very high, as opposed to the traditional view that large involvement of the state in the economy is typical of socialist economies.

In short, state involvement in the economy may be needed:

- to correct for market failures;
- to achieve non efficiency objectives.

However, large involvement of the government does not necessarily implies better outcomes in terms of efficiency and equity. The concept of *state* that we are assuming throughout the discussion is a very idealistic and abstract one: we imagine the state as a benevolent, well informed and technically equipped agent, who can correct for market failures without inducing other forms of “failures”. In reality, the government and the state are made of people who can suffer of the same information problems that affect common citizens. The state, in other words, can be as inefficient as the private market because of many phenomena, which have been named “state failures” (Ellis, p. 10-13). The most widely discussed form of state failure in the recent literature on economic development is the so-called “rent-seeking” or directly unproductive profit-seeking (DUP) activities.

In the analysis of policies, we must be aware of these problems. In other words, in evaluating policies one should ask:

- Does the policy address equity objectives, efficiency objectives, or both?
- If it addresses efficiency, which form of market failure it tries to correct for?
- If the policy requires direct involvement of the state in the market, are there other less intrusive, more private means of achieving the same objective?
- If not, which potential forms of “state failure” might be involved and how can they be prevented?

Chapter 3 - Introduction to welfare economics

We have seen in the previous section that there are many reasons why the government should intervene in the economy. The next step will be to try and understand what happens to all of the agents involved, when the government takes actions to modify the natural outcome of a certain market. The fundamental question we will be concerned with is: "*Who gains? Who loose? And by how much?*" The answer to this question is the core of the policy incidence analysis.

Two concepts of welfare economics will be mostly used throughout this course to answer the fundamental question and we will illustrate them first.

3.1. Demand functions and consumer surplus.

You are familiar, by now, with the economic theory of consumer behavior. The solution to the utility maximization problem subject to a budget constraint leads to the derivation of an individual's ***demand function***, that is, a relationship between quantity consumed and price.

Using general notation, the problem of:

$$\max U(x_1, x_2, \dots, x_N)$$
$$\text{subject to:}$$
$$p_1x_1 + p_2x_2 + \dots + p_Nx_N < y$$

leads to a solution in terms of the optimal quantity demanded of all goods:

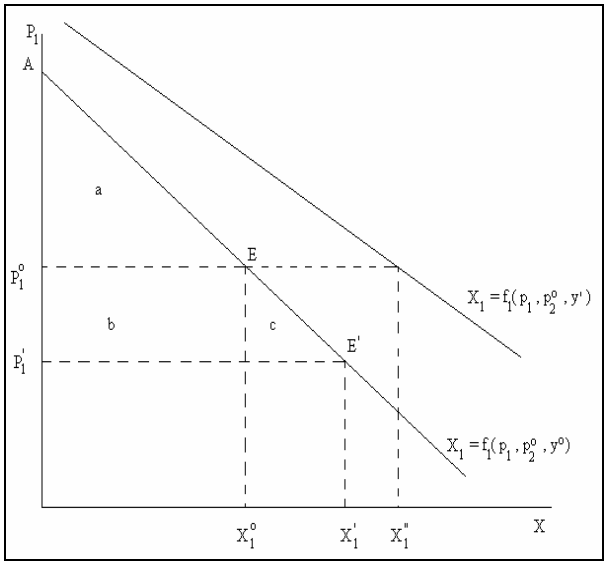
$$x_1^* = f_1(p_1,p_2,\dots,p_N,y)$$
$$x_2^* = f_2(p_1,p_2,\dots,p_N,y)$$
$$\dots$$
$$x_N^* = f_N(p_1,p_2,\dots,p_N,y)$$

which is a system of demand functions, where the quantity demanded of a certain good is expressed as a function of the price of that good, the prices of other goods, and the level of income.

Any demand function can be represented in a graph[3], and this graph can be used to determine what happens to the quantity demanded if one of the independent variables change. For example, with reference to Figure 3.1 which depicts the demand function for the good x_1, suppose that the consumer faces a price level p_1^o. Suppose also that the level of the only other good is p_2^o, and the income is y^o.

[3] Notice that usually the graph is depicted with the quantity, that is the *dependent variable*, on the horizontal axis, something unusual for a mathematical function.

Figure 3.1. Demand function and consumer's surplus



Then, the quantity consumed will be $x_1^o = f_1(p_1^o, p_2^o, y^o)$, as indicated by point *E* in the graph.

What happen if, for any reason, the price falls to a level p_1' ?

Usually, what we would expect is that, given a lower price, the consumer will demand more of the good. The demand function tells us that he will demand a quantity $x_1' = f_1(p_1', p_2^o, y^o) > x_1^o$.

How can we analyze the effect of a change in the level of income? We have to realize that an increase in income from, say y^o to y', will determine a shift of the demand function from $x_1 = f_1(p_1, p_2^o, y^o)$ to $x_1 = f_1(p_1, p_2^o, y')$. Thus, if the price of good x_1 remains p_1^o, the new quantity demand will be
$x_1'' = f_1(p_1^o, p_2^o, y') > x_1^o$

We could do the same exercise by changing the price of the other good, p_2 and predict what would be the change induced in the demand for x_1. In short, by knowing the demand function, we can predict the change in the quantity demanded induced by any change in prices and/or in income. However, observing just how the quantity demanded changes does not tell us what happens in terms of utility, that is, if after the change the consumer is better off, worse off, or has the same utility as before. For this reason, economists have defined the so-called *consumer surplus* which is intended as a monetary measure of the utility associated with a certain consumption choice.

Let us look again at the graph in Figure 3.1. If the price of good 1 is p_1^o, the consumer would buy x_1^o and will spend a total of $p_1^o x_1^o$. However, if the price were higher, the consumer would have still bought some of the good, which means that the consumer were willing to pay more than p_1^o for quantities of the good less than x_1^o. This means also that, by buying all of x_1^o at the price p_1^o, the consumer is receiving a benefit equal to the area comprised between the demand function and the horizontal line passing through p_1^o, which is indicated as area *a* in the graph. This area defines the *consumer's surplus*, which is a monetary measure of the utility associated with the purchase of a good at a fixed price[4].

[4] For an extended discussion of the properties of consumer's surplus as a monetary measure of utility, see any advanced microeconomics book, such as Hal Varian's *Microeconomic Analysis*. Complete reference is also provided by welfare economics textbooks such as Just, Hueth and Shmitz's *Applied Welfare Economics and Public Policy*.

With this concept, we are now able to answer the question: what happens to the consumer's welfare when the price of good 1 changes from p_1^o to p_1'? The effect of this change in price is an *increase* in consumer's surplus from area *a* to area *a + b + c*, that is a net increase of area *b + c*.

Notice that this increase in consumer's surplus can be seen as composed by two parts: area *b*, which is the surplus derived to the consumer because he can now buy the old amount x_1^o at a lower price, and area *c*, which is generated because now the consumer will buy more of the good.

(As an exercise, you can try to identify what is the change in consumer's surplus induced by the increase in income from y^o to y')

3.2. Correct measures of welfare change: the equivalent and compensating variations.

The consumer's surplus is an appealing measure of welfare change in terms of money because it is easily computed once the elasticity of demand is known.

However, its definition as the area underneath the ordinary demand presents some theoretical problems, and its use may determine some errors in assessing the actual monetary value of changes in income.

Fortunately, economists have devised two alternative measures of welfare change, called the *equivalent variation* and the *compensating variation.*

To describe them consider first what a correct measure of welfare change for a consumer should be. It should measure the change in the level of utility caused by the policy that one wants to evaluate. To measure the change in utility *level*, however, as measured by the difference in the values of the utility function, would give an undetermined answer, given that utility function is an *ordinal measure*. In other words, utility functions serve only to rank possible choices, and two different utility functions that generate the same ranking are perfectly equivalent even if they express utility levels on different scales.

As an example, suppose there are only two goods and you have two different utility functions, defined respectively as:

$$U(x_1,x_2) = (x_1 x_2)^2$$

and

$$V(x_1,x_2) = x_1 x_2.$$

It is easy to prove that this two utility functions generates *the same* ranking[5] of all possible consumption bundles *(x,y)*. For example, consider the values reported in the following table:

x_1	x_2	$U(x_1,x_2)$	$V(x_1,x_2)$	*Rank*
1	*2*	*4*	*2*	*3*
3	*1*	*9*	*3*	*2*
2	*2*	*16*	*4*	*1*
1	*1*	*1*	*1*	*4*

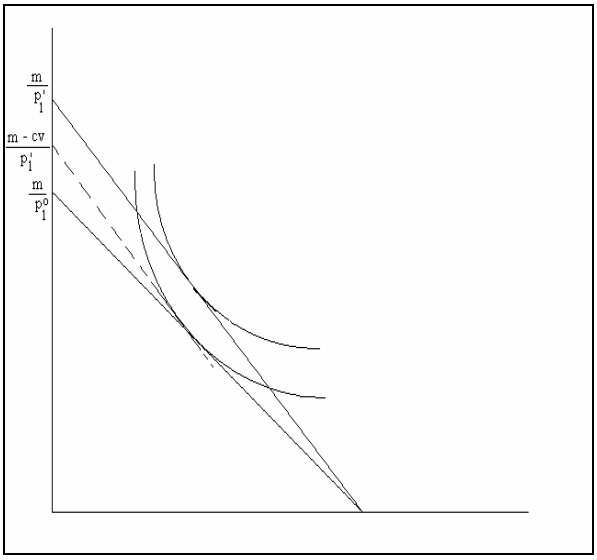
As can be seen, the ranking of alternatives induced by the two utility functions is the same, even though the *level* of utility is measured by different numbers. If we were to measure the change in utility induced by adding one unit of good y to the bundle (1,1), we will have:

$$\Delta U = U(1,2) - U(1,1) = 4 - 1 = 3$$

$$\Delta V = V(1,2) - V(1,1) = 2 - 1 = 1.$$

[5] From a mathematical point of view, the two functions generate the same ranking of utility because, conditional on positive amounts of x_1 and x_2, they are *monotonic transforms* of each other.

Figure 3.2. The compensating variation of a reduction in price



For this reason, we cannot simply use the difference in the value of the utility function as an index of the change in welfare.

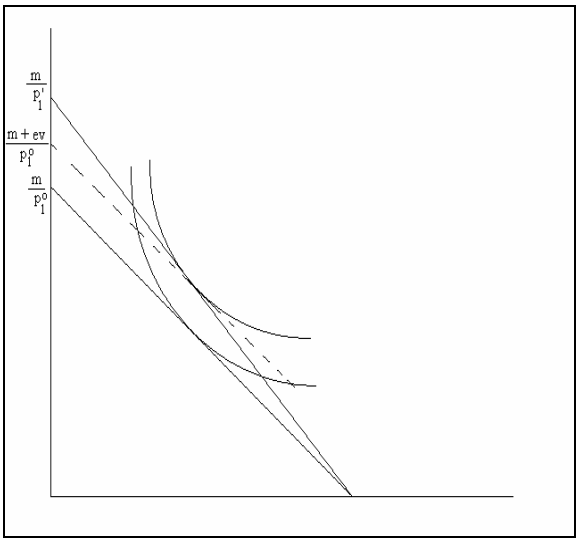
Two better measures are the **equivalent variation** and the **compensating variation**.

The equivalent variation of a certain policy (for example, a change in the price levels) is defined as the amount of money which, when paid to the consumer, will achieve the same change in utility caused by the policy.

Its measure can be seen graphically on figure 3.2 above.

In the graph, we are considering a reduction of price from p_1^o to p_1'. As a consequence, the budget line would rotate and the consumer would reach a higher indifference curve. The equivalent variation, *EV*, is the quantity of money which, added to income while keeping the price constant to the original level, would bring the consumer to the same higher indifference curve.

Figure 3.3. The equivalent variation for a reduction in price



The *compensating variation* of a certain policy, instead, is defined as the amount of money which, when taken away from the consumer after the policy implementation, would bring the consumer back to the old utility level. The graph in Figure 3.3 illustrates the compensating variation for a reduction in price from p_1^o to p_1'.

It can be shown that the *EV* and *CV* can be measured as areas to the left of the *compensated demand functions* and included between the two price levels. The difference between *EV* and *CV* is in which of the utility level is taken as a reference: for *EV*. We consider the final utility level u', while for *CV* we consider the initial utility level, u^o. (See Figure 3.4)

3.3. The relationship between change in consumer surplus, ΔCS, equivalent variation, *EV*, and compensating variation, *CV*.

There is a precise relationship between the change in consumer surplus, the equivalent variation and the compensating variation, which can be seen on the graph in Figure 3.4.

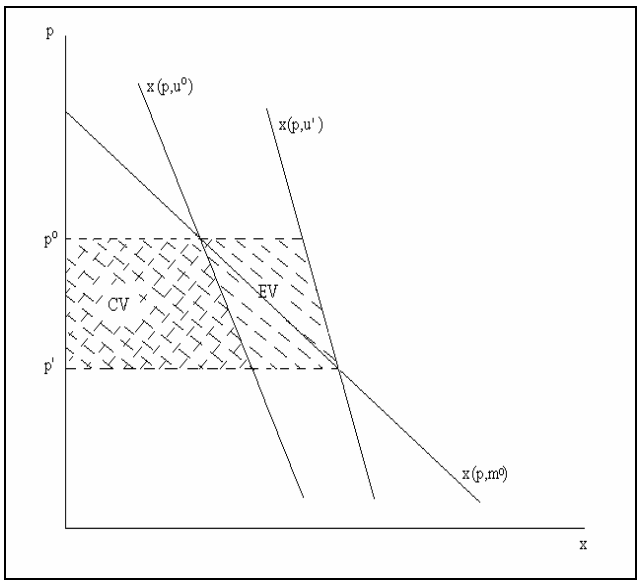
For a reduction in prices, which means a positive effect on utility, the change in consumer's surplus is always larger than the compensating variation, and smaller than the equivalent variation. On the other hand, it can be shown that for policies that determine a reduction in utility, the change in consumer's surplus is larger that the equivalent variation, and smaller than the compensating variation. In other words:

$$CV < \Delta CS < EV, \text{ for policies that increase utility}$$

$$EV < \Delta CS < CV, \text{ for policies that decrease utility}$$

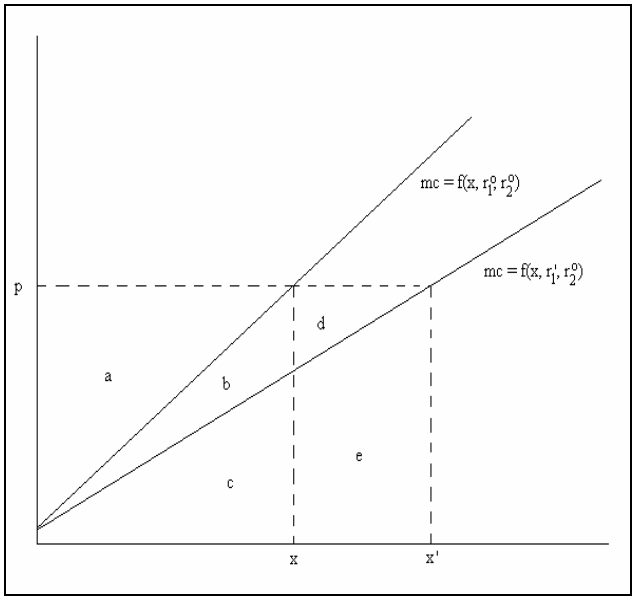
The difference between the change in consumer surplus and the two correct measures of welfare change, *EV* and *CV*, depends on the income effect: if the income effect is large, then approximating either the *CV* or the *EV* with the change in consumer surplus will determine a sensible error.

Figure 3.4. Change in consumer surplus, equivalent and compensating variation for a reduction in price.



One other question is related to which one of the two measures, *EV* or *CV*, one wants to use. Recall that the difference between the two is the utility level taken as reference: the *CV* is calculated with reference to the initial utility level, u^o, the *EV* with reference to the new utility level, u'. Thus, using the *CV* as a measure of welfare change, implicitly amounts at assuming that consumers have the right to the *ante-policy* situation and to the initial level of utility. Using the *EV*,

Figure 3.5. Marginal cost curves and producer's surplus.



on the contrary, is equivalent to assume that consumers have the right to the *post-policy*, final level of utility.

One point worth of attention in the context of a course on agricultural policies in developing countries is that, by using Δ *CS* instead of *CV* as a measure of welfare change, one *overestimates the benefits* and *underestimates the costs* of the policy to the consumers. And, as we have seen, the bias will be relevant whenever the income effect of the change is higher. For agricultural prices, for example, the bias will be higher for poor consumers which spend most of their income in agricultural products.

In the rest of this notes, we will continue to use the change in consumer surplus to indicate the effects of policy on consumers. We have to remember, however, that it could mean an imprecise assessment of the actual welfare effect in the cases noted above.

3.4. Marginal cost, supply function and producer's surplus.

In the market, the counterpart of consumers are the firms. Each firm, in a competitive industry, will have a *supply function*, that is, a relationship between quantity offered for sale on the market and price. From the course in production economics, you know that the quantity offered by a profit maximizing, competitive firm, is the quantity for which price equals marginal cost. This means that the supply function coincides with the marginal cost function of the firm, which in general is a function of the level of output and of the prices of the inputs: $mc = f(x, r_1, r_2, \ldots, r_M)$

The graph in Figure 3.5 represent one such function, where, for simplicity, only two inputs are considered.

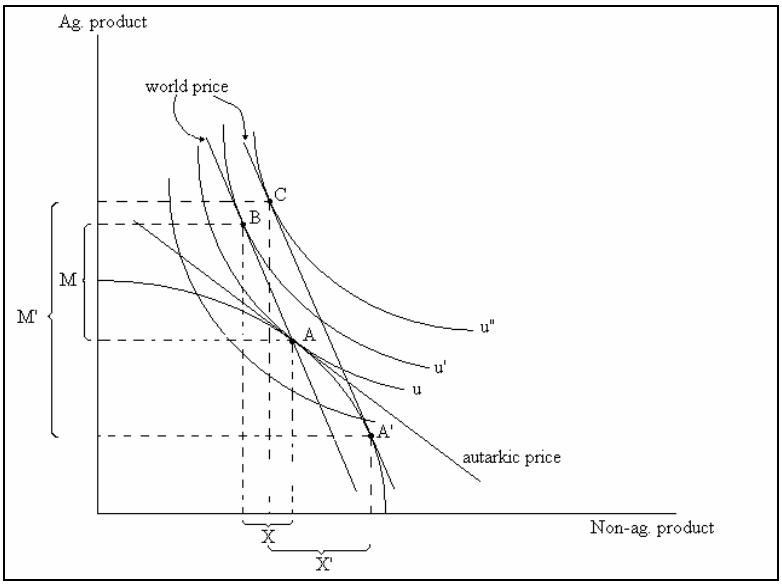
Let us consider first the case when the prices of the two inputs are fixed at levels r_1^o and r_2^o.

When price is p, the firm will supply an amount x : $f(p, r_1^o, r_2^o) = p$. The total revenues from this choice will be equal to the area $a + b + c$. However, area $b + c$ corresponds to the total variable cost[6] of producing an amount x, so that only the area a is actual benefits (more precisely, it in-

[6] The fact that the area underneath the marginal cost corresponds to the total cost can be proved by recalling that the marginal cost is defined as the derivative of the total cost. By integrating the marginal cost, then, one obtains the total cost. If you are not familiar with integrals, just take it as a fact that the area below the graph of a function does indeed correspond to the integral of that function.

cludes profits and returns to the fixed factors of production, as land and fixed investments). Such area can be used as a monetary measure of the benefits that the firm will receive by selling the amount x at price p.

Figure 3.6. The transformation curve and the autarkic equilibrium



The area a in the graph, that is the area comprised between the horizontal line passing through the price level and the marginal cost curve, defines the *producer's surplus*.

With this definition, we can now try and calculate what happens if, for example, the price of one of the inputs falls, say from r_1^o to r_1'. The new marginal cost curve will now become $mc = f(x, r_1', r_2^o)$, the quantity offered for sale will increase up to x', and the producer's surplus will increase by the area $b + d$. Notice that we can interpret this change in consumer's surplus as made of two components: the area b, which correspond to the reduction in costs to produce the old amount x, plus the area d, which is additional surplus generated by the fact that now the firm will increase production up to x'.

(As an exercise, you can determine the change in producer's surplus caused by an increase in the output's price.)

3.5. A note on aggregation and on the difference between profits and rents

In the previous discussion on consumer's and producer's surplus, we have considered an individual consumer and a single firm, respectively. The theoretical basis for considering consumer's surplus as a monetary measure of utility, in fact, is rigorously valid only for an individual demand. And, analogously, the supply function corresponds to the marginal cost only for an individual, competitive firm.

However, when we will analyze policies, we will often refer to the entire market: rather than the *individual* demand and supply function, we will consider the *aggregate* or *market* demand and supply. It is then reasonable to ask whether we can we still use the definitions of consumer's and producer's surpluses as the areas between demand function and price and between price and marginal cost as legitimate measures of welfare change.

It turns out that it is still legitimate to do so, under some restrictive assumptions. In particular, under the assumption that all consumers are identical, the area beneath the market demand function and above the price level is a valid monetary measure of the sum of individuals' utility. In general, we should remember that direct comparison of utility is not legitimate, given that

utility is only an *ordinal measure*. By simply summing up the individual consumer's surpluses, as we implicitly do when we measure the aggregate consumers' surplus as the area beneath the market demand, we are neglecting the possibility that consumers are different, and that the same reduction in income, for example, might be more onerous for poor consumers than for rich ones.

In other words, by only measuring the aggregate consumers' surplus, we neglect possible *equity* issues.

Things are less problematic for the aggregate supply function: provided the production sector is competitive, the aggregate supply is simply the horizontal sum of the individual supply functions, even if firms are different in the structure of their marginal costs.

A different issue that deserves consideration, however, is the difference between profits and returns to the fixed factors of production, or what we can call *rents*. In the long run, a competitive industry will have no profits, and all the area above the marginal cost curve is simply rents that represent returns to the fixed factors. If the entrepreneur is also the owner of the fixed factor of production (for example, if the farmers own the land he cultivates), then there is no practical difference between profits and rents: both will reward the same individual. When, instead, land is owned by a landlord who rents it to the farmer, and if supply of land is inelastic, any change in producer's surplus will eventually be completely transferred to the landlord. Once again, there may be equity issues to be taken under consideration (see Ellis, page 41).

3.6. Comparative advantages and gains from trade

One last chapter in welfare economics I would like to introduce in this course covers the concept of *comparative advantages* and of *gains from trade* and from *specialization*. To illustrate it, we will use the concepts of products transformation curve and indifference curves that you have been presented in microeconomics.

Suppose that there is a fixed amount of two resources in the economy: land and labor. And suppose also that land and labor can be used to produce agricultural and industrial products.

The transformation curve depicted in the graph of Figure 3.7, represents the efficient combinations of agricultural and industrial production that can be obtained in the economy by using the fixed amount of available land and labor.

If the structure of the preferences of the country can be represented by the set of indifference curves depicted in the figure, then the maximum social welfare will be achieved, in autarky, at point A, which corresponds to the highest possible indifference curve that the Country can reach, given the availability of resources and the technology.

The common tangent to the transformation curve and the indifference curve represents also the autarkic price ratio of agricultural and non-agricultural products.

Now, suppose that on the world market the relative price of agricultural and non agricultural product is different, for example as indicated by the steeper line labeled "world price". This would mean that on the world market, agricultural product is valued relatively less of what it is valued in the domestic market, and that the country has a *comparative advantage* in the production of non-agricultural products.

If the Country opens to international trade, then, it would be convenient to start selling some of the non-agricultural product on the world market, and import some agricultural product. This exchange, which corresponds to moving *consumption* from point A to point B, by exporting an amount X of non-agricultural products, and importing an amount M of agricultural products, which would allow for an increase in social welfare, from u to u'. This increase in welfare can be considered as *gains from trade*, which can be obtained even if the Country does not change its production schedule.

With an open market, however, there are additional gains that can be exploited through *specialization*. If the country rearranges its production activities, and moves on point A' along the transformation curve, it will be possible to increase exports up to X' and imports up to M', with a further improvement in social welfare up to the point *u"*. This further gains are due to *specialization* of production in the activity for which the country has a comparative advantage.

Gains from trade and specialization are always present in an open economy. The only condition under which there are no such gains if when *domestic prices are equal to world prices*. For this reason, it is usually conceived that the opportunity cost for domestic resources in an economy is measured by the respective price on the world market. World prices thus constitute a benchmark, that is a reference point, for assessing how much prices within a country are distorted (this is at the core of analyses carried on with use of the Policy Analysis Matrix, as we well see below.)

Chapter 4 - Introduction to Policy Analysis

After the presentation of the theoretical tools needed, we are ready to embark upon the study of the process of policy analysis, which will cover the remaining part of this course.

Policy analysis can be described as the *technical and economic work that considers alternative policy instruments, assesses and compares them in terms of net benefits, and, at a later stage, evaluates the impact of the chosen policy and infers lessons for the future from its implementation* (Ellis, p. 23).

It is thus the task of policy analysts, who are not necessarily those responsible for the eventual policy implementation, which is the responsibility of policy makers. Nevertheless, the role of policy analysts is very important in guiding the decision process that policy makers would accomplish.

Proper policy analysis requires a sound understanding of the conditions of the sector for which the policy is intended, as of the general conditions of the economy as a whole. Also, a sound knowledge of the technological and natural processes involved in the production processes is a significant advantage in that it helps assessing the physical effects of public intervention, together with the monetary ones. As clearly described by Ellis (p.29), *" [...] for example, a proposed policy to raise the price of a staple food, like maize, has impacts on the volume of maize production, the quantity of maize that is sold in the market rather than retained for home consumption, the demand by farmers for variable inputs like fertilizers used in maize production, and the demand by consumers of maize flour."*

As you can see, agronomical, economic, and social aspects of the sector are involved in determining the overall effects of a price policy.

No single course such as this one can provide all of the information needed to actually carry out a comprehensive policy analysis. What we aim at achieving, is the formulation of a structured way of thinking about agricultural policies, a framework that when needed, can be used as a reference to carry on all the phases of the analysis.

4.1 Alternative frameworks for policy analysis: demand and supply analyses vs. the Policy Analysis Matrix

There are various possible frameworks for policy analysis among those based on economic theory.

The most common framework is the one we have as implicitly assumed in all of the examples we have presented until now, based on supply and demand schedules.

To follow this framework, an analyst first identifies the relevant market (as for example the domestic market for maize consumption, or the regional market for aggregate agricultural production, or also the market for labor in a rural community, and so on). Then, he needs to specify the

demand and supply functions. This is potentially the most demanding task of the analysis. Demand and supply functions can, in principle, be estimated by using observed data on past outcomes of a given market (time series data), by using data on several different economic unities (cross-sectional data), or both (panel data). However, estimation of supply and demand schedules consistent with economic theory poses many challenges and requires abundant data. Moreover, usually requires time that the analyst might not have. For this reason, usually it is the case that analysts rely on second hand sources of elasticity estimations from various other sources.

An excellent detailed description of this framework, based on microeconomic analysis of individual behavior, is contained in the manual by Elisabeth Sadoulet and Alain de Janvry (1995) entitled: *"Quantitative Development Analysis"*. In the book, the authors start from the analysis of the behavior of the individual agents involved in the sector (farmers, consumers, the government) to build the needed aggregate relationships that allow for the desired level of analysis (market, sector, or national).

An alternative framework for policy analysis, the so called *Policy Analysis Matrix*, introduced by Monke and Pearson (1991), avoid the need to estimate the microeconomic relationships that form the basis of market supply and demand schedule. Rather, the framework is based on the construction of *representative productions systems*, whose performance is analyzed by *budget analysis*.

In PAM studies, the focus is on a commodity by commodity basis. Each commodity can be the described by the chain of production, processing and marketing activities that bring the commodity to the final consumers.

The performance of the whole system can be measured by the result it achieves in terms of *profits*, that is the difference between revenues and costs. Revenues are simply the product of quantity and price of the consumption good, as registered on the final market. Costs are the sum of the products of the quantity and price of all inputs utilized along the commodity chain, from the farm, to the processing industry, to the marketing activity.

The key intuition in the use of the PAM for policy analysis is that the overall effect of policies and other market distortions that affect a given commodity system, can be captured by the induced difference in prices.

As we have seen in the section on comparative advantages and gains from trade, in a situation of liberalized trade, to *produce* where the marginal rate of transformation equals the ratio of world prices (see the graph in figure 3.7), and then to *exchange goods* on the world market at such prices would allow the maximization of the overall welfare of the country. The statement is conditional on many simplified assumptions, the most important of which is the absence of transaction costs on both the domestic and the international markets. Nevertheless, it indicates that *the presence of a difference between the prevailing prices within the country and the world prices indicates potential departure from the most efficient allocation of resources.*

By evaluating the relevant quantities in the budgets of a PAM first at *private* prices (that is at the prices actually faced by the agents) and then at their *opportunity cost* (which often is directly linked to the world price), analysts can measure the impact of the entire set of policies and all other distortions that influence the market for a commodity.

We will spend some time in this course in describing and discussing in detail the PAM approach to policy analysis, not because we think it is the only or even the best way of evaluating the effects of agricultural policy[7]. Nevertheless we believe that the PAM approach can be extremely

[7] In fact, there are some reasons why the PAM approach to policy evaluation might be criticized. It takes as a reference point the ideal situation that would emerge in a completely free trade market, where all market clear and there are no distortions. Some opponents of the PAM approach, consider such a situation only an ideal abstraction that bears no resemblance with the actual environment in which policy can take place (see for example Sadoulet and de-Janvry, 1995, page 6).

useful in the overall policy debate. First, because it is conceptually very simple, and easy to understand. Second, and most important, because in the process of building and evaluating the result of a PAM analysis, the analyst is forced to carefully examine many relevant technical and social aspects of the productive systems being analyzed.

4.2 Phases of policy analysis

Following Colman and Young, as quoted by Ellis (p. 30), one of the possible characterization of the phases of the process of policy analysis is as follows:

(a) Evaluation of price effects, meaning not just own price effects in a single market but also the impact on closely related markets;

(b) Production effects, including the quantities of outputs and inputs;

(c) Consumption effects, meaning the demand impact of the policy in affected markets;

(d) Trade or balance of payments effects, including effects on imports, exports, foreign exchange reserves and the exchange rate;

(e) Budget effects, meaning the impact on government tax receipts and public expenditure;

(f) Income distribution effects, meaning the impact of policies on equity;

(g) Social welfare effects, meaning the identification of the gainers and the losers of policy interventions, as well as measurement of the overall impact on social welfare.

As can be seen, the task is quite complex, that is why sometimes we need to make some simplifying assumptions that allow for reduction of the dimensions of the analysis.

The main simplifications that are usually considered when proceeding with the economic analysis of policies are the following:

(a) performing a *partial equilibrium* rather than a *general equilibrium* analysis

(b) performing a *comparative static* evaluation rather than a *dynamic* analysis

(c) performing a *commodity oriented* analysis instead of a *sector* analysis

(d) analyzing the effects of a *single policy* considered in isolation from all other policies that are in place at a given time, instead of the combined effects of *all policies* affecting a specific commodity chain, a region, or the whole agricultural sector of a Country.

We will discuss them in detail

4.2.1. Partial vs. general equilibrium analysis

A partial equilibrium analysis will limit the scope of the analysis to a *single market*, or at most, to a limited set of tightly connected markets. For example, when considering the effects of a policy that modifies the price of maize, to perform a general equilibrium analysis, one should consider all the effects that such a policy will have on:

- the production of maize by farmers
- the consumption of maize by final consumers

My personal criticism is founded more on rhetorical grounds. It is my opinion that to consider as an 'ideal' point the efficient outcome of free markets, might bring too much emphasis on *efficiency* objectives, as opposed to non efficiency ones. To be fair to the proponents of the PAM approach, I recognize that they allow for the presence of non efficiency objective when they affirm that 'nonefficiency objectives are [...] considered as potential justifications for policies that support inefficient production systems' (Monke and Pearson, 1989, page x). However, such a statement subtly implies that the government should always try and achieve non efficiency objectives (such as an equal distribution of income) through other interventions that do not distort the productive systems, avoiding to discuss the social, political and technical difficulties that such a strategy would imply. Use of the PAM, in other words, may lead to the selection of set of policies that can only be justified on the ground of only potential Pareto improvements, whose benefits are likely to remain potential and never manifest themselves.

- the market for other grains that can be substitutes for maize consumption
- the demand of maize by livestock operations that use maize as a fodder for animals
- the market of other feed crops that may be substitute for maize in animal production
- the production of alternative crops that may compete with maize for the agricultural land

and so on. The list may be very long so that the analysis would be very demanding.

In some cases, it may suffice to limit the analysis to just the first two elements: production and consumption of maize, on the account that the other effect may be negligible when compared with the direct effects.

This might increase the feasibility of the analysis, even though we must keep in mind that simplification always implies some lost of information, and we must be careful in deciding when the information we lose is not going to change the overall judgment about a policy.

From the economic point of view, different markets can be linked from the consumption side, from the production side, or from both.

From the consumption side, the relevant relationships are those of *complementarity* and *substitutability*. Recall from the course on consumer theory, that two goods are complement if the cross price elasticity is negative, meaning that if the price of one good increases, the consumption of the second good decreases. Alternatively, two goods are said to be substitutes if the cross-price elasticity is positive, that is when the consumption of one good increases following an increase in the price of the other good.

From the production point of view, *markets for outputs are linked to the markets for inputs* used in the production function. In fact, the derived demand for inputs depends directly on the output price.

Moreover, different product may be *joint in production*, and thus any change in the production of one output will necessarily affect the production of the other.

Finally, different products may be linked with each other because their production *compete for the use of a common factor*, such as land.

All of these connections makes it often necessary to extend the analysis of the effects of a given policy to several markets, thus moving towards a *general equilibrium analysis*. One important point to notice is that, when markets are *only vertically linked*, the analysis in *any* of the markets will yield a correct measure of total benefits. However, the *distribution of the benefits* can be only appreciated by working through the analysis of all the markets.

As an example (see Figure 4.1), consider the following discussion[8].

Suppose that land, labor and other farm inputs are used to produce an agricultural commodity. Then, this commodity, together with other marketing inputs, is used to supply a final commodity to the consumers on the retail market.

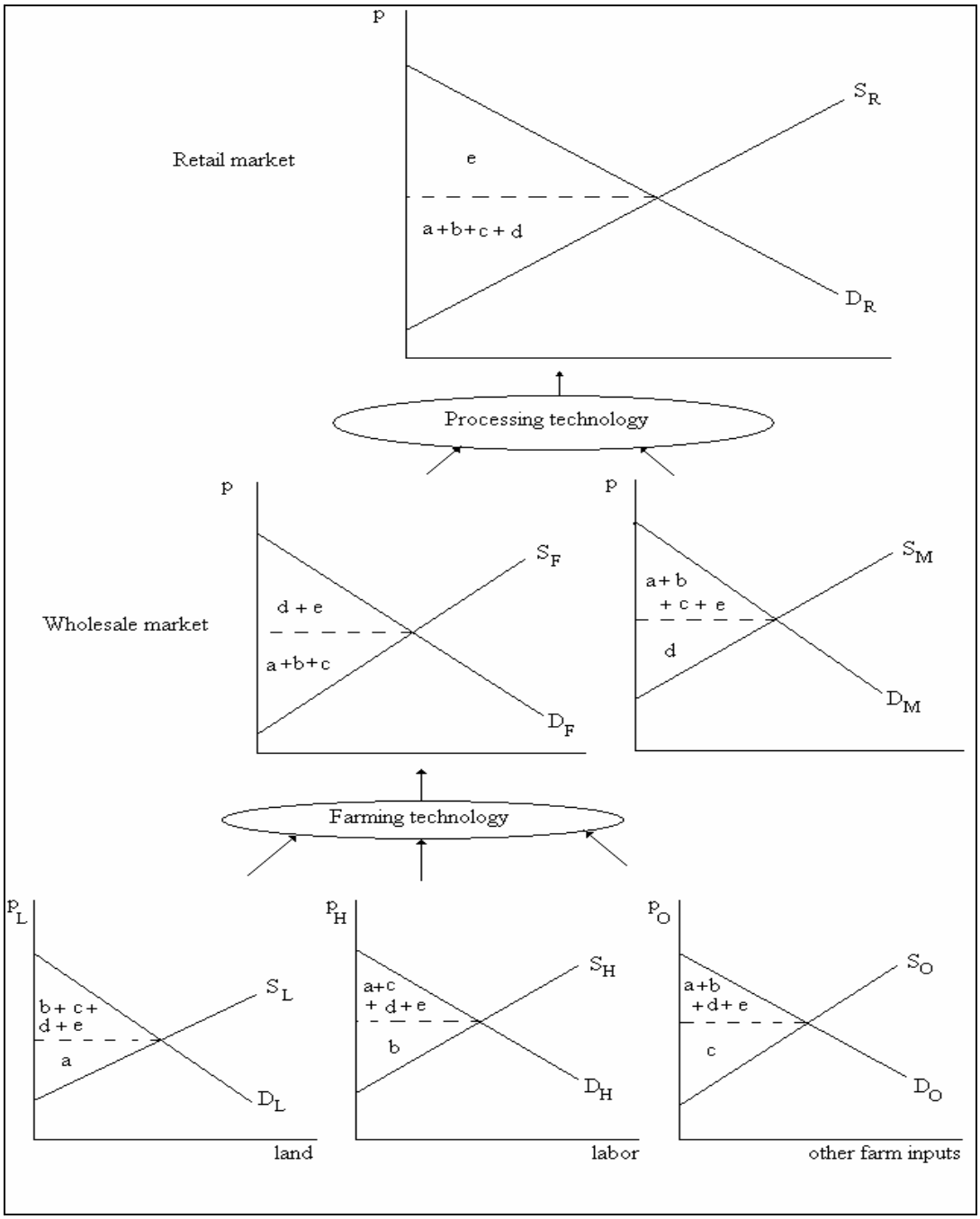
If one analyzes the equilibrium on the retail market, the area identified as consumer's surplus (area *e*) accrues to consumers, whereas the area identified as producer's surplus will include surpluses accruing to different *functions* in the production chain, that is: surplus to the owners of farm labor (*a*), land (*b*) and other farm inputs (*c*), and to providers of marketing inputs (*d*).

To see why it is so, consider that the sale of the product in the retail market will induce a derived demand for farm output and for marketing inputs. If one analyzes the wholesale market of the agricultural product, then the consumer's surplus measured under the demand expressed by the

[8] This discussion is taken and adapted from: Julian Alston and Jennifer James (forthcoming), *The Incidence of Agricultural Policies* Draft chapter for the Handbook of Agricultural Economics, edited by Bruce Gardner and Gordon Rausser for North Holland Publishers.

marketing firms will include the consumer's surplus of final consumers plus the surplus to the suppliers of the marketing inputs.

Figure 4.1. Distribution of welfare in a multi-market model



On the other hand, if one focuses on the derived demand for marketing inputs, then the area underneath the derived demand function for marketing inputs will include returns to final consumers and to all the suppliers of inputs into the agricultural process.

The analysis could also be carried at the level of the markets for agricultural inputs. In each of those markets, the area identified as producer's surplus will correspond to the net returns to the

suppliers of the particular input, whereas the area identified as consumer's surplus will include the benefits to all others[9].

The discussion serves also to highlight the difference between *personal* incidence and *functional* incidence or distribution of welfare. In economics, we usually perform functional incidence analysis. That is, we measure the welfare that accrues to people in their economic functions of producers, consumers, taxpayers and owners of fixed resources, not as specific individuals. For example, consumers are always also taxpayers, whereas peasant farmers are at the same time producers and consumers of the good. This means, for example, that if we wanted to perform an analysis of the personal welfare effect of a subsidy on agricultural products on such farmers, we should add the benefits that accrue to them as producers, and subtract the welfare loss to be credited with them as consumers.

Eventually, what would really matter from the social point of view is the personal incidence. However, to assess personal incidence one needs a detailed description of the ownership of factors of production, something that is rarely available.

4.2.2 Comparative static vs. dynamic analysis

In the discussions we have conducted so far, and in most of those we will carry on in the next sections of this course, we assume a static framework.

For example, when defining the concept of change in producer's surplus due to a subsidy on price, for example, we assumed a fixed supply function. Under such modeling choice however, there is a precise restrictive assumption of the dynamics of supply, namely, that the supply function would not change as a consequence of the presence of the subsidy. This may be true only if there are technological or resource availability constraints that prevent the agricultural supply from increasing. In all other instances, we would expect that the presence of the subsidy will attract more resources in the sector, by shifting the supply function to the right. At the same time, other phenomena such as the development of new technologies, will contribute to increase productivity and supply.

This means that the elasticity of supply is either zero or very low because of technological and resource constraints), otherwise, when the analysis is conducted at a level that no such constraints are in effect, the elasticity is positive and increasing over time.

Recognition of this fact has very important consequences for the analysis of the welfare effects of policies especially of those which apparently are designed to improve the conditions of agricultural producers, as we will discuss next.

Suppose we want to analyze the effects of a price subsidy on the agricultural product. When the elasticity of supply is zero because of the presence of some limiting resource, such as for example, a fixed amount of land, any producer's surplus will end up paying just for land rents. The reason is that the higher price will induce a higher derived demand for land. In turn, the higher demand for land, faced with a perfectly inelastic supply will result in a higher price for land. The additional cost for land will erode all the benefits from a higher output price, and who really benefits from the subsidy are land owners. This discussion, when properly understood, has interesting implications for the effects of *removing a subsidy* to agriculture, something that is becoming more and more common under the rules of the World Trade Organization. The consequence will be that, where there exists an active market for land, young farmer who bought the land when the subsidy program were in place, had already paid in terms of higher land price the capitalized value of the benefits due to the program. When the program is eliminated, they suffer a real loss in terms of depreciation of their land assets.

[9] Fore a more technical discussion on the analysis of welfare distribution in vertically linked markets, see R.E. Just and D.L. Hueth (1979) "Multimarket welfare measurement", *American Economic Review* 69, p.947-954.

The other case is when the elasticity of supply is positive and increasing over time. In the short run, the supply elasticity may be low to increase as we move towards longer run. To perform a static analysis of welfare distribution, thus, implicitly amounts at fixing a particular length of run.

Consider again the potential benefits of a fixed, per unit price support. Depending upon the elasticity of supply, the distribution of the benefits will change. A larger share would go to consumers the higher is the elasticity of supply. In the extreme case of a perfectly elastic supply function, all of the benefits will go to the consumers.

Combining the results of this two cases, the picture one can draw is that in the long run, any support to agricultural production will end up either paying rents to the owner of the fixed resources, or being enjoyed by consumers through lower prices for agricultural products. The hypotheses that led to such conclusion are not so extreme as one could think. The explanation for this result can be found by considering that, by its very nature, labor, the other factor of production of which the agricultural sector is rich especially in developing countries, cannot appropriate any long run benefit from sector support.

The point I want to make with the entire discussion on the dynamics of response of supply and of the incidence of agricultural policies, is that by only conducting comparative static analyses, there exist the risk of over estimating the benefits in terms of returns to labor and underestimating those in terms of returns to land and other fixed factors or of returns to consumers deriving from a policy of support to agriculture.

Conversely, the same type of myopic analysis might have led to underestimate the costs of policies of taxing agriculture to finance industry and the consumers in urban areas, so common in the past decades in many developing countries.

Chapter 5 - The *Policy Analysis Matrix*: A measure of the overall effects of policies

In this section we will describe in some detail the process of building and analyzing a Policy Analysis Matrix, which has been introduced to the profession of agricultural economists by Eric A. Monke of the University of Arizona and Scott R. Pearson of Stanford University's Food Research Institute.

A PAM can be considered as a way of organizing budget data on representative commodity systems. The way in which data are gathered, processed and organized, allows for evaluation of the impact of the set of all policies and market distortions on a given *representative commodity system*. Collecting and adding PAM's for several commodity systems, then, can extend the analysis to the agricultural sector of a region or of the entire country.

The emphasis, thus, is on a commodity-by-commodity basis, and the main requirement is to be able to correctly identify only few *representative* systems.

There are typically three rows and four columns in the PAM for a representative system (see table 2.1. in Monke and Pearson, 1989): The first row contains actual values of **revenues** (*A*) and **costs**, divided in payments to **tradable inputs** (*B*) and to **domestic factors** (*C*). Actual values means that the values are obtained by direct collection of current data on quantities and prices as they manifest themselves in the economy. The difference between revenues and costs measures **private profits** ($D = A - B - C$).

Notice that costs are classified in only two categories: tradable goods (that is, goods that can be potentially traded on international markets) and non-tradable domestic factors (namely: land, capital and labor). Intermediate goods that are not directly tradable must be disaggregated in their basic components, so that any cost item can be either classified as due to a tradable input (oil, fertilizers, chemicals, etc.) or to domestic factors.

The value in *D* thus measures the overall **private profitability** of the particular commodity system under analysis. The main intuition behind the PAM analysis is that this observed profitability can either be the 'natural' result of fundamental economic forces in the economy, or an 'artificial' result induced by policy transfers.

To assess to what extent private profitability is due to market forces, the second row of the matrix aims at representing the ideal, most efficient level of profitability of the commodity system. It is built by evaluating the budgets at so-called *social prices*. Social prices are defined as those that express the opportunity cost of the goods or the resources[10] in an undistorted economy. To build the second row of the PAM, then amounts at identifying the social prices, and at predicting how quantities would change under those prices.

[10] This definition of social prices correspond to the definition of *economic* or *shadow prices* of Ellis (p. 55), who defines social prices as those adjusted to take into account also equity objectives.

Table 2. The Policy Analysis Matrix

	Revenues	**Costs**		*Profits*
		Tradable inputs	*Domestic factors*	
Private prices	A	B	C	D
Social prices	E	F	G	H
Effects of divergences and efficient policy	I	J	K	L

The values in the second row express revenues (*E*), costs for tradable goods (*F*) and costs for domestic factors (*G*) all evaluated as if social prices prevailed. The difference between revenues and costs yields **social profitability** ($H = E - F - G$) and expresses the ideal potential level of profits that the commodity system could generate.

By comparing the private with the social profitability, then, the analyst can judge whether the commodity system under analysis is subsidized or penalized under the prevailing set of policies. To this aim, the third row of the PAM contains the differences between the values in the first and in the second row.

The values in this row express the overall effect of policy and other distortion that affect the production of the particular commodity. The difference between private and social values can be considered as *transfers*.

We can distinguish between **revenue transfers** ($I = A - E$), **tradable cost transfers** ($J = B - F$), **domestic factor transfers** ($K = C - G$), **and total transfers** ($L = I - J - K = D - H$).

For example, a positive value for *L* means that private profits in the commodity system being examined (*D*) are higher than what they would be if the economy where at its efficient equilibrium (*H*). In other words, the sector is *subsidized* as a result of the set of policies being in place. The overall effect, *L*, is also equal to the difference between the level of output transfers minus the sum of input and factor transfers ($L = I - J - K$), so that one can identify whether the distortion is due to revenue transfers, tradable cost transfers, and/or factor transfers.

As a result, the analysis of a commodity system through the PAM can highlight the relative position of the system in terms of implicit taxation of subsidization. But nothing can be said on the non-efficiency effects of such transfers. In other words, the PAM can tell that a given set of policies will induce inefficiencies in the economy and can quantify those inefficiencies, also by pointing to the main sources of inefficiencies (whether they are mainly due to revenues, tradable costs, or domestic transfers), but tells nothing on how to eliminate such inefficiencies without compromising the non-efficiency objectives of the policy.

One way in which the PAM could be used, in principle, to suggest ways of improving the conditions of the economy is through *simulations*. If one is able to imagine alternative set of policies, one can build simulated budgets under these hypothetical conditions, and observe how the level of distortions might change.

However, the simulation results are strongly dependent on the ability of forecasting how the entries in the first row of the PAM would change under the set of hypothetical policies, an exercise that usually has a high degree of imprecision.

To conclude this introduction, we can summarize by saying that the PAM approach for policy analysis can:

- measure the efficiency cost of existing policies and market failures;
- compare the relative position of different commodity systems in terms of net transfers;
- help to highlight the efficiency cost of policies that may have equity objectives;

However, it cannot directly isolate the causes of inefficiency, so that an informed decision on how to change the policies that are in place need additional information that can be obtained only by more specific analysis of benefits and costs of each individual policy, as for example traditional partial equilibrium analyses of single policies.

In the following part of this section we will discuss in detail how to build and analyze a PAM, whereas the remaining sections of the course will be devoted to more traditional partial equilibrium analyses of several kinds of common agricultural policies.

In the following subsections we will discuss the separate phases in which the process of constructing a PAM can be divided. These phases are:

1. identifying the representative systems
2. constructing the baseline budgets, under private prices
3. determining the social prices for goods and factors
4. constructing the budgets under social prices
5. evaluating the results

5.1. Identification of representative systems

As we have seen, the PAM is best organized in terms of *commodity systems*, which are defined as the vertically integrated chains of production activities that go from the farm production to the retail market for consumption, including any processing and marketing activity that may exist in between.

The analysis could be national in scope, even though it is usually carried over at a *regional* or *sub-regional* level (different regional analyses can then be aggregated to yield results on larger territorial aggregates).

Once defined the region of interest, the next step is to identify a *representative system* of farm production, processing and marketing activity to analyze. Usually, the commodity system would be comprised of many farms, a few processing plants and some marketing firms (including wholesale distribution, transport and retail).

Farms could differ in size (small, medium or large farms), in type of conduction (peasant farms, cooperatives, corporate owned farms, etc) and in the level of resource endowments (irrigated or not, mechanized or not and so on). Each type of farm would needs to be represented in the system, if one wants to provide a full account of the farm production component. Usually, one representative farm per type is described, and then the results of the representative farms are aggregated with weights corresponding to the relative share of production due to each type.

To identify the representative farms, one can rely on available statistical data (such as agricultural census data), when they exist. In case no statistical data are available, one can rely on experts that have a sound knowledge of the farming sector under study, possibly by supplementing the information provided with ad hoc surveys.

The objective is to try and identify the smallest number of representative farms that is able to account for the highest share of agricultural production in the region.

Processing and marketing activities are usually more homogeneous and more easily described in terms of their technical and economic structure.

5.2. Construction of the baseline budgets

The baseline budgets are an account of the economic results of the production activities of the system.

The accounting equation defines profits as the difference between revenues and costs.

profit = revenues – costs

Revenues, in turn, are the sum of the products between prices and quantities of all the final outputs $p_i^p q_i^p$, where the superscript p is used to indicate that these are *private* values. Analogously, costs are the sum of products between prices and quantities of inputs. Inputs are divided in tradable and non-tradable (i.e., domestic factors of production), so that the accounting equation can be written as:

$$profit = \Sigma p_i^p q_i^p - \Sigma s_j^p q_j^p - \Sigma r_k^p q_k^p$$

where s_j^p are the private prices of tradable inputs, and r_k^p are the private prices of domestic factors of production.

Basically, to construct a budget means to provide a detailed account of all inputs used in the production process and of the outputs produced.
For agricultural productions, it may be convenient to organize the data according to the various operations that are performed during the production cycle of a crop. In this way it is usually easier to correctly account for labor and machinery use.

Many details need to be considered in accounting for the costs at the farm level, such as for example how to calculate annual costs for fixed inputs, or how to impute a cost for live animals. We will not go into the detail of describing these costs, because it could cover an entire course[11].

The only point I want to make is that it may be a demanding task and that the overall quality of the results depends on how carefully this step of the analysis is performed.

5.3. Social evaluation of tradable goods

Once the baseline results are completed, the analyst needs to build the second row of the PAM, which requires to quantify *social prices* and to modify the relevant quantities according to the possible incentives that are determined by the system of social prices. Social prices are intended to express the *opportunity cost* of the goods.

Opportunity cost for a good is what the good could earn in the next best alternative use.

For tradable outputs and inputs, the opportunity cost can be considered the *effective* world price, as measured by the border price and adjusted for eventual costs that are needed to transfer the good from the production or consumption site to the nearest commercial border. The rationale for such a definition of opportunity cost is that under free trade, efficiency would be reached by trading the commodities at the prevailing world price.

The world price is usually available as the Cost, Insurance and Freight (C.I.F.) price for imports, or as Free-On-Board (F.O.B.) price for exports. The difference between the two prices is insurance and handling needed at the entry/exit point:

$$C.I.F. = F.O.B. + Insurance + Freight$$

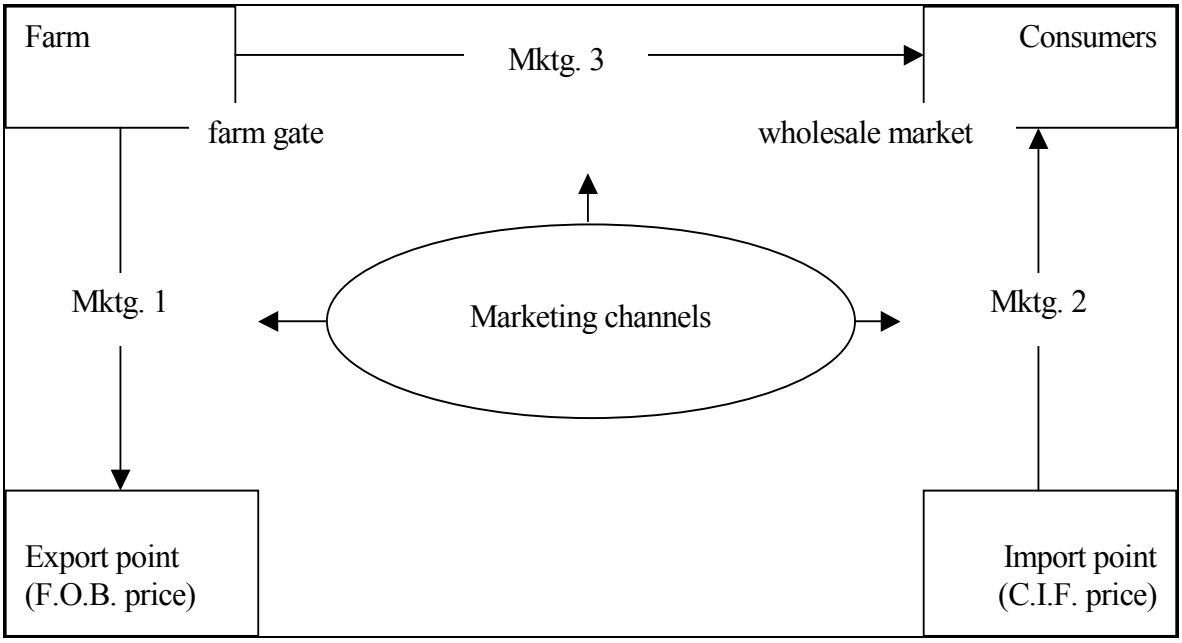
To express the effective opportunity cost of the good, these prices needs to be adjusted to take into account marketing costs.

Marketing costs are the costs that are needed to bring the commodity from the point where it is produced or made available through imports, to the point where it is consumed or sold as export.
To understand the adjustments needed to express the effective world price, consider the diagram in Figure 5.1.

It indicates the steps that a product needs to take to be imported or to be exported.

[11] To appreciate the difficulties of the task, see the attached example of budget for a crop farm.

Figure 5.1. The marketing channel



To be competitive on the world market and to be exported, the marginal cost of the product at the farm gate must be lower than the export price net of all marketing costs needed to take it from the farm gate to the border (mktg. 1). Under these conditions, the good will be exported.
On the other hand, goods for domestic consumption are imported when the marginal cost of production, inclusive of the marketing costs from the farm to the wholesale market (mktg. 3), is higher than the import price plus the marketing costs from the border to the wholesale market (mktg. 2).

The relative magnitude of marginal cost of production, marketing cost and border prices determines whether a product is traded or not.

Conditions for a good to be traded:

exports:

$$\text{F.O.B.} - \text{mktg. 1} > \text{mg. cost}$$

imports:

$$\text{C.I.F.} + \text{mktg. 2} - \text{mktg. 3} < \text{mg. cost}$$

When:

$$\text{C.I.F.}+\text{mktg.2}-\text{mktg.3} > \text{mg. cost} > \text{F.O.B}-\text{mktg.1}$$

the good is non-traded.

The effective C.I.F. and F.O.B. prices can also be altered by Government intervention, through direct imposition of levies or payment of subsidies.

For example, a subsidy on exports will increase the C.I.F. price, whereas a tax on imports will increase the F.O.B. price.

Also, the government may indirectly alter the effective border price by the exchange rate. For example, a *devaluation* of the local currency would have the same effect of a tax on imports and a subsidy on exports.

A good which is potentially tradable, may become non-traded because of:

- high production costs,
- high marketing costs,
- government intervention

Usually, C.I.F. and F.O.B. prices are expressed in foreign exchange (usually, in U.S. dollars). To compare them with domestic production and marketing costs, they must be converted to local currency (i.e. in Syrian Pounds).

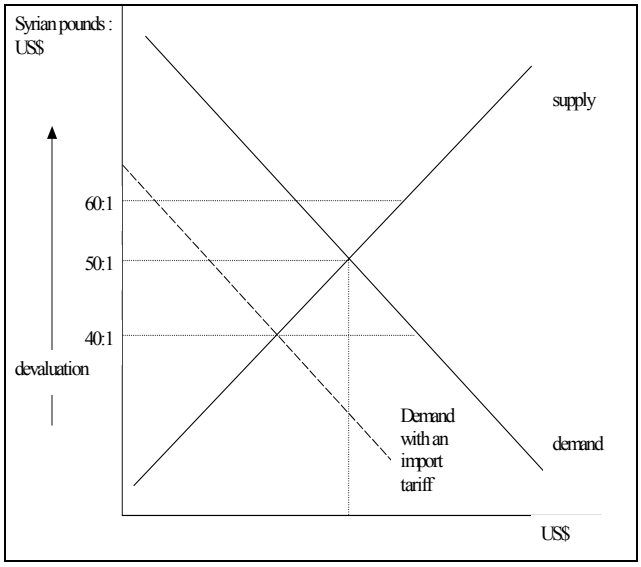
Which exchange rate to use is a critical point in the determination of social prices.

Under free market for the foreign currency, the exchange rate should express the relative scarcity of foreign exchange needed to buy imports. Demand for foreign exchange is expressed by importers, whereas supply of foreign exchange is generated by exports.

The correct exchange rate is the one that balances demand and supply of foreign exchange, as for example would be a rate of 50:1 (that is, 50 Syrian Pounds are required for 1 US dollar) in the graph of Figure 5.2.

If, for any reason, the exchange rate is set at a different level, there will be either excess supply or excess demand of foreign exchange. Such disequilibria cannot be sustained for long periods.

Figure 5.2. The exchange rate market



Suppose for example the government sets the official exchange rate at 40:1 (that is, the Syrian Pound is overvalued relative to its free market rate). As a consequence, there will be an excess demand for US dollars: people that need foreign exchange to buy import, would be willing to pay more than the official rate, however because those who export good only receive the official rate, there will be a shortage of current exchange. To sustain such a rate, the governments needs to engage in other activities, such as *rationing*, that is directly controlling the supply of foreign exchange, or indirectly modify supply and demand of foreign exchange by engaging in trade price policies.

For example, the government could impose a tariff on imports, so that the incentives to import are lowered and the demand for foreign exchange shifts to the left.

Whenever the official rate is set very far from the true equilibrium, unofficial markets may develop, which would compensate for the rationing, for example, by providing foreign currency at a higher price. The presence of illegal markets for foreign exchanges is thus a symptom that the official rate is not a good indication of the actual value of the domestic currency relative to the foreign currency.

If the official rates overvalues the domestic currency, to price import and exports at the official rates would be equivalent to undervalue exports and to overvalue imports.

For all these reasons, the official exchange rate should never be used to convert CIF and FOB prices in domestic currency.

The market exchange rate, when available, should be used. When a market rate is not available, neighboring countries values of the exchange rate could be used instead.

(See also the discussion in Tsakok (1990, pages 33-41))

As we said, the market exchange rate that prevails in a country can be affected by policy restrictions on import or output. However, if one is only interested in comparing the long run profitability of different sectors, use of such exchange rate can be appropriate[12].

In all other instances (for example, when the analyst is interested in the short-run effects of policies[13]), use of a distorted market exchange rate may not be adequate, and one needs to estimate the SER.

5.4. Social evaluation of domestic factors and non-tradable commodities and services[14]

When world prices cannot be taken as a reference, the assessment of the correct social price is more difficult.

For non-tradable commodities and services, such as, for example, electricity, water, marketing activities, legal services, etc., the domestic, private valuation of these goods and services may be distorted by any action that shifts their demand.

Their value, thus, should be decomposed in their tradable and factor components, so that one can use the shadow values of the previous section for the tradable component, and the shadow price of factors for the second component[15].

We will discuss the social valuation of factors next.

In principle, the social evaluation of domestic factors of production (land, capital and labor) could be performed by applying general equilibrium principles.

When competition in factor markets eliminates any excess profit, the value of production in any sector must equal the weighted sum of the factors of production used in those sectors, with weights equal to the efficient prices of the factors.

For example, in an economy with two outputs, Q_1 and Q_2, which uses labor, L, and capital, K, the following identities will hold:

$$w\,L_1 + r\,K_1 = P_1Q_1$$
$$w\,L_2 + r\,K_2 = P_2Q_2$$

from which:

$$w\,L_1/Q_1 + r\,K_1/Q_1 = P_1$$
$$w\,L_2/Q_2 + r\,K_2/Q_2 = P_2$$

[12] See the discussion in Monke and Pearson (1989, pp. 103-106). The basic argument is that, even though the market exchange rate can be distorted by government policies, the distortion will affect all tradable outputs, tradable inputs and domestic factors in the same proportion, and the relative profitability of different systems will not be altered.

[13] In such cases, use of a distorted exchange rate may lead to errors given that the short-run responsiveness of tradable inputs and outputs is higher than that of domestic factors.

[14] For this section, see Monke and Pearson (1989, chapter 7) and Tsakok, (1990, pages 107-117).

[15] This is indeed one problematic aspect of the PAM analysis, which becomes relevant when non-tradable goods and services are a relevant share of costs of a commodity system.

if constant returns to scale can be assumed, the ratios L_1/Q_1, K_1/Q_1, L_2/Q_2, and K_2/Q_2 are constant input/output coefficient and we can indicate them as l_1 (i.e., the amount of labor needed to produce one unit of output in the first sector), k_1, l_2, and k_2 respectively:

$$w\ l_1 + r\ k_1 = P_1$$
$$w\ l_2 + r\ k_2 = P_2$$

Then the equilibrium factor prices can be calculated as:

$$w = (P_1k_2 - P_2k_1) / (l_1k_2 - l_2k_1)$$
$$r = (P_2l_1 - P_1l_2) / (l_1k_2 - l_2k_1)$$

The simple general equilibrium model can be generalized to any degree of detail (see Monke and Pearson, 1989, p. 101-103). However, estimation of the general equilibrium model usually requires considerable amount of data and is usually unfeasible for many practical policy analyses.

An alternative approach is to explicitly consider the divergences that are known to affect factor prices.

First, distortion may be present in the factor markets. A possible list includes:

- proportional taxes and subsidies (as for example social security taxes)
- direct regulation of factor prices (such as minimum wage, rent control, etc.)
- market failures (such as market segmentation and transaction costs)

Second, distortions in commodity markets may affect factor prices: for example, if labor intensive industries are supported relative to capital intensive industries, total demand for labor may increase while demand for capital may decrease. As a consequence, wage rates might increase whereas interest rates may decrease. In general, however, given the different level of support to various industries and the varying degree of labor intensity, the effects coming from different sectors that use the same factor might offset each other, and have limited effect on the equilibrium price of factor markets.

Finally, macroeconomic policy can affect the interest rate, thus changing the price of land and labor relative to capital. How this would affect the price for these other two factors depends on the pattern of complementarity or substitution between factors.

In general, we can conclude by quoting Monke and Pearson who say that:

"social valuation of domestic factors is the most difficult aspect of social cost accounting. The critical first step in estimating the social prices of factors is the development of a consistent framework in which to identify divergences. The exercise of quantification becomes a series of sequential adjustments to private market factor prices to recognize the effects of commodity market divergences and the indirect effects of macroeconomic distortions and input substitution. As in all shadow pricing methods, complete knowledge of the response of commodity systems to price changes is necessary to derive exact estimates of social values.

Empirical estimates of social factor prices are thus approximations, and the analyst will be forced to make arbitrary judgments about what constitutes large and small changes." (Monke and Pearson, 1989, pp. 126-127)

This comment makes it clear that the values of wage rates and of interest rate used in calculation of the second row of the PAM are very critical points of the overall analysis. Unfortunately, results may depend heavily on these prices, and thus the overall analysis may be faulted by the wrong selection of these prices.

One advantage of the PAM framework, however, is that, once the budgets are determined in all other quantities, it allows for easy recalculation of budgets under different scenarios in terms of wage and interest rates, so that a sensitivity analysis of the results can be performed.

Chapter 6 - The rationale for agricultural policy and the role of the state in the economy

In this second part of the course, we will discuss the problems of design, implementation and analysis of the principal agricultural policies in developing countries.

The first part served the purpose of providing us with the tools needed for understanding the economic effects of policy that interests the agricultural sector.

Now, we are ready to analyze in detail several of the policies that have been implemented in many developing countries. In particular, we will refer to the experience of the Syrian Arab Republic as described by the document prepared by the National Agricultural Policy Center (NAPC, 2001) and entitled "Country Profile".

Before entering in the details of the description of agricultural policies, however, we will present a brief discussion of the history of public intervention in agriculture (Norton, 2002). The discussion will be oriented towards an understanding of *if* and *when* government intervention in agriculture can be justified.

In the second section, we will analyze the policies, which are classified in three main categories: policies that *affect producer's incentives*, policies that grants *access to resources*, and policies that *influence access to factor's markets*, as in Norton (2002).

Policy is the *course of action chosen by government towards an aspect of the economy, including the goals that the government seeks to achieve, and the choice of methods to pursue those goals* (Ellis, 1991 p. 8)

Government is the group of people in charge of running a country, and who are responsible for making policy decisions.

The **State** is defined as the *whole set of public institutions responsible for the administration and enforcement of policy decision*

To describe the policy process, we can say that the government decides on the actions to be taken to reach some implicit or explicit objectives and then it is the responsibility of the state apparatus to implement those actions and to monitor their results.

Agriculture is traditionally characterized by heavy government intervention, in both developing and developed countries. But it is fair to ask: Why do we have agricultural policies? Why the government may decide to take actions that alter the natural functioning of the markets?

Several reasons have been suggested. Some of them are related to the concept of *economic efficiency* and the supposed superiority of competitive equilibrium. The role of economic policy, then, should be that of removing all obstacles that prevents markets from reaching a competitive equilibrium. Other reasons are based on **equity concerns**, that is concerns about the equal distribution of wealth among all citizens.

6.1. The new-institutional view of agricultural policy

Markets are economic institutions that permit trade. At the beginning of the economic development of a country, government action may be needed to favor the *emergence* of markets that do not exist. For example, a fundamental precondition for a market to exist is that property rights are well defined and enforced. It is obvious to consider that, in order to trade something, the property right must be clearly defined. Usually, it is the government responsibility to assign and enforce property rights. Land reform policies, for example, are still a very important task for the governments in many developing countries.

Even where markets are well developed, however, there may be the need for government intervention to achieve the efficiency predicted by the classical theory of general equilibrium. The presence of *transaction costs*, in fact, may prevent some of the potential beneficial trades from taking place.

That of *transaction costs* is a very general concept, that may be used to define a very broad set of phenomena, including asymmetric information, strategic behavior, geographical distances and lack of infrastructure.

Transaction costs are *all costs that must be paid when operating a transaction*. They include transportation, administrative costs, information gathering, etc.

The new-institutional view of economic policy considers *institutions* as the response of the economy to the presence of transaction costs. The correspondent view of the role of the state in the economy, hence, is that of favoring the creation and functioning of all the institutions (including markets among them). According to the transaction cost interpretation of market failures, the role of the government should be that of *reducing* or *eliminating transaction costs*.

Institutions are *sets of rules and agreements that regulates economic activity*

6.2. Efficiency vs. equity

Efficiency should not be the only concern of public officials. One other justification for state intervention in the economy is to provide an equal distribution of resources among the population. For example, progressive tax systems have the explicit goal of reducing the differences in disposable income, by raising higher proportional taxes to the highest income levels. Also, the provision of essential social services -- such as education and health services -- at a reduced cost to part of the population has the main objective of reducing disparities in income.

Agricultural policies too may have distributional effects. Low food prices, for example, have a larger beneficial impact on poor consumers than on rich consumers. Unfortunately, there are trade-offs between efficiency and equity objectives: by keeping agricultural prices at a low level, for example, investments are discouraged, and the growth of the sector in the long run is compromised.

One of the objectives of this course is to learn how to identify such trade offs.

6.3. The role of the state in a market economy

In the past years, all across the world, governments have been heavily involved in the agricultural sector, both in developing and in developed countries. Most of the intervention was direct regulation of both prices and resource use. Governments had several institutions in place to:

- regulate domestic prices of agricultural outputs and inputs (through taxes, subsidies, centralized purchases and use of buffer stocks, etc)
- control the use and the price of factors
- limit import or exports, either directly or indirectly through the exchange rate.

Even though such measures are still in place in many countries, experience has shown that such a heavy intervention may be unsustainable in the long run.

The conditions that a viable strategy of sectoral policy should obey are (Norton, 2001 chapter 2, page 11):

- **economic sustainability**. The policy must prove to be economically advantageous. A policy which cannot be proven to be linked to any clearly identifiable economic benefit for the economy, is not going to be supported for long time
- **social and political sustainability**. The benefits must be shared by large part of the population, which in the less developed countries correspond to the poorest part of the population. In absence of large consensus, no policy can be sustained for long time, lest the risk of social uprising and revolts.
- **fiscal sustainability**. Many policies have an explicit budgetary cost. Policy whose source of financing is not clearly identified should not be undertaken.
- **institutional sustainability**. Many policies needs the development and activity of institutions to support them. When the institutional capacity to support the policies is low, the effectiveness of the policy is strongly undermined.
- **environmental sustainability**. Finally, and very important, all economic policy should be assessed also in terms of their long run impact on the environment. Water reserves, fisheries stocks, forests and soil should be protected against overexploitation by avoiding policies that do not create the correct incentives towards the conservation of the natural environment.

Sustainability. The concept of sustainability refers to *the long term viability of a set of action.*

Most analysts agree that a *modern view of the role of the state in the economy* should not be that of heavy, direct intervention through prices and regulation. Rather, it should be that of:

- monitoring the functioning of the markets, in order to identify the possible presence of distortions and possible lack of competition
- providing energy, communication and transportation services when the extent of the market is not large enough to justify private provision of those services
- reducing transaction costs
- redistributing income across different sectors of the population (for example from urban to rural, from rich to poor, from the coastal areas to the interior, etc.)

In other words, the government should assist and support the functioning of the private sector by providing the infrastructural and institutional framework within which the private economy can function at its best, and should constantly monitor such functioning, by preventing the concentration of economic power in the hands of few large private agents[16].

6.4. Analysis of specific agricultural policies

Agricultural policies can be classified in several ways, depending on their objectives, the instruments used, the commodity system they are primarily focused on, etc.

[16] Rather than *efficiency*, it is my opinion that the most likely result of completely free market operation, is that of the *consolidation of larger and larger concentration of market power in the hands of few firms*, national or multinational in scope. The economies of scale that are observable in many sectors, and that leads to high concentration in sectors such as grains storage, food processing and distribution, and, in general, industrial production, are due to the presence of transaction costs. One of the ways in which the effect of transaction costs can be overcome is by "internalizing the market" by integrating vertically the two counterparts, as pointed out by Ronald Coase in his 1929 article "The theory of the firm".

We will use the classification suggested by Norton (2002), which classifies policies in three categories:

- ***Policies that affect producer's incentives***, which include:
  - Output price policies
  - Trade and exchange rate policies
  - Other policies that influence incentives
- ***Policies that grant producers access to resources***, among which we can identify:
  - Food policy and food security
  - Land tenure policies
  - Water access policies and irrigation
  - Agricultural technology policies
- ***Policies that influence access to factors' markets***, most importantly:
  - Labor market
  - Credit market

Such a classification is more in line with the modern view of government intervention in the agricultural sector we described in the previous section, and gives emphasis to the institutional role of policy.

6.5. Policies that influence producer incentives

Economic activities are guided by **prices**. For this reason, one of the most important ways of trying and affect economic activity is through the modification of prices and the policies that aim at modifying producer incentives can be described as *price policies*.

Which prices are really important for farmers? The result of any firm is measured by profits, which depends on both outputs' and inputs' prices.

Thus, what really matters for the incentives for farmers is the *relative trend of output versus input prices*, rather than the absolute value of output and input prices. In other words, only if *output prices rise proportionally more than inputs' prices*, there is an increase in profits.

For example, when we discuss the effects of higher input prices on a graph with a fixed supply function, we implicitly assume that inputs' prices remain unchanged. Only if all other prices are kept constant, an increase in output price means an increase in the relative terms of trade between outputs and inputs.

To highlight the difference between absolute and relative prices, we call *real prices* those expressed in relative terms.

Usually, real prices are obtained by dividing the absolute, or *nominal* price levels by an index of all prices. A change in real price for agricultural products, thus means that agricultural prices are changed *relatively to the general level of prices in the economy*.

To discuss of possible policies to alter real agricultural prices, we need to understand what is that determines them. In other words, we need to understand how prices form.

6.5.1. The determinants of agricultural prices

The most obvious determinant of prices is the balance of demand and supply. Even though a perfect explanation of the mechanisms by which demand and supply meets is not available, it is a fact that the overall level of prices is the result of the encounter of demand and supply. Even though in short periods of time there may be a difference between supply and demand, *excess supply and excess demand are not sustainable in the long run*.

As a result, if for example there is an increase in the demand for agricultural products, eventually this will generate pressures towards an increase in prices. Also, and very important for agriculture, a shortage in supply (as for example as a consequence of bad harvests) for a product which is mainly oriented towards domestic markets, will necessarily cause an increase in prices.

The effects of changes in supply and in demand on the level of prices depends heavily on the relative magnitude of the elasticity of supply and demand. For example, a given increase in the demand for agricultural product will cause a higher increase in price, the lower is the elasticity of supply.

Also, a reduction in supply will be a higher effect on prices, the more inelastic is the demand.

Changes in supply and demand due to seasonal variation or to the weather usually determine short-run fluctuations, which have effects on the stability of income.

Terms of trade: it is a measure of the relative price of one sector of production. It is calculated as the ratio between an index of average price for the sector one is concerned, and an index of average price of the rest of the economy.

More important for the level of income is the long-run price trend. It is a well known fact that, in the long-run, the relative price of agricultural products tends to decline. The reason for such a trend is to be found in the *income elasticity of food products*, which is almost always less then one. Norton reports that the income elasticity of food demand, on average across countries tends to be consistent with values of 0.6 to 0.7. This means, for example, that an aggregate real income growth in the economy of 5% in one year will result in an increase in food demand of only 3 to 3.5% per year.

The effect on prices depends on how fast is the growth of agricultural production, and on whether or not import can compensate for the higher demand. If productivity of agriculture grows by more than 3 – 3.5%, the result will be that of declining agricultural prices.

The most fundamental determinants of increase in the demand for basic agricultural products is population growth, whereas the force that drives increase in productivity is technological progress. On a global scale, especially, at least until the eighteenth century, innovations in agriculture is what permitted population growth, so that the two figures were tightly linked.

With the industrial revolution and the mechanization of agriculture, agricultural productivity started growing faster that agricultural demand, with the result of declining real prices known as the *farm problem* which has affected many of what are now developed countries.

The above discussion was centered on a global, worldwide perspective. Focusing more at the an individual country level, the real price for agricultural product is tightly linked to the evolution of the world price. In other words, especially if a country is 'small' when compared with the world market, domestic dynamics of productivity and demand may have only a limited effect on the evolution of agricultural terms of trade, which are determined mainly by the world price levels.

This is important for developing countries, were the high rates of increase in food demand, driven by population growth, which could have sustained stable relative prices for agriculture, have failed to do so because of the increases in imports. International trade has had the effect of preventing the domestic agricultural sector from benefiting from increased food demand. The constantly declining world price has forced the agricultural sector to accept lower real prices of what a closed economy could have achieved, thus reducing the incentives for increased production and increasing dependence on imports, in a self-fulfilling spiral of declining prices and increased agricultural imports.

The decline of agricultural relative prices on the world market has been exacerbated by the high levels of subsidies that large developed economies (the U.S. and the European Community, above all) have granted to their producers.

A developing country open to international trade, thus, finds itself in the conditions of high dependence on import and lack of incentives for domestic agriculture.

Agricultural price policies are one of the instruments that could be used to break such a spiral, which should thus be considered as one the main objective of a strategy based on this kind of policies.

6.5.2 Objectives of price policies

In principle, price policies could be aimed at:

- increasing prices
- decrease prices
- stabilize prices

The objectives are always related to more general economic growth and income distribution objectives which can be reached by a combination of different instruments on different markets.

Chapter 7 - Instruments of agricultural price policies

Given that most agricultural products are tradable, in absence of any restriction to trade or other policies, agricultural output prices will be determined by the world price levels, which, for a small country, are to be considered as exogenous.

The objectives of price policies, thus, should be pursued through attempts at modifying the *effective* prices faced by farmers and consumers, which constitutes the real incentives.

The main instruments to modify the price faced by producers and consumers are:

- Trade policies
- Exchange rate policy
- Sectoral policies
  - Price controls
  - Farm support prices
  - Public Storage
  - Input markets

In addition, general economy-wide policies such as *fiscal policy* and *macroeconomic policy* can also have large influences on the incentive prices.

7.1. Trade policies

With the term trade policies we indicate the set of public intervention intended at modify the *volumes* of import and/or exports.

By modifying the volume of international trade, these policies effectively drive a wedge between domestic prices and world prices.

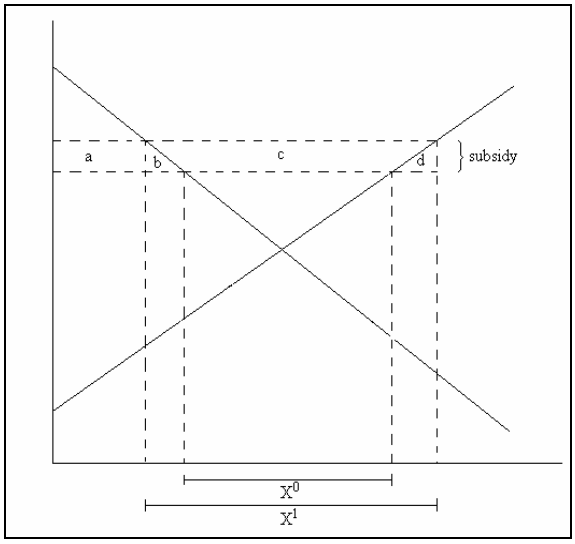
We have described in the previous half of the course the basic theory of gains from trade, and have assumed that, when a country opens to trade, the world price becomes the price to which both producers and consumers respond.

Now, we will analyze the effects of trade policies in more detail, and will discover that, sometimes, restrictions to international trade may be beneficial for a country, thus revising the general conclusion of the theory of international trade.

In particular, we will see that some form of trade regulation may be needed to offset the negative effects of declining world agricultural prices.

It must be noted that all forms of trade restriction have been at the center of intense debate during the last 70 years. The recent GATT agreement on agriculture and the new WTO that has emerged, has imposed, at least in principle, strong limitations to the extent of trade protection that member countries are allowed.

Figure 7.1. The effects of a subsidy on exports



In principle, trade restrictions are detrimental in the long run, because they achieve protection for producers at a high cost. Moreover, the protected sectors tend to be less competitive on the world market, when compared with producers from the rest of the world which face lower prices.

Nevertheless, some form of protection may be needed by developing countries to offset the effects of subsidies paid by rich economies to their exports, which contribute to keep world price artificially low.

The negative effects of low prices for staple food (such as rice or wheat) are particularly strong for poor rural families which base most of their income on the production of such foods.

Until developing countries will be able to strengthening their position by joint participation in the international trade negotiation, the challenge they have to face is to ensure adequate incentives to the domestic agricultural sector "without falling into the self-defeating trap of protectionism." (Norton, 2002, chapter 4, p.6)

One way of doing so could be through an intelligent combination of import tariffs and export subsidies, designed and implemented with mechanisms that would ensure the benefits to be targeted to the producers of agricultural products for which the country has a real comparative advantage.

7.1.1. Tariffs

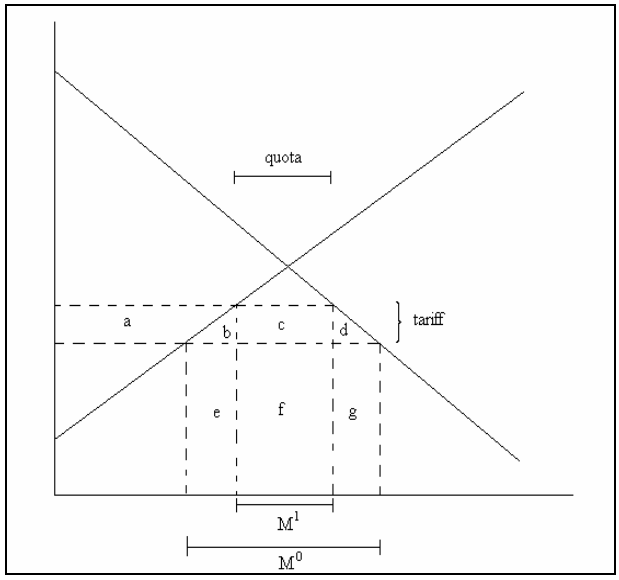
Tariffs are taxes levied on imports, so that the effective domestic price becomes higher than the world price.

In general, the effect of a tariff is to *provide economic protection for domestic production*, because it makes imported products more expensive in the domestic markets

The graph in Figure 7.1 illustrates the effects of imposition of a tariff on imports. The effective, domestic price will be raised above the world price by the amount of the tariff. As a result: domestic production will increase, domestic consumption will decrease and the level of imports will reduce from M^o to M^1.

(When a tariff is larger than the difference between autarkic price and world price, it is said a prohibitive tariff, and have the effect of eliminating all imports.)

Figure 7.2. The effects of a tariff and of an equivalent quota on imports



Producers of import substitutes will gain (a), and consumer will loose (a + b + c + d) when compared with the free trade situation.

Also, the government will earn revenues from the tariff equal to the area (c) in the graph and the net efficiency loss is equal to area (b + d).

We can have *generalized or uniform tariffs*, which would cover all tradable goods by the same percentage (i.e. all import price are raised by 5%), or *specific tariffs*, differentiated by product or sector (for example, agricultural products have a tariff of 3% while industrial products of 6%).

A generalized tariff scheme can be easier to implement, and it should cause less distortion. In fact, a uniform tariff on all tradable goods will not change the *relative* prices of those goods, and the comparative advantages in the production of some product will be saved.

Specific tariffs, instead, can be used to alter the relative profitability of some products and sectors against others. While such diversified tariffs could be beneficial in the short run to protect specific sectors, in the long run they have the potentially negative effect of reducing competitiveness of the protected sector. In fact, the least competitive sector is the one which will have the stronger interest to obtain a preferential tariff (Norton, 2002 page 4-8).

Tariffs are thus a powerful mechanism to protect sectors that produce import substitutes, and are justified whenever world price level is objectively too low to warrant the right incentives to the agricultural production.

In general, however, a Country should not fall in the trap of raising prohibitive tariffs and go back to extreme protectionisms. Norton suggests that three principles should guide the setting of tariffs:

1) tariff rates should not be high in general, and if they are, a program should be put in place to scale them downward over time

2) their rates should be relatively uniform over sectors and products

3) the tariff system should be relatively stable over time, except for the downward adjustments planned years in advance.

7.1.2. Quotas and other non-tariff trade restrictions

An alternative type of intervention on trade is to restrict the volume of import or export through *quotas.*

The effect of a quota on import is the same of an equivalent tariff, as is illustrated in Figure 7.1.

The only apparent difference is that the government will not earn the tax revenue. However, if the quota is enforced through the issuance of licenses, there will be rents generated by the possess of the license that are quantitatively equivalent to the area (c).

Apart from explicit quotas, there are many other forms of restrictions on trade.

7.1.3. Export incentives

Rather than by reducing imports, one other set of trade policies that can be used to raise incentives for agriculture concerns enhancing exports.

A subsidy on exports has the effect of raising the effective price for producers and consumers, as illustrated in the graph of Figure 7.2.

The level of exports will increase from X^0 to X^1, the benefits for producers will be (a+b+c+d), whereas consumers will sustain a loss of (-a-b). The government expenditure will amount at an area equal to (-a-b-c-d), so that the overall, net effect of the policy will be a loss of welfare equal to area (-b-d).

Direct subsidies on export, as can be seen, are very expensive for the government budget. Usually they cannot be used extensively, unless an equivalent amount of import tariffs is available to finance them.

Also, given that usually the export subsidies are paid to the exporters, whenever there is concentration in the distribution sector (i.e. monopsony power on the part of exporters), the benefits will not reach the farmers.

For this reason, if the government want to really target the farmers, the right to the subsidy should be given directly to the producers, for example through a system of transferable permits (See Norton, 2002, page 4-15)

7.1.4. The experience of the Syrian Arab Republic

What is the experience of Syria with regards to trade policy?

In the past, foreign trade in Syria was completely controlled by the Government. No private operator could either import or export goods.

Starting from 1987, a process of gradual economic liberalization, aiming at promoting private sector's contribution to both production and external trade, was undertaken (NAPC, 2002), and some progress has been made.

Today, the state of trade policy can be described as a "complex and segmented regulatory and institutional system: product specific tariff and non-tariff measures, product heterogeneous currency regulations linking import and export operations, a system of specialized state trading enterprises acting, in some cases, as legal monopolies." (De Benedictis, 2000, p. 23)

Overall, the main policy affecting agricultural trade has been a system of differentiated exchange rates, the functioning of which will be analyzed in the next lecture. Also the complex exchange rates regime is undergoing a reform process. Nevertheless, it can be said that it still dominates other policies.

Here we will discuss all other forms of trade policy. To do so, we will refer to some of the policy studies produced within the activities of the project GPC/SYR/006/ITA of the FAO.

Following is an excerpt from the FAO Project GPC/SYR/006/ITA report entitled "Taxation and Net Transfers to the Agricultural Sector", by Peter Wehrheim:

Tariff and non-tariff barriers to trade

Development of trade regime and trade structure

Before 1985 all import and export operations were controlled by the state. Since 1985 private traders were allowed to import industrial inputs. After 1987 more substantial reforms were implemented in an attempt to liberalize Syria's trade regime. One part of these reforms was to allow private traders to export agricultural commodities.

Today trade for some agricultural products such as **fruits** and **vegetables** is dominated by private traders. Trade with **strategic crops**, particularly, cereals, cotton, tobacco, and sugar remains widely in the hand of state organizations. [...] Total manufacturing trade [represents a high share of public exports while state agencies have reduced their import operations in the course of the 90s already. However, the use of foreign currency earnings remained restricted by various regulations. Furthermore, in 1991 a law (No 10) was passed which gave more concessions to foreign traders. Because of these changes exports diversified substantially as private traders were successful in exporting fruits, vegetable, and other food commodities to Arab Gulf countries and garments to European countries. GDP also grew in this period. However, in the second half of the 1990s the Syrian economy experienced a depression again. Only at the end of the 1990s new reforms were initiated to liberalize the trade system further. However, they were not yet sufficient to remove the trade restrictions which are still in place today. Therefore, since the 1990s major policy reforms have been pursuit and are still being implemented today.

The trade structure of Syria changed in the 90s to some extent but with the exception of 1997 Syria had a negative trade balance in each year. The major share of its commodity imports accrued from oil and oil exports. The major share of imports was realized by the manufacturing sector.

Import tariffs.

Imports of agro-food commodities are subject to two types of tariffs. First, a 'product-specific import tariff' which differs between 1 and 150%. Table 3.4-1 gives an overview of the import tariffs for agricultural commodities which were applied in early 2001.

They have been effective throughout most of the 1990s. The highest import tariff rates are applied for premium food items such as caviar (100%). This seems to be excessively high. Furthermore, tariff variation is very high! While tariff rates might differ it would be better to keep tariff variation as low as possible. The experience from Chile, for instance, shows that the introduction of a more 'uniform tariff schedule' has not only significantly reduced the incentives for corruption but it has also contributed to export growth.

Second, an additional 'general import tariff' which varies between 6-35% and which increases underproportionally with the level of the product-specific import tariff (see Table 3.4-2). This additional tariff is supposed to collect fees that in turn are used for various government expenditures (e.g. defense, consumption, schooling, harbor, transportation etc.). Law No.1 from 1980 specified some exemptions from the need to pay the 'general import tariff'.

Imports of important consumer products such as flour, for instance, were exempted from these additional tariff payments.

Again no data was made available on the extent of annual tariff revenues that has been collected with this tariff. If the tariff levels which are reported in Table 3.4-2 have actually been applied the 'general import tariff' should have been a significant source of additional import protection. Furthermore, the revenues collected with the 'general import tariff' must have been substantial as well.

From an economic point of view the application of such a 'general import tariff' reduced the transparency of Syria's trade system. If revenue objectives were the major reason for imposing this additional customs tariff it would have been more beneficial from the beginning on to raise product-specific import tariffs instead of imposing an additional tariff.