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Quantitative Socio-Economic Policy Impact Analysis

A Methodological Introduction

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Quantitative Socio-Economic Policy Impact Analysis
A Methodological Introduction

by

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for the

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Attributions and Acknowledgements

This work is the result of various contributions. Lorenzo G. Bellù conceived the document and drafted most of the text and figures. Rosa Vega Pansini wrote and revised some parts related to specific tools, provided all the tables with examples and real case applications and identified a great deal of references. The material comprised in this document has been used in various capacity building courses, organized by the FAO UN. It therefore benefited from various comments and suggestions provided by participants on the courses and by FAO UN staff. The authors would like to thank Mr Materne Maez, Senior Policy Officer at FAO UN, for his substantial comments on the various drafts of this work and Ms Paola Landolfi (FAO UN) for formatting the document. It goes without saying that all the remaining errors and omissions have to be attributed to the authors.

1. SUMMARY

The present document aims at introducing selected analytical approaches for quantitative analysis of the socio-economic impacts of policies. In the first part of the document, after considering a set of basic questions that a quantitative policy impact analysis has usually to address in order to be useful for informing decision-making processes; some definitions and insights on policy-relevant elements such as policy objectives, policy instruments and impact models are provided. The document then briefly describes the use of counterfactual analysis for socio-economic policy impact analysis.

The second part of the work focuses on the review of selected quantitative analytical approaches frequently applied to assess policy impacts, such as Value Chain Analysis (VCA), Multi-Market Models (MMM), Computable General Equilibrium models (CGE) etc. For each of these, after a description of their "technical" features, an assessment in terms of data, time and expertise requirements for their practical application is provided. For each approach, some real case applications have also been identified and summarily described, considering the specific policy field of application, the hypotheses to be tested and the policy-relevant conclusions provided by their authors. The last section provides some concluding remarks about the use of tools for quantitative policy impact analysis in decision-making processes.

2. INTRODUCTION

Objectives: The present document aims at providing a general picture of quantitative socio-economic policy impact analysis for decision- making and introducing selected analytical approaches available, to understand how policy measures affect complex socio-economic systems. The user could then acquire a quite large, albeit not exhaustive, vision of the analytical approaches available for this purpose.

Target audience: This document represents a support for different categories of potential users and in different contexts: Trainers can use it in the framework of capacity building. Academics can use it as a support for courses devoted to students of the first cycle in political economy, development economics and related subjects. Other users include NGOs, policy makers, professional associations and the cabinets that need to reinforce their knowledge of policy impact analysis.

Required background: The comprehension of this document does not require any specific technical knowledge. Nevertheless, prior notions about the constituting elements and the structure of a complex socio-economic system and the role of public policies may facilitate a fuller understanding of the issues covered by this module.

To find documents and materials about these subjects, the user can follow the links to other EASYPol modules or consult the references at the end of the module[1]. The links to other EASYPol modules are provided in the last section.

3. POLICY IMPACTS IN A COMPLEX SOCIO-ECONOMIC SYSTEM

Policy measures affect a socio-economic system by modifying the behaviour of economic agents, whether they are producers, consumers or suppliers of factor services, such as workers or renters.

In general terms, public policies for agriculture, rural development and food security aim at modifying the natural course of the socio-economic and natural events by:

- **directly supplying goods, services or purchasing power** (e.g. the supply of public or merit goods: transport services, information, health care services - including drugs and screening; supporting the income of poor households etc.)
- **promoting/encouraging/supporting** (e.g. actions to stimulate the adoption of new technologies for irrigation, promotion of export products, supporting off-farm employment);
- **imposing/enforcing** (e.g. vaccinations etc.);
- **saving/preserving** (e.g. durable agricultural techniques like the rotation of cultures, the carriage of soil fertility etc.);
- **preventing** (e.g. the use of certain types of pesticides);
- **discouraging** (e.g. ploughing in the pastures, wasting water)

In addition, different policy measures have different impacts on a socio-economic system. To explore the ways in which different policy measures affect a socio-economic system, we proceed as follows: A) we explore the structure of a socio-economic system; B) we provide a possible classification of policy measures for agricultural, rural development and food security; and C) we look at the "entry points" into the economic system of the various policy measures.

A) Structure of a socio-economic system. In order to understand how policy measures modify the behaviour and relations among different economic agents within an economic system, it is worth understanding the basic structure of a socio-economic system.

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[1] The hyper textual links to other EASYPol material appear in blue:
a) training path are shown in **UNDERLINED BOLD FONT**;
b) other EASYPol modules or complementary EASYPol materials are in ***UNDERLINED BOLD ITALICS***;
c) links to the glossary are in **BOLD** and
d) links to external sites are in *ITALICS*.

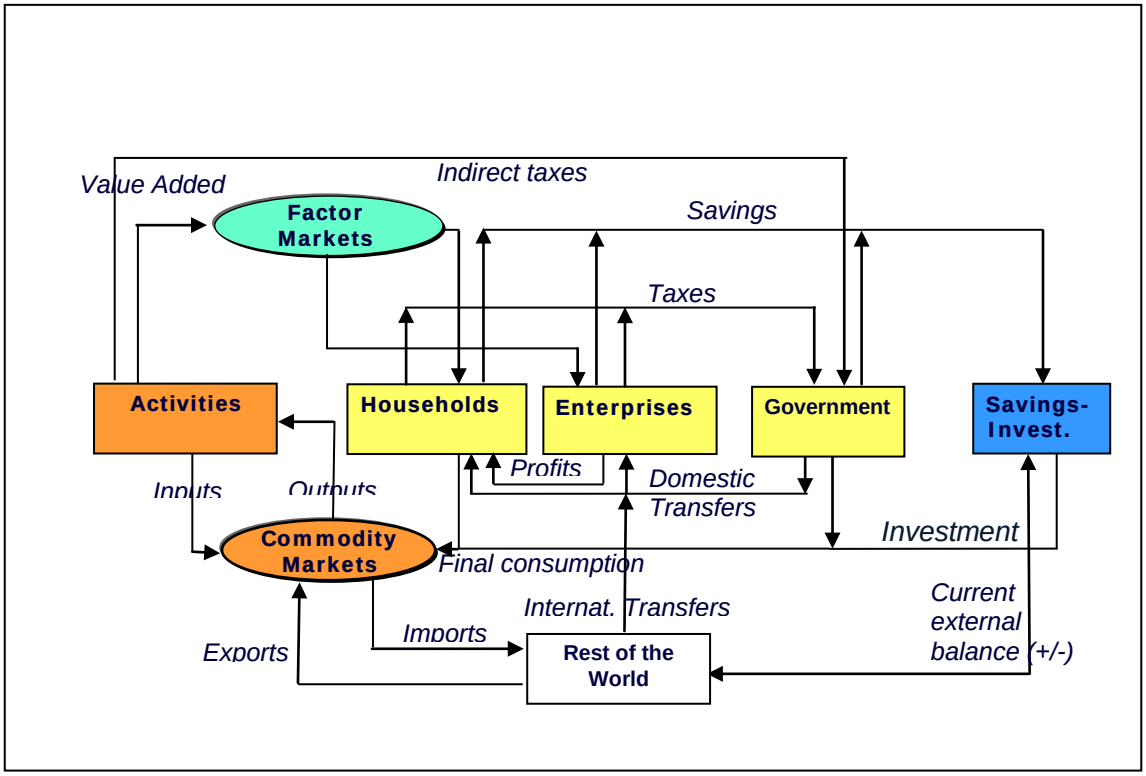
A socio-economic system is constituted by a set of elements, mutually linked by means of physical flows (flows of goods and services) and countervailing flows of payments, flowing in the opposite direction. The System of National Accounts of the United Nations (SNA UN), a standard approach for national accounts adopted by almost all countries, identifies some basic elements of a socio-economic system. For each of these, inflows and outflows of payments (income and expenditure, respectively) are recorded on two-side balancing accounts for each period (usually a year) . These elements comprise:

- **Commodities:** Goods and services produced, purchased, sold and consumed by various economic agents within an economic system. Commodities are exchanges on commodity markets where supply and demand meets;
- **Activities:** Economic sectors (industries) which produce commodities by using other commodities (intermediate consumption), factor services ;
- **Factors:** Services provided by economic agents for activities such as labour, land and capital services; remunerated by payments such as wages, rents, interests, profits.
- **Institutions**: Economic agents such as households, enterprises and the government. They are classified as "private" institutions (households, enterprises) and "public" (the government). Private institutions provide factor services to activities, and to other institutions, by supplying them on factor markets. Private institutions are remunerated with payments for factor services, which constitute their income. Institutions consume final consumption goods and services, whose payments constitute their expenditure. The part of income not spent is saved. The government, as a public institution, collects taxes from other institutions (direct taxes) and activities (indirect taxes). It transfers money to other institutions and activities (public transfers) and directly provides selected services (defence, justice etc.).
- **Savings-Investment**. This account keeps track of the savings (income not spent) of the institutions and of the demand for investment goods. This account acts as a peculiar "institution" which receives the income not spent from the other institutions (their savings) and allocates it to purchase investment goods. In addition, this account may receive savings from the Rest of the World (RoW) or may "invest" lending money to the RoW.
- **"Rest of the World" (RoW).** This is an account that keeps track of the transactions between the domestic agents and the economic agents outside the economic system, i.e. the rest of the world. The inflows of this account comprise payments for imports; payments for services provided by foreign agents to the national economy; such as immigrants into the country, expatriation of earnings of foreign corporations and transfers from domestic institutions to foreign institutions. The outflows comprise payments for exports, remittances of emigrants and transfers from foreign to domestic institutions[2].

[2] In the SNA, the RoW and S-I accounts are used to square up the two-side, balanced accounts system. The balance of the RoW account in a given period represents the deficit or surplus of the RoW towards the country in that period. If it shows a deficit, this implies a surplus in the current external balance of the country, i.e. the RoW received more money from the country than it paid. The balance is then transferred

These elements and the flows of income interlinking them are represented in Figure 1.

Figure 1: Elements of a socio-economic system and their mutual linkages

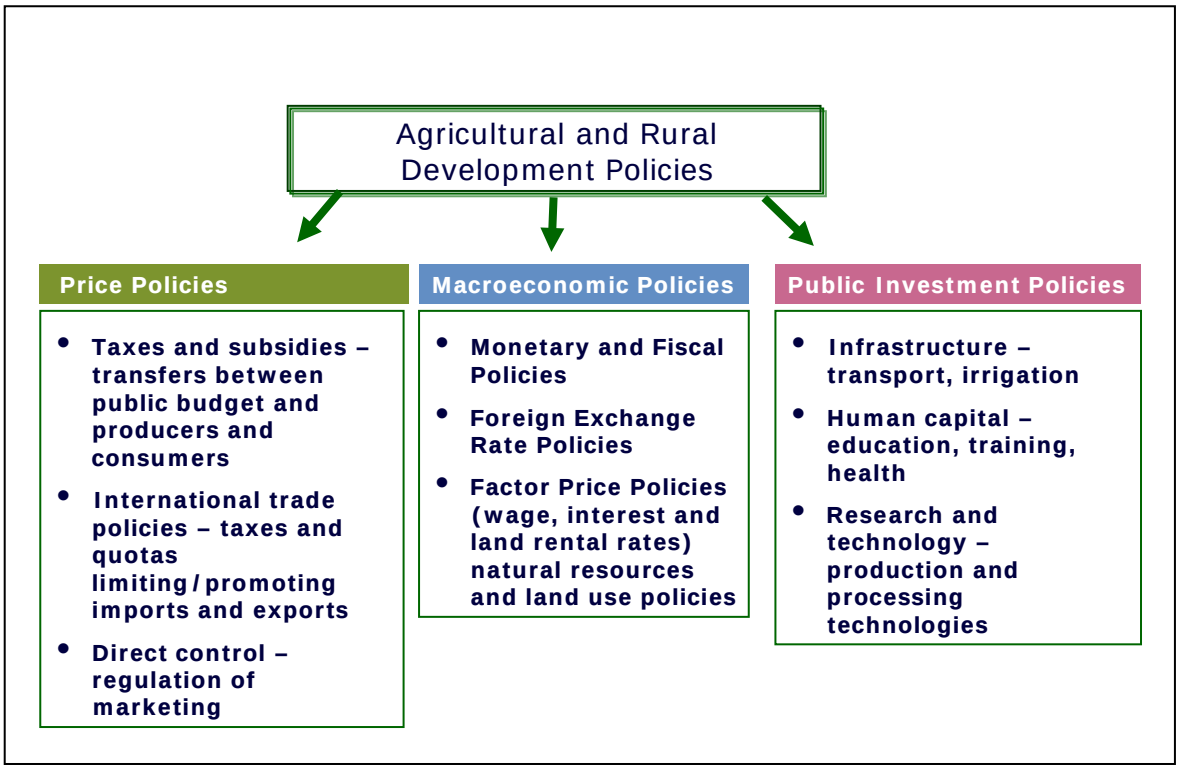


Source: Freely adapted from Round (2003)

B) Classification of policy measures. As happens in many circumstances, there are different ways of classifying complex "objects", such as policy measures for agricultural, rural development and food security, which lend themselves to be described using a multiplicity of criteria. In order to cluster different policy measures, we adopt here as a criterion the economic focus of policy measures.

to the Savings-Investment account as an "investment of the country" abroad. In this case, the country is a net lender to the RoW. If the RoW account shows a surplus, this implies that the RoW received less money from the country than it paid out. The balance is then transferred to the Savings-Investment account as a "foreign savings". In this case, the country is a net borrower from the RoW. Note that being this a two-side, balanced accounting system, once all the other accounts balance, the deficit-surplus of the RoW account exactly matches the surplus-deficit of the S-I account.

Figure 2: A classification of agricultural and rural development policies



Price policies are usually commodity specific. They are generally implemented through:

- ***Taxes and subsidies.*** They result in transfers between the public budget and producers and consumers. Taxes transfer resources to the government, whereas subsidies transfer resources away from the government. Examples: issue of licenses for natural resource use; subsidised sales of state-owned farmland; purchase of harvests at above the market prices etc.).
- ***International trade polices.*** They influence prices and quantities of competing products imported into the country and those received from exports. Instruments: tariffs or quotas on imports and subsidies on exports. Examples: Import restrictions that raise domestic prices above comparable world prices; high tariffs on selected products, low tariffs on others etc).
- **Direct controls.** These amount to government regulations of prices, marketing margins or cropping choices. They can create excess supply or demand at administered prices and are used mainly to benefit consumers**.** Examples: price controls on basic foods such as cereals, dairy products etc.

Macroeconomic policies are nationwide and potentially affect all agents and commodities simultaneously. They amount to:

- ***Monetary and fiscal policies*.** They refer to controls over the rate of change in the country's supply of money and to the balance between governments, revenues and expenditures. Examples: commodity taxation, public utility pricing, income taxation, budgeting public expenditure etc.
- ***Foreign exchange rate policies.*** They directly affect agricultural prices and costs. This is because the domestic price (in local currency) of a tradable commodity is closely tied to the 'world price times the exchange rate' (the ratio of domestic to foreign currency). Examples: eliminating an overvalued exchange rate in order to maintain the country's international competitiveness.
- ***Factor price policies.*** They directly affect agricultural costs of production (land, labour, and capital costs). Examples: minimum wage policies; policies that affect land rental rates; support to negotiations between employers and workers etc.

Public investment policies can affect various groups of agents – producers, traders, and consumers – differently, as they may be specific to the areas where the investment occurs and/or to segments of specific value chains. These comprise:

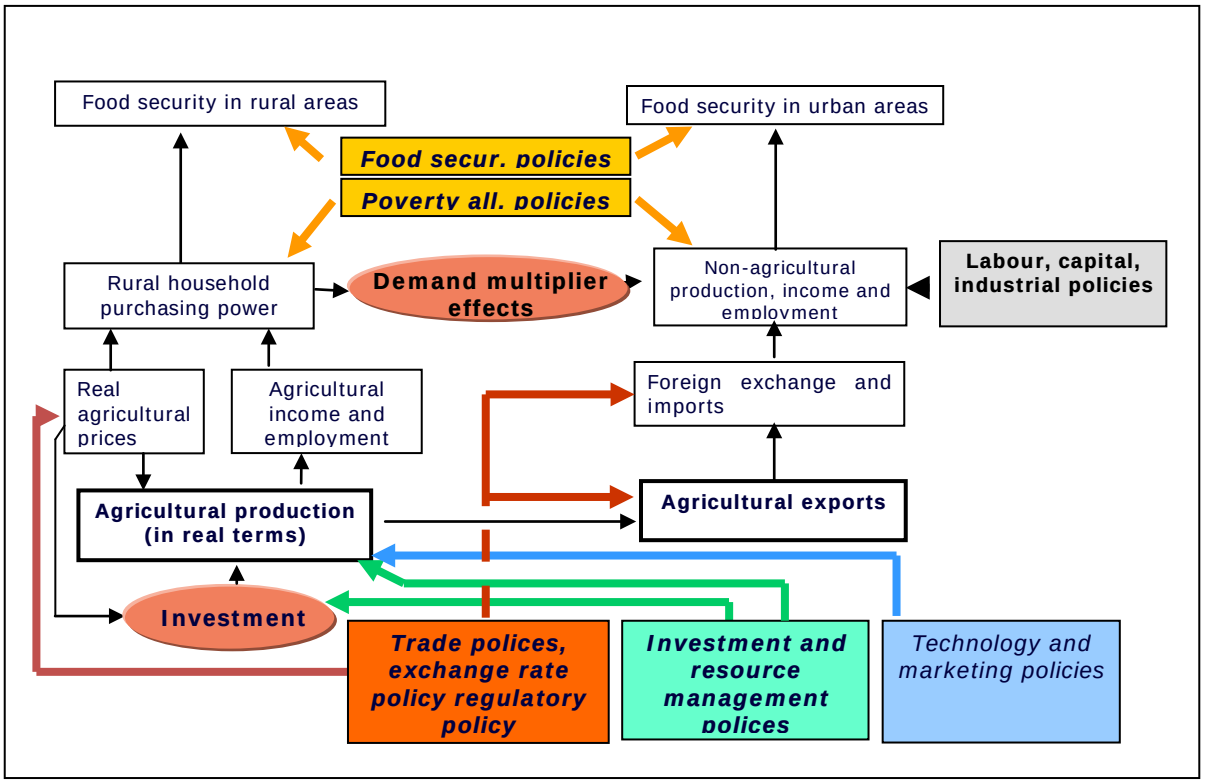
- ***Public investment in infrastructure*.** This can raise returns to producers or lower production costs**.** Examples**:** construction of essential capital assets; such as roads, ports, and irrigation networks; provision of port facilities; collection centres and storage deposits etc.
- ***Public investment in human capital*.** This consists of government expenditure to improve the skill levels and health of producers and consumers**.** Examples: investments in schools, training and extension centres; public health facilities; clinics and hospitals.
- ***Public investment in research and technology*.** This is related to research in new agricultural production technologies and aims at improving agricultural productivity. Examples: better water control; provision of technological breakthroughs; research in new types of seeds or conservation agriculture; good agricultural practices etc.

In addition to the above types of policies, a specific set of policies refers to **direct poverty alleviation and food security**. This aims to directly and immediately provide food (or entitlements to food) and/or increase the well-being of the most in-need people.

C) **"Entry points" of policy measures into socio-economic systems**. The range of policy measures listed above have direct and immediate impacts on different parts of a socio-economic system. For example, trade and exchange rate policies directly affect imports and exports of goods and services by shifting domestic prices in relation to international ones. Investment and natural resource management policies may have direct impacts on production processes due to their capacities to shift the relative costs and productivity of various inputs and factors. The same may apply to specific technology and marketing policies; the latter particularly affecting the downstream segments of value chains. Factor policies may affect both agricultural and industrial sectors. In addition, as mentioned above, some policy measures, such as poverty alleviation or emergency policies may directly affect poverty and/or food security in

both rural and urban areas. Figure 3 summarises the ways in which different policies directly affect specific parts of a socio-economic system

Figure 3: Different types of policies and their entry points in the socio-economic system



Source: freely adapted from Norton (2004).

However, note that in addition to direct affects, the circular flow of incomes linking the different elements of a system (illustrated in figure 1), gives rise to "multiplier" effects, i.e. activation of other parts of the economic system due to changes in one part. For example, increased incomes in rural areas may activate the demand of industrial goods, which in turn may activate the demand of industrial inputs and factors. This generates employment, increases the household income and increases the demand of agricultural goods; thus increasing again agricultural incomes. In addition, investment may accelerate the "multipliers" effects by enhancing, period after period, the stock of capital and the efficiency of production and distribution processes.

4. POLICY IMPACT ANALYSIS IN DECISION MAKING PROCESSES

There are many reasons why government interventions and public policies are important in the development process[3]. From an economic point of view, they can be classified as:

[3] For a general view of the importance of public policies, see EASYPol Module 103, ***Policy Making in the National Context: How Policies Impact on a Socio-Economic System***, Module 1: Policy

1) **Efficiency reasons**; i.e. policies aiming at a better allocation of resources in view of increasing the output of the economic system. These policies comprise the interventions to correct for market failures such as the presence of public goods, imperfect information, externalities; 2) **Equity reasons** like improving food security of specific social groups, interventions for poverty reduction and income redistribution or achieving sustainability of national resource uses (inter-generational equity).

Due to the fact that public policies are fundamental tools to achieve socio-economic development objectives, it is important to assess the effectiveness of each policy measure compared to a pre-fixed development objective before deciding to implement it (ex-ante)[4].
However, given the complexity of real socio-economic systems, due to inter-sectoral and inter-agent linkages, multiplier effects and dynamic impacts of investment; as described in the previous section, it is important in the decision making process to have adequate tools at one's disposal to gain insights into policy impacts.

Ex-ante Socio-Economic and Environmental Policy Impact Analysis (ESEPIA) helps in this endeavour.

ESEPIA can be defined as the assessment of the socio-economic and environmental impacts that a policy measure (or a set of policy measures) is (are) likely to have on the conditions of the different stakeholders and on the environment directly or indirectly affected by the policy under scrutiny[5].

ESEPIA is an important iterative step in the policy formulation process, as it provides relevant information to decision makers about the desirability of a specific intervention with respect to the achievement of development objectives; such as economic growth, income distribution, gender equity, sustainable natural resource use etc, before deciding on its implementation. In the presence of multiple objectives and limited resources, it is important to dispose of ex-ante information to prioritise interventions in order to maximize net positive socio-economic and environmental impacts.

ESEPIA is also useful in analysing likely impacts of exogenous changes (i.e. not induced by policies but by external factors) in the national or international context, such as international price changes, changes in climatic conditions etc. and to formulate appropriate policies to countervail their expected negative impacts or boost positive ones.

Framework, Introduction to Policy Impact Analysis and Policy Making at the National Level. See EASYPol website, WWW.FAO.ORG/EASYPOL .

[4] This document deals specifically with "ex-ante policy impact analysis, i.e. analysis of "expected" socio-economic impacts. Methodological aspects related to impact analysis in a Monitoring and Evaluation (M&E) framework are addressed, in EASYPol Module 056 ***Monitoring Policy Impacts (MPI): The Role of MPI in Policy Formulation and Implementation*** and related references.

[5] ESEPIA is pretty much an extension of the Poverty and Social Impact Analysis (PSIA), as promoted in recent years by the World Bank (HTTP://GO.WORLDBANK.ORG/3919SFVEJ0)and applied to all policy decision making processes (including, but not exclusively, poverty reduction strategies).

ESEPIA aims at responding to some basic questions referring to diagnosis, priority setting, identification of policy options, detailed assessment of impacts and implementation instruments, such as:

- Which sectors of the economy and/or of society need interventions of the public powers?
- What policy measures are available for bringing the desired changes into the socio-economic context?
- What are the expected effects?
- Who are the 'gainers' and how much do they gain if the policy measure is implemented?
- Who are the losers and how much do they lose?
- How long will the effects of the policy measure last?
- What are the budgetary implications of the policy measure?
- How could the cost of the intervention be financed?

In order to provide decision makers with answers to such questions, ESEPIA normally deals with multiple domains of investigation and provides a comprehensive set of indicators, on aspects such as:

i. Impacts on output, costs, margins, value added and profits of different economic agents affected by the measure, including up-stream and down-stream agents;

ii. Impacts on poverty and food security of different stakeholders;

iii. Implications of policy measures on equity, including gender aspects, income and expenditure distribution;

iv. Dynamic effects on capital accumulation, investments, and long term growth perspectives;

v. Inter-sectoral implications, i.e. repercussions of the measure on other sectors not directly targeted by the measure;

vi. Budgetary implications and other macro-economic effects (impacts on the balance of trade and balance of payments, exchange rate etc.)

vii. Implications for factor markets, such as wage levels, labour supply and demand, credit implications, migrations and urbanisation;

viii. Natural resource use and environmental sustainability;

ix. Inter-intra agent conflict generation, negotiation and resolution.

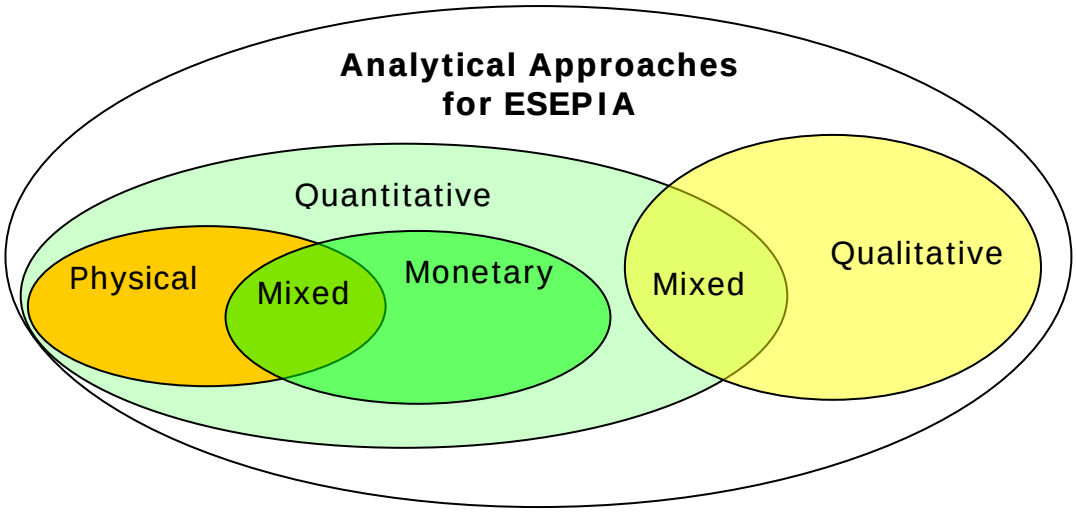
Due to the number of aspects mentioned above to investigate, ESEPIA has to rely on a multiplicity of analytical tools, ranging from simple to complex ones, which allows for the covering of different domains.

5. QUALITATIVE VERSUS QUANTITATIVE APPROACHES

Most of the analyses can be carried out using different approaches, either qualitative or quantitative, as indicated in figure 1.

Although it is not possible to draw a precise frontier to separate qualitative from quantitative analysis, as many approaches have mixed natures; qualitative approaches for policy impact analysis essentially make use of non-numerical information. These include value judgements of key informants; non-structured interviews of stakeholders; focus groups, panel discussions etc. They can be also very detailed and context-specific, to feed the decision making process. Many of these methods derive from ethnography, a discipline that uses FIELDWORK to provide descriptive studies of human societies[6].

Figure 4: Analytical approaches for ESEPIA



On the other hand, quantitative approaches make use of numerical data, usually gathered by means of surveys based on structured questionnaires with close-ended questions; or from other statistical sources (e.g. national statistical yearbooks, national accounts, custom data, international databases etc). They treat information by means of mathematical methods in order to derive expected responses to variables affected by policy interventions. Quantitative approaches may deal with physical data (e.g. physical quantities of inputs and outputs, number of hectares cultivated, number of households

[6] "Ethnography presents the results of a HOLISTIC research method founded on the idea that a system's properties cannot necessarily be accurately understood independently of each other" (*http://en.wikipedia.org/wiki/Ethnography*). Social and cultural antropology are anchored to ethnograpy.

benefited etc) and provide decision makers with information on policy impacts in physical terms.

However, very often, monetary evaluations are also carried out using money as a common unit of measure (numeraire). Physical quantities are converted into monetary values by means of prices expressed in monetary units. In these cases, decision makers are provided with summary information expressed in monetary terms or in percentage variations of monetary variables (e.g. income or expenditure of various household groups, GDP growth rates, value added variations, budgetary implications etc).

This paper focuses essentially on quantitative monetary models for socio-economic impact analysis[7]. For a review of techniques to take into account environmental impacts in decision making processes, see e.g.: Cistulli, V. (2002), Markandia, A., Harou, P., L.G. Bellù and V. Cistulli (2002), Asian Develolment Bank (1996), Economic Commission for Europe (1992), World Bank (2003).

6. COUNTERFACTUAL ANALYSIS

ESEPIA is often carried out in a "counterfactual" context. The analyst follows a logical process, shown in figure 2, which goes through the construction of a base scenario, which is the stylised description of the socio-economic system «**WITHOUT**» policy intervention (WoP), i.e. a state of the socio-economic system which is assumed to represent the situation if the policy measure is not implemented. This will be the reference scenario, also called benchmark or baseline, for the impact analysis of policies.

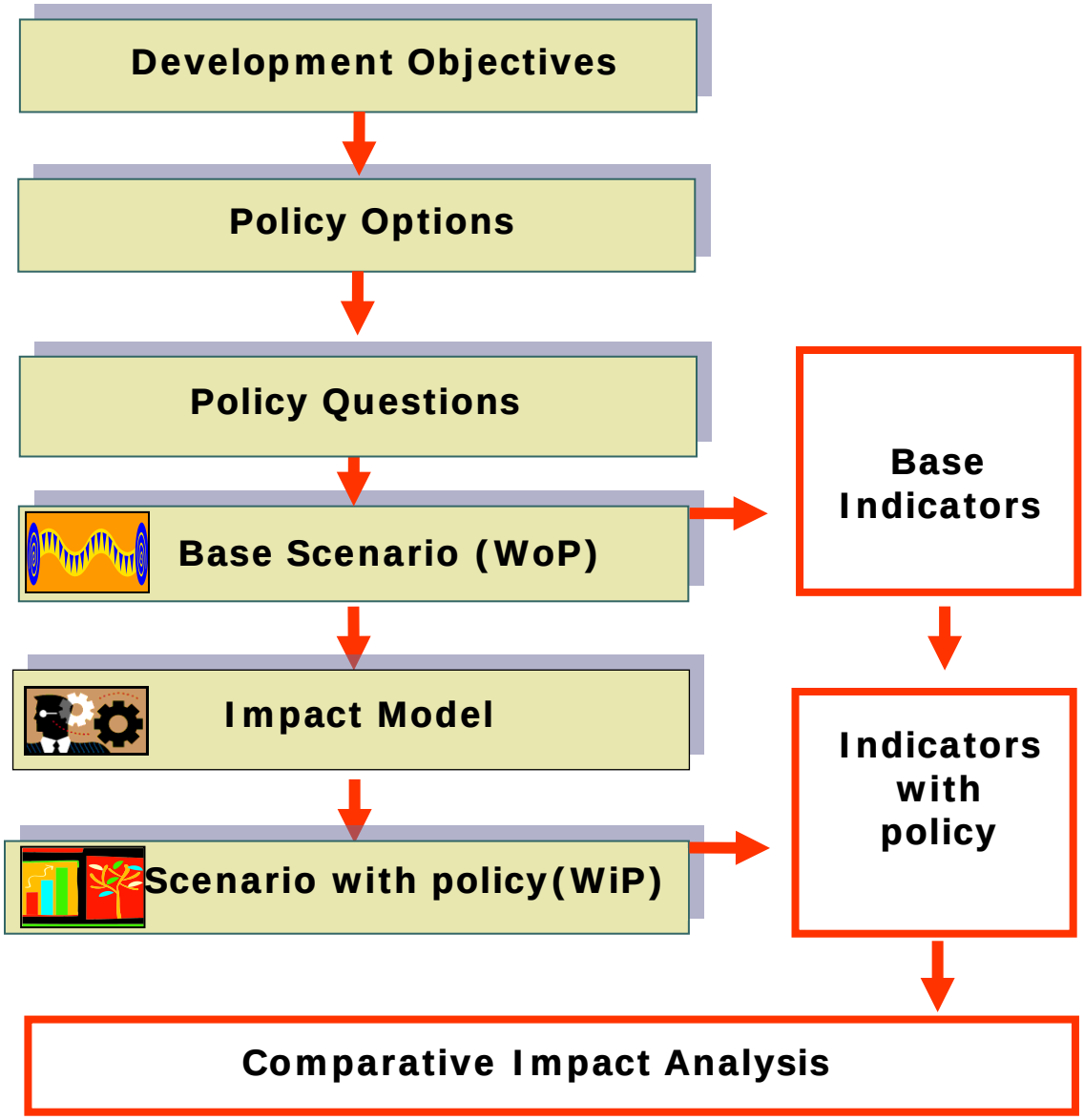
The reference scenario is described using some **indicators**, chosen on the basis of the type of policy that one would analyse. If, for example, the policy measure aims at poverty alleviation and food security, one would use poverty and food security indicators, like the poverty headcount rate, the poverty gap, the per capita intake of calories and proteins or their distribution (e.g. per different deciles or quintiles of population) etc. These indicators calculated for the reference scenario are used as reference indicators.

After building and describing the reference scenario, the analysis focuses on the construction of one scenario that integrates the expected socio-economic impacts of the policy option. This is the scenario «**WITH**» policy (WiP). If more than one policy option has to be analysed, the analyst can build different scenarios "with" policy.

How is it possible to construct a scenario WiP? The scenarios WiP are usually built as a modification of the WoP scenario.

[7] For a more general discussion of quantitative versus qualitative methods in social research see e.g.: Brady H. and David Collier (2004).

Figure 5: Counterfactual approach for policy impact analysis



In order to go from one scenario to the other, one needs a **model for socio-economic and environmental impacts** that allows for identifying, describing and quantifying the changes in a socio-economic system which is most likely induced by the policy measure. A model of impact highlights causal links, i.e. "**transmission mechanisms**", among different socio-economic variables, specifically among the variables directly influenced by a policy intervention, i.e. the "**policy instruments**" and the variables that are directly related to the objectives of the policy intervention i.e. the "**policy objective**". The impact model is therefore a device to simulate the effects of the changes in variables controlled by the policy measure on selected socio-economic variables relevant for the policy objective, as represented in figure 3.

Figure 6: Basic structure of an impact model

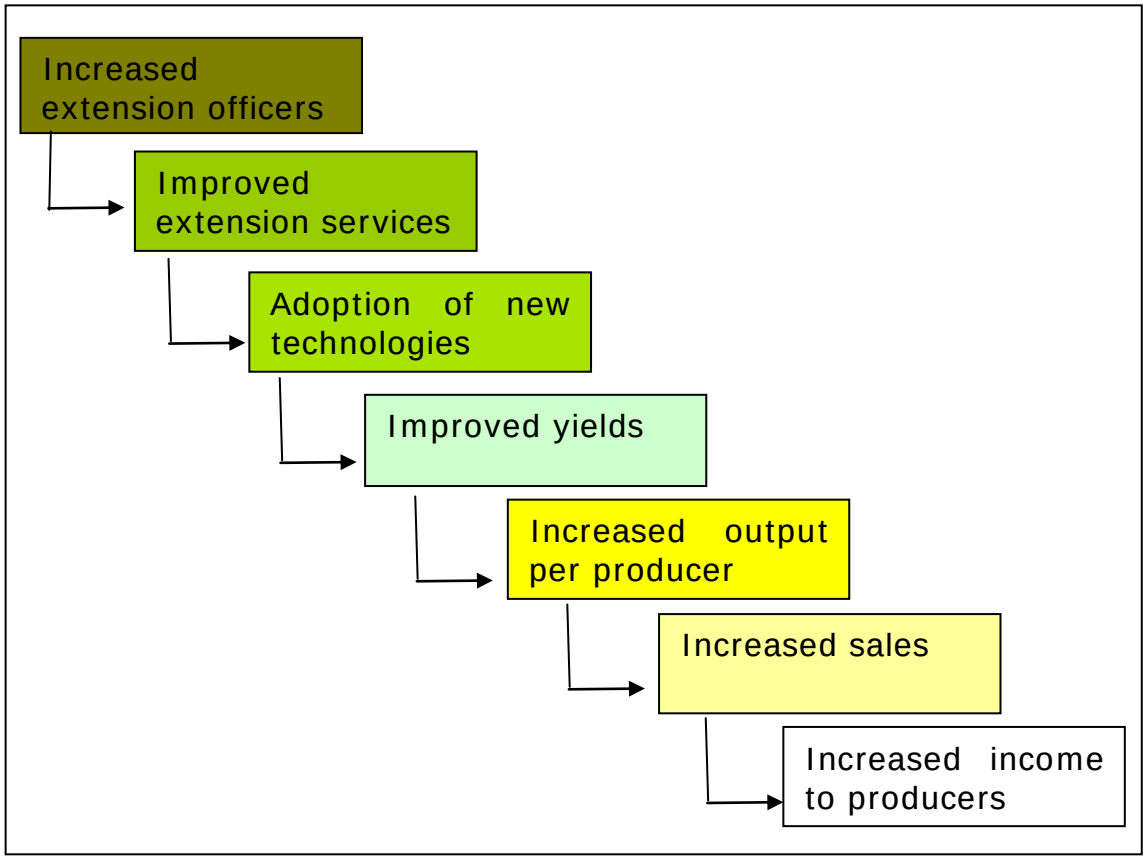
If we consider a measure aimed at increasing the revenue of selected groups of producers by means of a technological change induced by an extension policy, for example; the model of impacts must be such that cause-effect links between say, increased number of extension officers and revenue of producers should: 1) be spelled out, 2) quantified in physical terms; 3) converted in monetary terms.

In this sample case a model of impacts could be graphically represented as in figure 4.

Ideally, it should also allow quantifying impacts on the following examples: yields, quantities produced per producer; total quantities produced in the zone; prevailing prices of the output in the situation with productivity and production changes; additional production costs and margins to producers.

Note that in the same model of impacts, the different cause-effect links may involve varying degrees of subjectivity and/or a different mix of qualitative and quantitative information. For instance, the link between increased extension officers and improved extension services can be identified and estimated based on expert consultation or discussion with selected stakeholders. The link between adoption of new technologies and increased yields could be based on some agro-technical models, and the links between output, sales and income could be based on some quantitative economic models.

Figure 7: Example of an impact model



After having constructed the scenario «WITH» policy using the model of impacts, this can be described using some **indicators** similar to those for the description of the reference scenario. If, for example, one has used poverty indicators: like the poverty headcount rate; the poverty gap and the consumption of calories and proteins per person or per different quintile of population; one would use the same indicators for the scenario <WITH> policy, allowing comparisons for the results before and after the policy change.

The analysis of the "counterfact" will then be essential to measure impacts. Indeed, the comparison of indicators of the scenario WiP with those from the scenario WoP underlinines the changes in the socio-economic system introduced by the policy measure. Moreover, if one constructs scenarios for different policy options, one could also compare the different policy options.

In the following section, we will present selected quantitative models currently used for modelling the socio-economic effects of policy interventions. After a general description of the methodology used in each model, some real case applications for each of them will be briefly reported.

7. QUANTITATIVE MODELS FOR SOCIO-ECONOMIC ANALYSIS

In order to «measure» policy impacts, one can use different approaches or **quantitative models for socio-economic analysis**, i.e. models in which the variables of interest are expressed in a common unit – the numeraire – that is usually used as a monetary unit[8].

Quantitative models for policy impact analysis are used to represent a complex socio-economic system in a stylised way and to highlight possible linkages between its different elements. Thanks to the interdependences among their constituent elements, one can analyse the impacts of a policy because they transmit changes generated by a policy measure on some variables under control of the policy maker (policy instruments), to other variables (policy objectives), by means of some transmission "mechanisms" (cause-effect relationships).

Among different approaches that can be adopted to perform impact analysis, a first distinction should be made between econometric and computable models. Econometric models are used to describe the main economic mechanisms of a national or sub-national economic system. Using regression analysis with different estimation methods, it is possible to estimate a model's parameters, coefficients and elasticities from available data at the micro or macro level.

If, for example, we want to assess the impact of agricultural market reforms at the farm level, we have to estimate farm level production functions in order to derive the impact of price changes on budget, using the appropriate parameters estimated. One possible drawback of some econometric approaches is that they do not usually take into account general equilibrium effects of policy changes. There are many examples in the literature on policy impact analysis, of the use of econometric models, both at micro and macro level[9].

Similarly, to econometric models, computable models also describe the main mechanisms of an economic system. Computable models are so called because, for a given policy change, or any other exogenous shock, they 'compute' results, in the sense that they return a new set of information about prices, wages, incomes and equilibrium quantities of goods and services, all endogenously determined by the model during the simulation exercise.

They are constructed as a set of simultaneous equations describing the behaviour of several economic factors, like utility-maximising households, profit maximising or cost minimising firms. Therefore, they usually describe how demand and supply decisions made by different economic agents determine commodities' and factors' prices. Depending on the specification, they can represent equilibrium conditions in the system including equations that describe how prices adjust to clear the markets. In general, the

[8] In other models the numeraire can be a caloric unit, if one refers, for example, to problems of food security, or another unit, like the per capita income, as a proxy of the individual or community's level of well-being.

[9] For an extensive presentation of their application, see among others: Coudouel, A. and S. Paternostro (eds) (2005), Coudouel, A., Dani, A. A. and S. Paternostro (eds) (2006) and Sugiyarto, G. (ed.) (2007).

equations illustrated refer to a specific underlying economic theory, which is not always the case for econometric models.

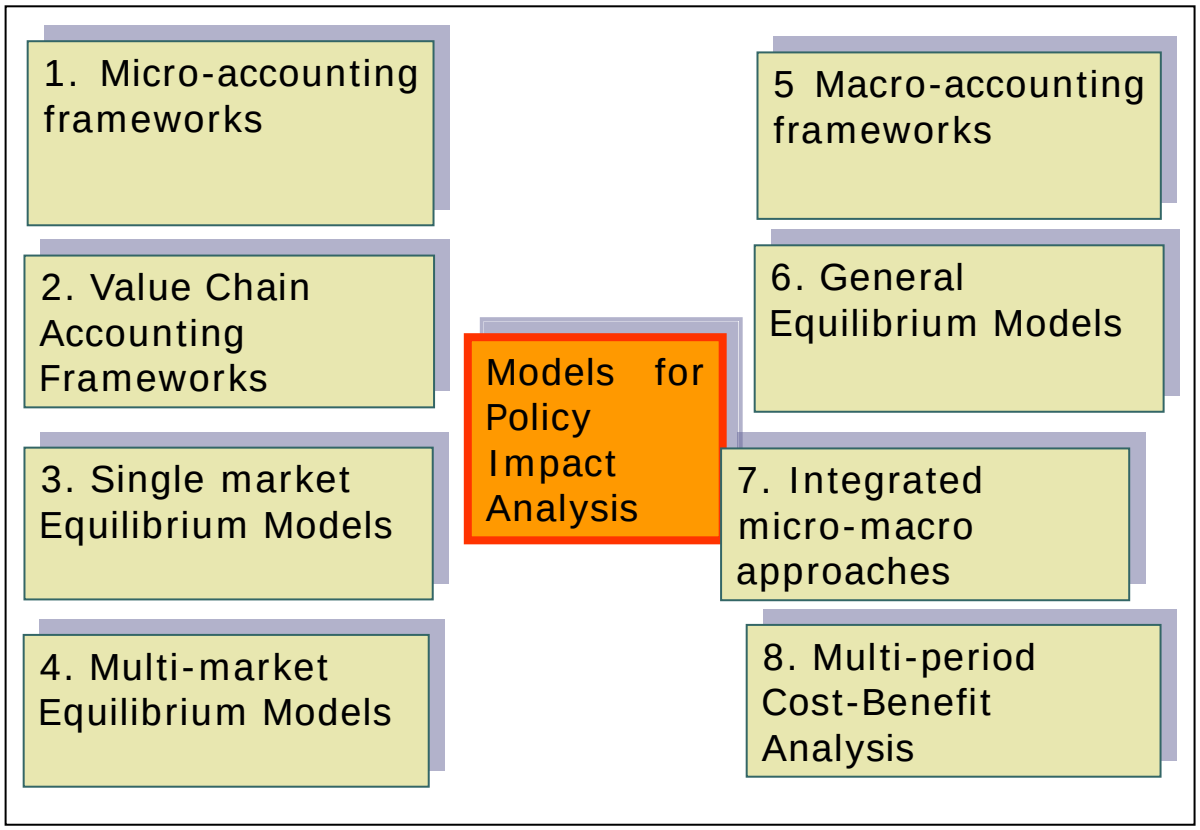
Many parameters of a computable model are built with reference to a "benchmark", i.e. a state of the economic system where the policy measures under assessment are not implemented. For example, for most CGE models, the benchmark is represented by a Social Accounting Matrix. If a SAM-based CGE is solved without any change, it "replicates" the benchmark, i.e. provides the same values of the SAM, because it is "calibrated" on the SAM. This means that some parameters are calculated on the basis of the values included in the SAM. Together with "calibrated" parameters, computable models also make use of information derived from econometric models: key parameters and elasticities can, in fact, be estimated using regression analysis outside the model. This fact constitutes an important link between the two families of models.

As mentioned before, a large part of computable models are constituted by General Equilibrium Models (CGEs). Together with "accounting models", these form the majority of the quantitative models used to assess socio-economic policy impacts. While CGEs describe equilibrium relations among different agents and components of an economic system, considering feedback and indirect effects generated by a policy change; micro-accounting models do not model behavioral agents' response. Thus, they only allow for evaluation of direct effects.

Accounting and computable-equilibrium models constitute the focus of the following section, which reviews different approaches to conduct policy impact analysis. Figure 5 shows selected approaches widely used for the analysis of socio-economic impacts of policies[10].

[10] A detailed presentation of most of the mentioned approaches and how they work can be found, for example, in Sadoulet, E. and A. De Janvry (1995), Bourguignon, F. and Pereira da Silva, L. A. (2003), World Bank (2003), Essama-Nssah, B. (2005).

Figure 8: Selected models for quantitative policy impact analysis



To select the most appropriate model for use in a specific operational context, the policy analyst should take into consideration its key features, such as:

- **Technical features:** Each model is characterised by specific features referring to its structure: the emphasis on specific socio-economic aspects and the way the transmission mechanisms are built. For example, the explicit inclusion of the geographic dimension (e.g. consideration of different regions and relative mutual relations); the explicit modelling of the time dimension; the treatment of the behavioural reactions of the economic agents; the treatment of the capital accumulation and the effects of investments.

- **Suitability:** Different models can be suitable for investigation of different policy measures. To be suitable for a specific policy measure, an approach has to cover the key socio-economic aspects and be pertinent to the policy instruments, the transmission mechanisms and policy objectives considered. For example, if the analyst wants to explore the impact of an international trade policy (e.g. a tariff increase on imported meat) on poverty and food security, a suitable approach should explicitly consider: Domestic tariffs (the policy instrument) - selected relevant transmission "mechanisms" linking tariffs with domestic prices; domestic prices with production and income generation; income generation and domestic prices with household expenditure; household expenditure with food consumption and calories and/or proteins intake (the

policy objective). It is apparent that the suitability of a model to simulate the socio-economic impacts of a specific policy measure is closely linked to its technical features.

- **Flexibility.** A desirable feature of a model is the possibility of using it for analysing different types of policies. This helps reduce the reaction time of the analyst to the decision-makers' request and better managment of the fixed costs generated by the implementation of the model (selection of the analytical tools, identification and procurement of specific software, training, data collection, adaptation of the tools etc). The flexibility of the model, as much as its suitability, is also closely linked to its technical features, and more specifically, to its degree of complexity. More complex models usually comprise several variables that can be used as policy instruments.

- **Human Resources requirements.** Each model may require a different mix of professional profiles and know-how, according to its complexity and its specific focus. Usually they are built and run by fairly small teams comprising some economists with diversified macro-micro and quantitative-statistical know-how. However, the contribution of other experts may be required. For example, if the focus of the model is on production processes, the support of experts with specific knowledge of sector or sub-sector technologies may be required; if the focus is on food security, a nutritionist may be part of the team. This also applies for models focusing on environmental aspects and natural resources. In this case, environmental scientists and experts in natural resource use should be associated with the conception, implementation and use of the model.

- **Data requirements**: The actual possibilities for implementing a model are also determined by the availability of secondary data (i.e. data collected by statistical agencies for general purposes or for other specific investigations) and/or by the possibility to collect primary data (i.e. data collected for the specific purpose of building the model). When selecting a model, the policy analyst should consider what data is indispensable for its implementation and whether it is or could be available in the actual context.

- **Time requirement**: Different models may require different implementation time according to their complexity, data requirements and human resources availability. The timescale for implementing a model and obtaining the first results should be compatible with deadlines imposed by decision- makers. A possible approach to this regard is to identify the minimum acceptable size of a model required to provide decision makers with sufficient information (a core model) and start building and using this nucleus. Additional complexities may be added at a later stage in order to refine the model and provide additional information.

In the following sections, we will review selected analytical models currently used for ex-ante policy impact analysis. For each of them, after a general presentation highlighting their main features as listed above, we will provide some examples of concrete applications for the analysis of different policy options.

7.1. Micro-accounting frameworks

Technical Features

Among micro-simulation models[11], the micro-accounting approach[12] is characterised by the direct insertion into a base of micro-data selected modifications supposedly induced by the policy measure under assessment. These models are often used to simulate welfare effects of fiscal or social policy reforms directly affecting prices and/or incomes of individuals or households. As micro-simulation models allow for a focus on the whole income or expenditure distribution, the micro-accounting approach is particularly useful for poverty, inequality and food security impact assessments.

Even though they are simple in the application and immediately permit the interpretation of results, micro-accounting models suffer from some drawbacks. Due to the fact that they do not model any behavioural response of economic agents to policy changes, they measure only the first order effects of policies, as highlighted by Bourguignon et al (2003:9). Indeed, they provide only a first approximation of the total effects of policies on households' or individuals' welfare. Therefore, these type of models provide only a partial picture of the effects induced by a policy measure and they should be applied only if the policy changes are marginal. It is also not suitable for simulating the impacts of policies with strong indirect effects. For example, as production processes are not modelled, the structure of production in the economy and its role in generating policy impacts on households' welfare is ignored. In all these cases the difference between simulated policy-induced impacts and the real ones can be very large.

Needs in Human Resources

In order to simulate the alternative policy measures and evaluate their impact using this approach, it is necessary to set up a team comprising:

- an economist, expert at cost-benefit analysis, able to identify and quantify the link between the policy measure considered and the accounts of different economic agents and also to identify and interpret the relevant indicators of the simulated policy;
- a statistician with good knowledge of one or more statistical applications for data managing and simulation (like SPSS, STATA, SAS etc).

Data Needs

In general, this approach is feasible if Living Standard Measurement Surveys (LSMS) or similar data exists with the following characteristics:

- Detailed data by household, covering many of the dimensions of the socio-economic life of the households (for example, expenditures by type of product; revenues by source; wages for sector of occupation; social and demographic

[11]As defined in Spadaro (2007:18), microsimulation models 'allow the simulation of the effects of a policy on a sample of agents at the individual level and they are based on the representation of individual behaviour when agents face different economic and institutional frameworks'.

[12] They are also called arithmetical microsimulation models. They differ from the models which simulate the behavioural agents' response, called 'behavioural' microsimulation models.

characteristics of the family and of its members, endowments in durable goods, etc);

- With a national, regional or sub-regional coverage;
- Based on a statistically significant sample;
- Availability of «sample weights», i.e. the number of households represented by each household record in the sample;
- «Clean», i.e., without information that is not clearly wrong or incoherent.

Time Needs

If the appropriate expertise and suitable <clean> data is available, the time required for the simulation of impacts of a policy measure is relatively short, (say within a month).

Figure 9. Micro-accounting approach: an assessment

General characteristics	Use of detailed household data to generate policy scenarios, by directly introducing changes in the data base, after selection of households affected.
Relevance for poverty / FS	Linked - the quantity/quality of available data. Good for poverty (expenditures, consumption….)
Coverage of policy measures	Take only the direct effects. Not suitable for structural policies with strong indirect effects.
Technical structure	Accounting framework without explicit modelling of behavioural feedback. Used in general in association with other approaches.
Resource needs	Limited, in terms of time, when good household surveys have been already carried out by statistical offices. Knowledge of data management needed.

Table 1. Some applications of the micro-accounting approach

Author / year / Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Van de Walle, D. (1994) The Distribution of Subsidies through Public Health Services in Indonesia, 1978-87	Indonesia	Benefit Incidence Analysis: analysis and comparison of change in the level of household welfare depending on the utilisation and provision of health care services. Utilisation is measured as the proportion of an eligible subgroup that uses a health facility. The computed unit costs to the government are then attributed across households according to utilisation patterns.	How the use of health services and the incidence of subsidies in the health sector varied across socioeconomic groups. It also examines how the distributions of utilisation and subsidies altered between 1978 and 1987.	Changes in utilisation patterns and in the incidence of subsidies have been pro-poor. Disparities in access and utilisation have diminished. However, public spending on health care is not yet well targeted.
Alderman, H. C. del Ninno (1999) Poverty Issues for Zero Rating Value-Added Tax (VAT) in South Africa	South Africa	Estimation of a welfare weight that captures the change in welfare due to change in the price and taxes for the commodity. Also, estimation of changes in government revenues due to tax changes to calculate a cost-benefit ratio to assess commodity-specific exemptions.	This paper investigates how well VAT exemptions have been targeted and what are the impact of exemptions on household consumption.	VAT exemptions for maize have a measurable positive impact on caloric consumption by deficit households. Other exemptions, like for meat, would favour non-poor urban households and negatively affect the caloric consumption of rural households
Younger, S., D. E. Sahn, S. Haggblade, and P A. Dorosh (1999) Tax Incidence in Madagascar: An Analysis Using Household Data	Madagascar	Welfare dominance analysis using tax concentration curves. Estimation of a welfare function for each household depending on tax rates on consumed commodities.	Identify the progressiveness of different tax levels in Madagascar, based on the consumption and income patterns.	Most taxes are progressive. Two exceptions are taxes on kerosene and export duties on vanilla. Moving away from trade taxes toward broadly based value added or income taxes would be more equitable and more economically efficient.
Chen, Matovu and Reinikka (2002) A Quest for Revenue and Tax Incidence.	Uganda	Concentration curves that plot households from poorest to wealthiest on the horizontal axis against the cumulative proportion of taxes paid by households	Examines the degree to which the government was able to shift from export taxation to other revenue sources and how this restructuring affected households and firms.	Tax reforms were generally pro-poor. A) Replacing the sales tax with the VAT did not lead to the poor being worse off. B) Increased taxation on paraffin is highly regressive, while taxes on other petroleum products are progressive. C) Given the liberalized market, export taxes on coffee used during commodity booms tend to hurt the poor.
Levy, H., L. Morawski and M. Myck (2008) Alternative Tax-Benefit Strategies To Support Children In Poland	Poland	Use of EUROMOD models: a static microsimulation model for European countries based on the calculation of household disposable income depending on earnings/wages and from tax and benefit.	Assess the impact of different tax-benefit scenarios on child poverty rates. In particular, the recent Polish benefits scheme is compared to other European reforms to obtain results in term of child welfare.	Due to reform in 2005, Polish families with children were supported by a means-tested family allowance and some supplements. This scheme was extended in 2007 with non-refundable child tax credits. Results show that poverty reduction would have been more pronounced, if child policies were changed along the lines of the system in France (based on tax concession and targeting of large and lone families) or the United Kingdom (more based on means-testing). The Austrian system – relying on universal benefits – would bring about a similar reduction in the poverty rate but with much greater reduction in the poverty gap.

7.2. Value Chain Analysis

Technical Characteristics

Value Chain Analysis (VCA). VCA is essentially an accounting framework referring to a sequence of economic activities vertically linked. It identifies, describes and assesses in economic terms relevant activities of all the factors (farmers, traders, consumers, authorities, development organizations, etc), which contribute to the production, transformation and distribution of a single commodity[13]. Thus, a value chain analysis includes the description and evaluation of a sequence of operations (stages of the Value Chain) ranging from the primary production of raw materials, the assembly/processing of intermediate goods, the delivery and distribution of the commodity to retailers and the markets and finally, to the consumption of the final output.

This sequence of activities can occur in a single country or in an international context (International Value Chains). Value chains can also be divided into sub-chains according to specific processing modalities or uses of the primary commodity.

To build a value chain analytical framework it is necessary to start with a functional analysis of the chain, following some subsequent steps: 1) identification of the physical flows of the commodity being analysed; 2) identification of technical functions required to produce, process and distribute the commodity and/or derived products; 3) identification of agents carrying out the technical functions; 4) quantification of physical flows of the commodity and related products 5) description of features and functioning of relevant markets on which the commodity or its derived products, are exchanged. These steps can be represented by a 'chain flow chart'. Then, physical flows of inputs and outputs are converted into monetary flows by means of both private and social prices[14]. Various margins and other economic indicators are then calculated for the different activities and agents by comparing their revenues with their production costs.

Once the VCA accounting framework is built, it can be used for policy impact analysis. VCA for policy impact analysis usually adopts a "counterfactual" approach. Inputs, outputs, prices, value-added creation and margins of the different economic agents and also the whole value chain are assessed at the "benchmark", i.e. in a situation "without"

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[13] For a more comprehensive view of the Value Chain Analysis and one of its applications see EASYPol Module 043 ***Value Chain Analysis: Constructing the Value Chain: Functional Analysis and Flow Chart*** and/or the VCA Software developed by FAO and related manuals (EASYPol Modules 073, 074 and 075, respectively: ***VCA: A Software for Value Chain Analysis: Installation Note and Software Package [Version 02.00 29/04/08***, ***VCA: A Software for Value Chain Analysis: Inserting and Managing Data***, ***VCA: A Software for Value Chain Analysis: Calculations Performed by the Software***)
Moreover on VCA, see EASYPol Module 105 ***Value Chain Analysis: A Tool for Quantitative Analysis of Socio-Economic Policy Impacts***, Module 1 Session 6 of the FAO Policy Learning Programme, available at the EASYPol website.

[14] "Private" and "social" prices are also referred to in the VCA and Cost-Benefit Analysis (CBA) literature as "financial" and "economic" prices, respectively.

any policy change. A "policy scenario" is then prepared by embodying into the benchmark framework, the likely impacts of the policy change on specific items of the value chain (e.g. yields, technologies, taxes, prices etc.). The same indicators are then computed for the benchmark and the policy scenario and subsequently compared. The comparison of the indicators at the benchmark with the same indicators for the policy scenario allows for assessment of how public policies, investments and institutions affect existing or planned value chains. VCA can be used, for example, to assess the impact of input and output price changes on value added creation and distribution among factors and agents and across countries (in case of international value chains). VCA, by means of computation of Policy Analysis Matrices (PAM) can also be used to assess the degree of protection and the competitiveness of domestic products on international markets.

Besides its operational advantages, VCA suffers from some disadvantages, such as: 1) being an 'accounting framework', it does not automatically take into account behavioural responses of the economic agents to policy changes; 2) it provides only a partial vision of the economy and the society; and 3) it is "static", in the sense that it does not explicitly take into account the 'time' dimension.

Needs in Human Resources

In order to simulate the alternative policy measures and evaluate their impact using this approach, it is necessary to set up a team comprising:

- an economist with a specific knowledge of value chain analysis and cost-benefit analysis of public policies;
- An expert on production and distribution techniques applying to the specific sector/sub-sector under investigation;
- A statistician with knowledge of data management using spreadsheets or dedicated software.

Data Needs

VCA is feasible if detailed data exists about the whole sequence of operations from primary production up to the production and distribution of final goods for the commodity under investigation. Information about economic agents; the institutional setting; the structure of demand and supply at different levels of the chain and prices of inputs and outputs are also essential.

Time Needs

In general, time requirements strongly depend on data availability. On average however, one to two months can be required to construct the structure of the chain including a fairly detailed specification of the accounts of the different agents involved in the chain.

Figure 10. Value Chain Analysis (VCA) accounting framework: an assessment

General characteristics	Value Chain Analysis allows us to analyse the policy impacts spreading into the economic system by means of the path followed by a commodity.
Relevance for poverty/FS	With VCA we can measure, among other things, the changes in the income of specific agents, due to sub-sectoral policies.
Coverage of policy measures	Only policies with impacts that do not deviate too far from the base situation can easily be simulated. Otherwise, behavioural assumptions are needed.
Technical structure	Accounting framework with no explicit modelling of behaviour. Prices and quantities are explicitly modelled.
Resource needs	Some knowledge of accounting rules at farm/firm and meso-level is required. Lots of micro data is needed.

Table 2. Some applications of value chain analysis

Author/year /Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Jernigan, D. H. (2000) Applying commodity chain analysis to changing modes of alcohol supply in a developing country	Malaysia	Mainly descriptive analysis of the chain of beer, applied to the Malaysian economy.	How the structure of alcohol production shifted as a result of the market control by an oligopoly of trans-national corporations.	The paper analyses the effects of changes in market setting. The impact of the increasing dominance of an oligopoly of transnational corporations in the alcohol chain is a substantial change in the appropriation of margins, shifting from national firms to transnational corporations. The paper highlights how the state effectiveness and autonomy in setting alcohol policies is influenced by the new industrial setting.
Bellù, L. G., N. Guilbert (2008) The case of the formal firewood chain in Burkina Faso, Ouagadougou area	Burkina Faso	Firewood Chain Analysis: construction of the chain chart, identification of policy issues and measures, calculation of actors' margins. Three main actors are considered: woodcutters, wholesale traders and retail traders. FAO VCA software is used to store and analyse value chain data and carry out competitiveness analyses.	The impacts of a demand side policy (stop the butane gas subsidy) and supply side policy (increase in forest productivity)	Policy interventions (sustain the demand by stopping the butane gas subsidy and increasing the forest productivity by investing in forest management) lead to positive impacts on the firewood sector and actors involved with important environmental positive effects. These include: less deforestation and more firewood available; increased employment; more revenues available for woodcutters, poverty alleviation; increased government revenues through the forest tax.
Huan D. et al (2002). Maize commodity chain in Northern area of Vietnam.	Northern Vietnam	Analysis of the maize value chain structure and functioning.	Analyse the maize production potential of communities in mountain areas.	The development of maize production and trade is strongly related to the development of animal production. Maize production is an opportunity for rural development especially in poor mountainous areas. This opportunity is threatened by increasing imports due to further integration within international trade.
Xuan Phuc, T. (2005) Accessing Forest Products: A Commodity Change Analysis on Timber in Northern Uplands of Vietnam	Vietnam	Timber Chain Functional Analysis: analysis of horizontal and vertical benefit distribution	Exploitation of the timber value chain in order to verify if revenue from timber markets are equally distributed among agents. Moreover, the VCA analysis is used to assess the impact on households' benefit and on forest exploitation of government's policy to allocate forest land to households.	Forest land allocation to households and land rights distribution policy are expected to benefit people and improve forest exploitation. The paper shows that villagers are the ones who invest most but benefit least. Due to controlling the timber market, wholesalers benefit most. The paper also shows that securing individual property rights does not help household to benefit from forest resource. Neither does it help to protect forest resources.

7.3. The Partial Equilibrium -single market- Approach

Technical Characteristics

This approach analyses how specific policy measures alter the price of goods or services which equilibrate the demand and the supply of those goods or services[15]. The behaviour of consumers and producers to price changes is modelled by means of price-quantity mathematical functions. The approach equates the supply to the demand in order to compute the "equilibrium" price, i.e. price levels that "clear the market", that is, do not leave any excess of demand (unsatisfied demand) or excess of supply (unsold goods or service). This implies that equilibrium price and related quantity are determined by the model itself, i.e. are "endogenously" determined, on the basis of the assumptions about the behaviour of economic agents and the policy context and embodied into the model.

The partial equilibrium – single market - approach is well suited to analysing sub-sectoral policy measures and, in general, those policy changes whose impacts on macro aggregates are more limited.

An advantage with respect to the micro-accounting approach is that the partial equilibrium analysis makes it possible to also consider the effects on prices and quantities originated by behavioural responses that are embodied into the model, by means of supply and demand functions.

Seeing as the equilibrium approach under consideration is "partial", by definition it does not include the analysis of the equilibrium in all the markets of an economy. Due to these characteristics and with respect to general equilibrium models, partial equilibrium models' application is more limited. In addition, if used as a stand-alone tool, it provides limited insights into welfare, poverty and food security impacts of policies. It is better suited on these grounds if it is applied in association with other tools that consider the whole income or expenditure distributions, such as the micro-simulation approach.

Needs in Human Resources

In order to simulate the alternative policy measures and evaluate their impact using this approach, it is necessary to set up a team comprising:

- An economist with knowledge of the sector/sub-sector analyzed and knowledge equations solvers (MS Excel solver, GAMS, etc).
- Econometric skills for regression analysis may also be required depending on the analytical functional forms of supply and demand chosen, and in the case of estimation of new supply.

[15] Multi-Market partial equilibrium Models (MMM) are presented in the next section.

- Demand functions, for estimating the parameters of these functions. These skills however are not strictly required if coefficients (also in the form of elasticities) are borrowed from the relevant literature.

Data Needs

Data required comprises quantities and prices in one or more periods for the calibration of the model and own and cross supply and demand elasticities.

Time Needs

In general they depend on data requirements and availability. Time requirements can be relatively short (within one month) if data is available.

Figure 11. Partial Equilibrium (Single market) A and Multi-Market Models: An assessment

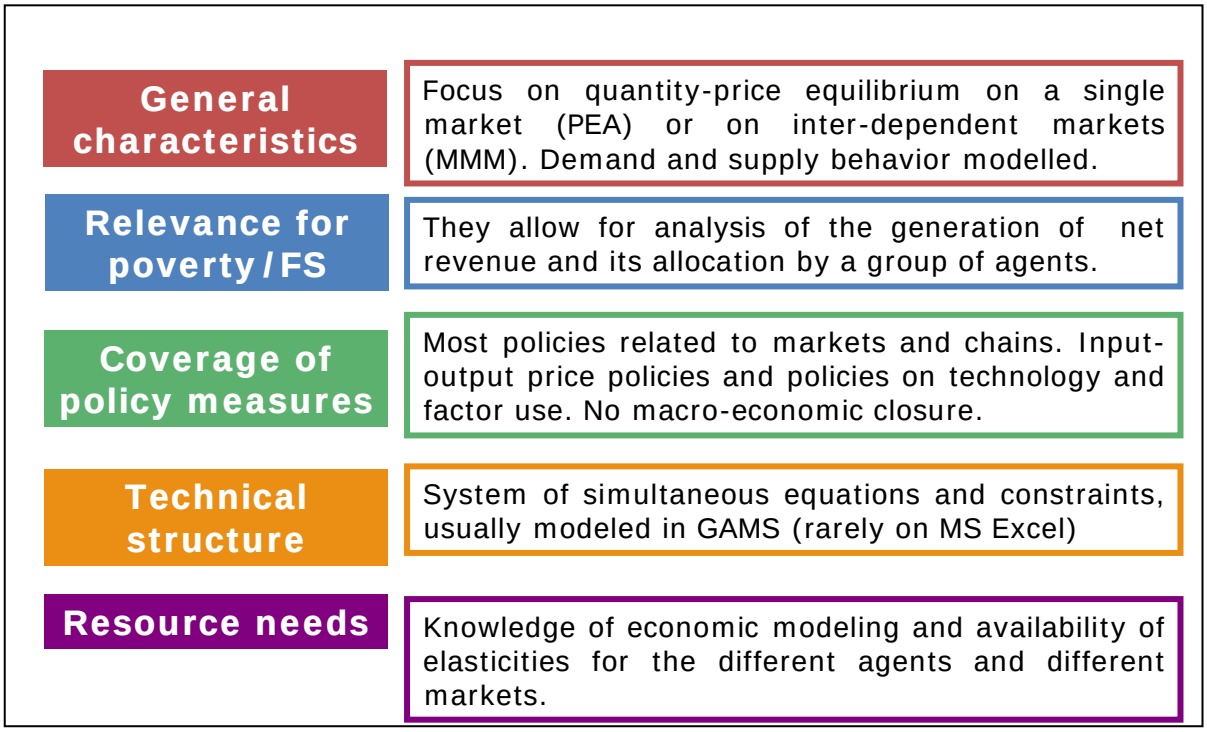

Table 3. Some applications of partial equilibrium models.

Author/year/ Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Scobie and Posada (1977): The Impact of High-Yielding Rice Varieties in Latin America.	Colombia	Demand and supply analysis for the rice sector using equations with an exponential form (linear in the logarithms).	The impact of high-yielding rice varieties in Latin America. The measurement of the distribution of social benefits derived from public investments on agricultural research.	The introduction of virus-resistant and dwarf varieties benefits the consumers but producers suffer from a loss. Benefits depend on the share of rice in the total consumption and on the frequency of consumption. Because rice is consumed in higher proportion by the poor, the net benefits were reaching mostly the poor.
López, Nash, and Stanton (1995) Adjustment and Poverty in Mexican Agriculture: How Farmers Wealth affects Supply Response	Mexico	Estimation of a farm household supply function.	Two empirical goals: first, to assess the relationship between household asset and the supply function; second, to monitor the condition of Mexican farmers and to evaluate their wealth in a changing poly environment due to globalisation and opening markets policy.	Based on the analysis of a production model focusing on capital as a productive input, they found that both the supply level and the elasticity to changing input and output prices depend on the farmer's net assets and on how they are used. Regarding the second research goal, the analysis suggests that farmers with more limited use of capital inputs are more likely to principally grow corn and therefore fewer crops than the others. Analysis using household survey data between 1991 and 1993 show conditions generally improving for the average farmer during a period when agricultural reforms related to markets openness were implemented (e.g. cropping patterns more diversified, the average size of landholdings increased, the average farmer received more credit etc.). At the same time, farmers that lacked access to productive assets did not respond as well to incentives or take advantage of the opportunities presented by globalisation.
Lampietti J. A, A. Kolb, S. Gulyani and V. Avenesyan; (2001) Utility Pricing and the Poor. Lessons from Armenia	Armenia	Multivariate welfare analysis. Estimation of a consumers' demand function at the household level.	To evaluate the impact on poverty rates of an increase in electricity prices (and an accompanying expansion in social safety net provision) and water tariffs.	For the electricity sector, households decrease their consumption and switched to wood and natural gas alternatives as a result of the increase in prices. For water prices, consumers are reluctant to pay significantly more for a service they deem unreliable.
Pan, S., Mohamadou F., S. Mohanty, Mark Welch and D. Ethridge (2005) Cotton in a Free Trade World	U.S. and the Rest of the World	Partial equilibrium (analysis of cotton supply and demand functions) model of the fibre world market	Impact on U.S and the rest of the world markets due to the complete elimination of domestic support mechanisms and market access restrictions in the world cotton market. Simulated scenario: all distortions directly affecting cotton supply and demand (price supports, input subsidies and border measures (import tariffs and TRQs) are eliminated for all major market participants.	Results show that export expansion occurs in the main U.S. competitors in the world cotton market (Australia, Brazil, West Africa, and Uzbekistan). U.S. cotton exports will decrease but the domestic and world cotton price will increase. Textile industries in low-duty countries (Japan, South Korea, and Taiwan) would be worse off by the price increase and they will lower their imports. However, the textile industries in relatively highly protected net importing countries (e.g., EU, China, India, Mexico and Turkey) would benefit from removing both domestic cotton subsidies and market restrictions.

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7.3.1. Multi market models

Technical Characteristics

Multi market models (MMM)[16] focus on the analysis price-quantities, equilibrium conditions in different interdependent sub-sectors related to one sector. Conceptually, they are an extension of the single-market models. Being partial equilibrium models, they do not consider macro-economic balances (e.g. savings and investments, supply and demand of foreign exchange etc.).

From an analytical point of view, multi-market models are based on a system of equations whose solution represents the quantity-price equilibrium conditions on the markets of products and of selected inputs and factors.

They require four steps to be constructed[17]: 1) determine the relevant markets to be analysed, also deciding at which geographic level and level of households' disaggregation to conduct the analysis; 2) regarding the demand side: to construct the matrix of own- and cross price elasticities for a number of food and/or non-food commodity groups; and a vector of income elasticities of demand for the same commodity groups[18]; 3) regarding the supply side: construct/estimate a system of output supply and input demand functions which are derived from a profit function; 4) impose market closure conditions for each of the goods. The final step is then represented by simulations of the impact of several alternative policies and events on food prices; real household incomes, income distribution, crop productions and a number of other important economic variables. Sensitivity analysis may be required because results could be highly sensitive to data used in the model.

Using multi market models, it is possible to study the impact of price, income and technology polices concerning selected markets and agents and evaluate the effects of these policies on production, factor use, prices, consumption, income and balance of trade. Thus they are useful when the policies are relevant for the sector analysed and when policy impacts have to be assessed at a quite disaggregated level.

Needs in Human Resources

In order to simulate the alternative policy measures and evaluate their impact using this approach, it is necessary to set up a team comprising:

- an economist with know-how in economic modelling of consumption and production systems. Econometric and analytical skills for the estimation of the

[16] Multi market models fall into the category of partial equilibrium models. In fact, we can refer also at 'limited equilibrium models' or 'multi-market partial equilibrium models'. For a general presentation of multi-market models, see André Croppenstedt, Lorenzo Giovanni Bellú, Fabrizio Bresciani and Stefania DiGiuseppe (2007). Agricultural Policy Impact Analysis with Multi-Market Models: A Primer. ESA Working Paper No. 07-26 June 2007 FAO UN - Rome

[17] See for detail Arulpragasam and Conway (2003).

[18] These elasticities measure the percentage change in the consumption due to a assign percentage change in the price of any commodity, a change in income (or total consumption expenditure), or both.

demand and supply equations of the model are also required in case the model's parameters have to be estimated. In that instance, coefficients and elasticities are taken from other studies, econometric skills are not strictly required;

- A statistician with knowledge of one or more statistical applications for data managing and equation solving and econometric estimation (like GAMS, STATA, EViews etc)
- Expert contributors with know-how in sectoral or sub-sectoral production technologies.

Data Needs

Data for the specification of demand and supply equations is required. This includes data about quantities and prices during one period for the calibration of the model. Data about elasticities of different agents and consumption and income distribution across households is also needed.

Time Needs

Time requirements depend on data availability, on the number of markets and agents considered and on the complexity of the specification of the equations of the model. The implementation of a fairly complex MMM may require several months.

Table 4. Some applications of multi-market partial equilibrium models.

Author/year/Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Quinzon J. et Binswanger, H. (1986) Modelling the impact of agricultural growth and government policy on income distribution in India	India	Four endogenous agricultural products (rice, wheat, other cereals and other agricultural produce), labour, animal draught and fertilisers. Eight types of households. Policy variables influence the endogenous demand and supply.	Impacts of the green revolution and of public investments on the different social classes a) impacts of technological improvements; b) impact of the trade liberalisation.	The technological improvements without 'exports opening' benefits the rural poor as well as the urban poor but they hurt large farmers. With the exports opening, the urban poor are very much damaged by the increase in the level of prices.
Bravermann A. et Hammer J. (1986). Multi-market analysis of agricultural pricing policies in Senegal	Senegal	Five endogenous agricultural products (groundnuts, cotton, rice, millet, maize), labour, land and fertilizers. Four regions. All the equations are made linear by expressing all the variables as percentage variations.	Impacts of the reduction of the public deficit by means of a reduction of the support to the price for the groundnut producers.	The benefits for the public budget generated by reduction of the groundnut subsidy are partially offset by the increase of the subsidies on cotton exports due to the substitution of groundnut with cotton production.
Minot N, F. Goletti (2000) Rice Market Liberalisation and Poverty in Vietnam	Vietnam	Four products: rice, maize, sweet potatoes and cassava in seven regions for the analysis of the impact of policies according to the specific vocation of each region. The supply is modelled using a double logarithmic function and the demand using a linear approximation of the "Almost Ideal Demand System" .	The impacts of the liberalisation of the rice market on the revenues of small farmers and on their food security.	A policy for the liberalisation of exports should be gradually introduced by replacement of quotas with taxes on exports, which generates income to be distributed to the target groups of poorer people.
FAO-TCAS (2006) Expansión Futura de la Soja: 2005-2014. Implicaciones para la Seguridad Alimentaria, el Desarrollo Rural Sostenible y las Políticas Agrícolas de los Países del MERCOSUR y Bolivia	Mercosurand Bolivia	Global dynamic partial equilibrium analysis using AGLINK-COSIMO model. It considers 18 agricultural commodities and 115 countries.	Projections about the expansion and increase in the production of soybean and the resulting impact in terms of food security, rural development and agricultural policies.	The expansion of soybean production has positive effects on agricultural development, increasing employment and trade opportunity. These benefits are not equally distributed and soybean production can hurt rural small farmers increasing their vulnerability.

Author/year/Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Siam, G. M. (2006) An Assessment of the Impact of Increasing Wheat self sufficiency and promoting cash transfers subsidies for consumers in Egypt: a Multi Market Model Approach ESA working paper 06-03	Egypt	Five products: wheat, rice, maize, livestock and berseem. Two agricultural inputs. Four types of households categorised by level of living standard: poor and non-poor urban or rural. The model consists of six blocks of equations: prices, supply, input demand, consumption block, and income block and equilibrium condition.	The impact of increased self-sufficiency in wheat and a switch to a cash-transfer subsidy on cropping patterns, food consumption, production, input use and income.	A policy based on an increase in self-sufficiency in wheat reduces reliance on imports but adversely affects livestock. This is caused by the fact that rice-wheat rotation becomes more profitable thus reducing the cultivation of barseem which is the main livestock input. A move to a cash (instead of an in-kind) transfer subsidy system improves targeting of the poor and eliminates distortions on the consumption side. Moreover, the cash subsidy represents an incremental income for poor households which is distributed among commodities according to household preferences. Therefore, greater efficiency is realised on the consumption side.
Sayaka, B., Sumaryanto, Croppenstedt, A., Di Giuseppe, S. (2007) An Assessment of the Impact of Rice Tariff Policy in Indonesia: a Multi Market Model Approach ESA working paper 07-18	Indonesia	Seven products: rice, maize, soybean, cassava, banana, wheat and livestock. Three agricultural inputs. Nine types of households classified by level of living standard, urban/rural and off-on Java. The model consists of six blocks of equations: prices, supply, input demand, consumption block, income block and equilibrium condition.	The impact of a hypothetical change in rice tariff on household welfare	A reduction in the rice tariff from 30% to 0% reduces rice supply and wheat demand and stimulates rice demand and soybean supply. Rural households' income decreases but, in terms of purchasing power, all households gain. If, on the other hand, rice tariff increases from 30% to 50%, it eliminates rice imports, reduces soybean output and stimulates wheat demand. Rural households see incomes rise although the effect is relatively modest. In terms of purchasing power, households are all worse off.

7.4. The Social Accounting Matrix (SAM) and SAM-based multipliers

Technical Characteristics

The SAM is a macroeconomic accounting framework based on the national accounts. It embodies some of its macro-economic balances, such as the balance between savings and investment, income and consumption etc. It represents a country's national accounts as a compact square matrix (figure 12). This is a widely used tool in policy analysis, because it allows for analysis of the structural interdependences at the macro and meso level and inter-sectoral linkages within an economic system[19].

Figure 12. Structure of a Social Accounting Matrix

			Goods and services	Activities	Factors		Resident Institutions			Capital accum.	Rest of the world	Total
					Labour	*Capital*	*Households*	*Firms*	*Public sector*			
			(1)	(2)	(3)			(4)		(5)	(6)	
Goods and services	(1)		Trade and transport margins	Intermediate consumption			Final consumpt. of households		Final consumpt. of the public sector	Investment and Increases of stocks	Exports	Demand of goods and services
Activities	(2)		Domestic production						Subsidies to production			Inflows of activities
Factors	(3)	*Labour*		Wages and Salaries							labour income from ROW	Labour incomes
		Capital		Earnings before taxes (EBT)								Capital incomes
Resident Institutions		*Households*			Wages and Salaries		Intra-household transfers	Distributed profits	Transfers to households		Transferts from ROW	Households incomes
	(4)	*Firms*				Earnings Before Taxes (EBT)					Transferts from ROW	Firms incomes
		Public sector	Taxes on goods and services	Security charges and taxes on activities			Taxes and social security	Taxes	Transfers within the PS	Budget deficit	Transferts from ROW	Public sector income
Capital Accumulation	(5)		Decreases of stocks	Depreciation of capital assets			Savings of households	Savings of firms	Budget surplus		Deficit of the balance of payments	Total savings (financial resources)
Rest of the world	(6)		Imports		Remuneration of foreign labour		Transfers to ROW	Transfers to ROW	Transfers to ROW	Surplus of the balance of payments		Total Outlays to ROW
Total			Supply of goods and services	Domestic production	Payments for labour	Payments for capital services	Households expenditure	Use of EBT	Public expenditure	Total investment	Payments of ROW	

While single and multi-market models, as seen in the previous sections, are instruments for conducting partial equilibrium analyses, a SAM allows the analyst to work in a general equilibrium context. In the SAM, all the possible transactions between sectors of activities (e.g. agriculture, livestock, fishing, forestry, food processing, manufacturing, industrial production, mining etc); commodities (food products, textile, manufactured goods, industrial products, transport and social services etc) and

[19] For a comprehensive presentation of the Social Accounting Matrix, its structure and its use for policy simulations, see Bellù (2009)

institutions (different types of households, types of companies and government) in one country are represented in an equilibrium framework, i.e. for each account, the total income must be equal to the total expenditure.

This tool helps with the representation of several possible interactions between different parts of the economy and captures direct and indirect effects of exogenous shocks. It is also possible to construct SAMs at different geographical levels, such as regional or village ones.

Before conducting a policy impact analysis using SAM, it is necessary to derive SAM-based multipliers. To this end, SAM's accounts are re-organised dividing them into endogenous (those which are mutually interrelated and are subject to receiving the influence of external shocks and policy measures) and exogenous (those from which external shocks are generated). Choosing between a different combination of endogenous and exogenous accounts influences the general meaning of multipliers derived from the SAM and implies different theoretical models underlying the construction of the matrix. In fact, the distinction pertains to the choice of a particular 'closing rule' of the model based on the SAM.

The choice of endogenous accounts usually relates to the accounts of Production Activities, Factors and Private Institutions (Households and Companies). Exogenous accounts which are then considered are those of the Government, the Rest of the World and the Savings-Investment account. This particular distinction relates to the adoption of a Keynesian approach in which the final demand for consumption[20] depends linearly on the level of disposable income of the private institutions. The demand from private institutions is then determined inside the model, while the demand from government and for exports is considered exogenous and thus, determined outside the model.

After reorganising the SAM into endogenous and exogenous accounts, it is possible to compute SAM-based multipliers, e.g. coefficients which show the average impact of an exogenous injection of additional income on one or more endogenous accounts. These coefficients will be then used to assess the impact of income injections generated by specific policy measures. For example, they can be used to assess the impact on rural farm households' income of the introduction of expansionary policies for a specific agricultural sector.

In addition, SAMs represent a basis for modelling because they are used to construct and calibrate Computable General Equilibrium models (CGE).

Implicit in the construction of a SAM starting from national accounts and from the computation of SAM-based multipliers, is the hypothesis that relative prices do not change after the shock. That is why they are referred to as "fixed-price" accounting multipliers. The "fixed-price" hypothesis is also a major drawback of the SAM approach for policy impact analysis. It allows for analysis only of policies which introduce small changes into the socio-economic system, as prices are not adjusted

[20] The final demand is defined as the sum of consumption, investments, public expenditure and exports.

when changes are introduced into the economic system. For a general presentation of a SAM and how to use it as a tool for policy impact analysis, see for example: Pyatt, G., J. Round (eds.) (1985) and Pyatt, G. and E. Thorbecke (1976)

Needs in Human Resources

In order to simulate policy impacts using this approach, it is necessary to set up a team comprising:

- an economist with specific know-how of accounting rules of national accounts, macro-economic balances, calculation of multipliers and interpretation of results.
- A statistician with extensive knowledge of national accounts systems to build, adapt or update the SAM;
- Experts in specific areas (e.g. production technologies, household income generation and consumption) whenever the SAM has to be disaggregated to highlight impacts on specific productive sectors or different household groups.

Data Needs

To implement policy simulations based on SAM, the analyst must dispose of a possibly recent SAM of the socio-economic system under investigation. If the SAM has to be heavily adapted/updated or it has to be built from scratch, a large amount of data is required.

To compile a SAM it is necessary to use data at the macro and micro level and use information about the relative share of each single sector on the total production of the economy. It is necessary to reconcile different sources of data that are not always mutually consistent. The amount of data required also varies depending on the level of dis-aggregation of the accounts.

Time Needs

If a SAM with the appropriate level of dis-aggregation already exists, the simulations of policy impacts by the means of multipliers are relatively easy. Otherwise, the construction or a substantial adaptation/update of a SAM can be very time consuming (up to several months).

Figure 13:SAM multipliers approach: a summary assessment

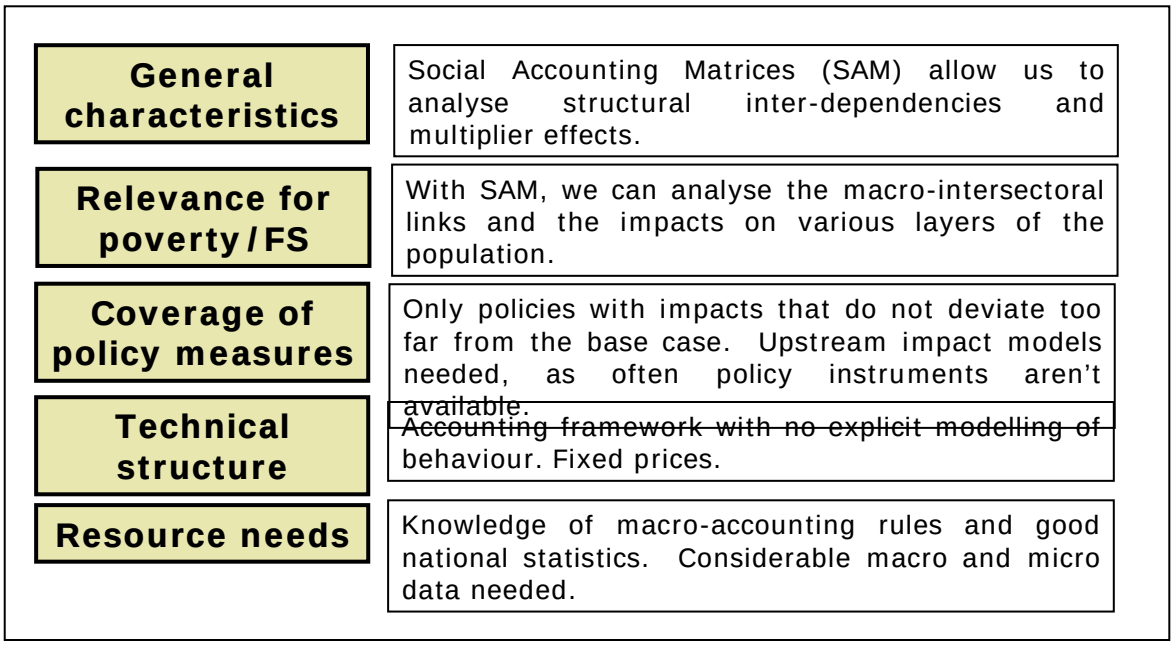


Table 5. Some applications of impact analysis with social accounting matrices

Author/year/Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Thorbecke, E., Jung, H.S. (1996) A multiplier decomposition method to analyze poverty alleviation	Indonesia	A new decomposition of SAM-based multipliers with a focus on poverty alleviation.	Derive multipliers and decompose them for an analysis on poverty alleviation to show direct and indirect effects of a sector output growth.	Agricultural and service sectors contribute more to overall poverty alleviation than industrial sectors. The direct linkages depend on the factor endowment of the poor household groups and the prevailing technology in the different production sectors.
Taylor, J. E. and A. Yunez-Naude in Davis, B.,T. Reardon, G. K. Stamoulis, Winters, P. (eds) (2002) Promoting farm/non-farm linkages for rural development Case Studies fro Africa and Latin America, FAO	Mexico	A village-town SAM is constructed for five villages of medium and small farmers and for a "mini-region" or municipality in rural Mexico. As a village SAM, the rest-of-the-world sub-accounts do not necessarily balance. Another departure from a standard SAM framework is that non-monetary transactions are typically important. Simulations are conducted using three scenarios.	Study of the linkages between the farm and the non-farm sectors at the village level. In particular, the village-SAM provides the instrument to compute how exogenous impacts are transmitted from farm to non-farm households.	Results shown three important findings in terms of farm/non-farm linkages: 1) The size of village and village/town income multipliers is potentially large and sensitive to village economic structure. 2) Farm/non-farm demand linkages are important, even if the majority of these links are with markets outside the village e.g. in regional towns.. 3) Estimated farm/non-farm linkages from rural income changes depend critically on the supply response of agriculture and on model specification, and on its degree of elasticity to price changes.
Roland-Holst, D. And F. Tarp (2003) Globalisation, Economic Reform, and Structural Price Transmission: SAM Decomposition Techniques with an empirical application to Vietnam	Vietnam	Block and the path decomposition of multipliers matrices[21] derived from the SAM to disaggregate the economy-wide price transmission effect generated by the globalisation process. The methodology allows a derivation of a 'price' multiplier matrix indicating the effects of exogenous change in external cost on prices of endogenous activities.	The decomposition of the impact of a unitary increase in the exogenous commodity or production cost induced by globalisation process and the induced effects on producer, factor, and consumer price indexes.	The methodology helps distinguish the extent of price transmission effects, explained by inter-industry linkages; the consumption expenditures of households, factor prices and identifying what sectors are more cost responsive to price changes taking place elsewhere in the economy. Results show that not all sectors are equally responsive in magnitude and scope. Their identification can then inform how policies, such as changes in tax rates, could be designed to minimize undesirable welfare distortions.
Roland-Holst, D., Otte, J. (2006) Livestock and Livelihoods: Development Goals and Indicators applied to Senegal AGAL-PPLPI Research Report	Senegal	Path decomposition[22] analysis using SAM-based multipliers derived from a SAM for Senegal	Evaluate the linkages between livestock and livelihoods and evaluate the impact of targeted policies for poverty alleviation.	Structural path decomposition using multipliers permits the showing of linkages between market supply and income of rural households. Livestock appear to be a valid pro-poor policy instrument because the marginal effects of increasing its supply will benefit rural poor households.

[21] Block decomposition refers to the traditional decomposition methodology first applied by Pyatt-Round (1985) pertaining that the SAM-multiplier matrix can be divided into three components which evaluate, respectively; the transfer, the open-loop and the closed-loop effects of an exogenous injection of income on endogenous account. See, for details, Pyatt-Round (1985) in the references at the end of this document. Alternatively, path decomposition refers to a methodology put forth by Defourny and Thorbecke (1984) that permits showing all the paths through which adjustments occur.

[22] For definition of path decomposition, see the previous footnote.

7.5. Computable General Equilibrium models (CGE)

Technical Characteristics

Computable General Equilibrium Models (CGE) give a wide representation of the economic relations among the different components of an economic system.

They allow for working in a macro coherent context, with flexible prices and quantities, considering the behavioural aspects of economic agents.

From a mathematical point of view, a CGE consists of a system of simultaneous equations describing the behaviour of agents, modelled by means of supply and demand equations; income generation of different agents (households, government and enterprises); and macroeconomic aggregates and balances, such as the government account, investments and savings and the balance of payments.

CGE models are suitable for evaluating the impact of a wide range of policy measures, such as changes in taxes and public expenditure; international trade policies; or exogenous shocks, such as changes in the international terms of trade or changes in the exchange rate etc. Also, changes in the economic and social structure of the economy, such as technology shifts or changes in consumers' tastes and behaviour.

CGEs can be used for a variety of purposes like the impact of policies on poverty and income distribution, other social welfare analyses, environmental impacts, natural resource uses etc.

Depending on the purpose of the analysis, CGE models can be static, i.e. not comprising time as a variable of the model, or dynamic, i.e. explicitly considering time and time-related adjustments, which helps to better analyise the effects of a shock within a given time span. These latter models are particularly suitable for analysing impacts of investment policies on growth and the related dynamics of income distribution.

One of the possible weaknesses of the CGE models is that they can only handle situations in which it is possible and relatively easy to reach an "equilibrium"; i.e. to find a vector of prices that "clear" all the markets while satisfying all the macro-economic constraints ("Closures") . This is because CGE models are solved "numerically", i.e. by programmes that work out solutions iteratively, whose performances depend also on the "shape" of the functions adopted. That is why modellers often rely on "well-behaved" functional forms, i.e. functions which give rise to downward sloping demand curves and infinitely elastic (or upward sloping) supply curves, with some sacrifice of adherence to the reality.

Needs in Human Resources

In order to simulate the impacts of policy measures using this approach, it is necessary to set up a team comprising:

- an economist with a knowledge of quantitative modelling and specific expertise in general equilibrium models;

- Specific know-how in different economic sectors according to the focus of the analysis;
- Knowledge of the software for the solution of simultaneous equations systems (for example, GAMS, but also the MS Excel solvers).
- Statistical expertise to gather appropriate micro and macro economic information.

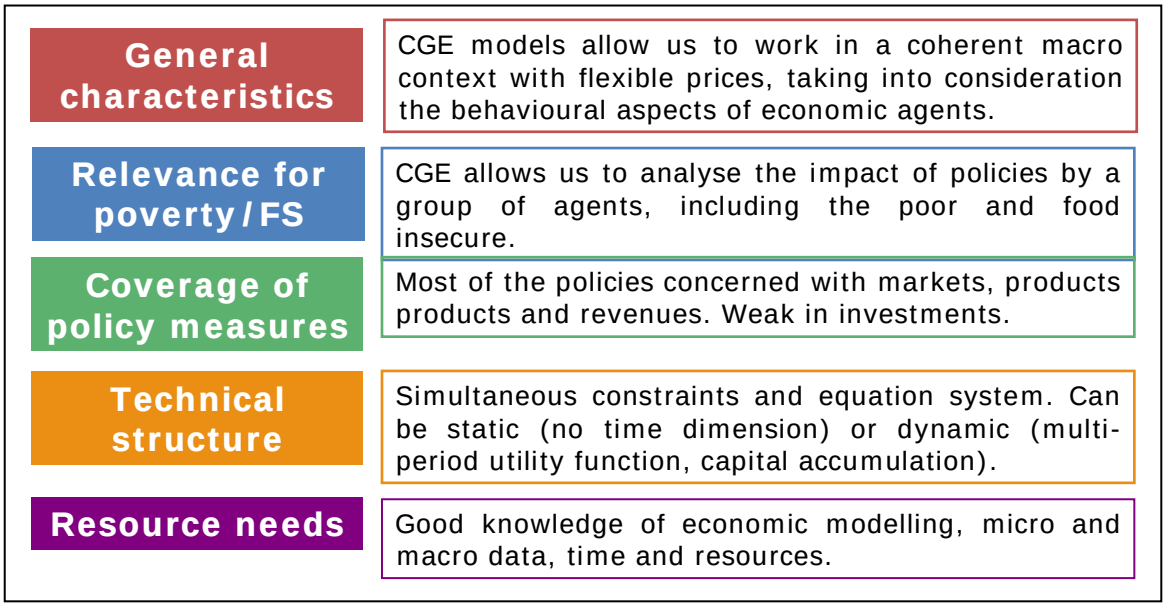
Data Requirements

In order to perform simulations using CGE models, it is necessary to dispose of a reference SAM of the country/countries which have been analysed that is useful in calibrating the model. If other information about parameters and elasticises is not available for the specific country under consideration, it is necessary to use it for the literature on the topic.

Time Needs

Building a CGE can be very time consuming, say up to a year. The time in constructing a CGE model can be reduced if a suitable SAM is already available. Also the availability of a pre-existing model can be very useful as the new model can be implemented adapting the existing one. Also a "standard" CGE, i.e. a general framework to be adapted to specific countries, can be useful to make the whole exercise ready for implementation in few months. This is the case, for example, of the "Standard Computable General Equilibrium Model" developed by IFPRI[23].

Figure 14. Computable General Equilibrium Models: An assessment



[23] A Standard Computable General Equilibrium (CGE) Model in GAMS, MICROCOMPUTERS IN POLICY RESEARCH n.5 IFPRI, Washington D.C.

Table 6. Some applications of computable general equilibrium models.

Author/year/Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Devarajan et al (1999) Quantifying the fiscal effects of trade reforms: a general equilibrium model estimated for 60 countries	60 countries	1(one country)-2 (two activities)-3 (three goods) general equilibrium model. The model separates goods into exports, imports and non-tradable goods.	Estimating the fiscal and welfare impacts of trade reforms in terms of public revenues.	Results depend on the level of elasticities of substitution and transformation. In any case, revenues decline from tariff reform.
Davis, B.,T. Reardon, G. K. Stamoulis, Winters, P.(2002) Promoting farm/non-farm linkages for rural development Case Studies from Africa and Latin America, FAO	Mexico	A village/town CGE model centred on a household farm. Five blocks of equations for each of the village and town economies, linked by commodity and factor markets: a household-farm production block, a household-farm income block, an expenditure block, a set of general equilibrium closure equations and a price block.	The impacts of exogenous income changes on the economy of the mini-region.	Technological changes that increase agricultural productivity generate important real-income linkages in rural farm and non-farm economies. Even though households do not benefit directly from these supply increases, their total incomes rise substantially.
Scandizzo, L. S. (2002) A General Equilibrium Analysis of Ownership, Property Rights and Control in a Transition Economy ESA wp	Slovakia	A series of general (dis-)equilibrium models, where both property rights and the rules of the game may be changed to reflect transition progress. The rules are: (i) product rationing and price controls as in most transition (planned) economies; (ii) "Stackelberg" equilibria[24] with sector or institutional leadership, (iii) "Nash equilibria[25]" under non co-operative conditions.	Evaluating the effects of a change of property rights, redistribution and addressing some questions about agricultural transition not captured by a standard CGE framework.	The main policy implications of simulations are: 1) Market inefficiencies due to implicit taxes and subsidies to producers are suboptimal because they generate high factor rents, unemployment and consumer losses; 2)Controlling consumer prices and upholding minimum standard for food consumption has beneficial effects because of the link with agricultural and food sector; 3) The priority should be the removal of rents and monopolistic behaviour and 4) Privatisation also shown to be necessary. For the Slovak republic, the results give support to the fact that institutional reforms may be more important for progress than the technological achievements.

[24] The Stackelberg model describes a structure of an imperfect competitive (duopoly/oligopoly) market in which the players (firms, consumers, etc) play strategically and in which the leader moves first and then the follower move sequentially competiting on quantity. Each player is then characterized by a reaction function explaining the optimal behaviour in response to the other player's behaviour. The solution to the Stackelberg model is then represented by the Nash Equilibrium e.g. the strategy profile that serves best each player, given the strategies of the other player.

[25] See note #20.

Author/year/Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
FAO, Commodities and Trade Commission: Impact of trade liberalisation on the world sugar market. Paper prepared by the Economic Research Service (ERS) of USDA	13 countries	Computable General Equilibrium (CGE) framework that includes a majority of the sugar producing and trading countries. 13-region, 13-sector Social Accounting Matrix (SAM) estimated for 1992 based on the Global Trade Analysis Project (GTAP) database. 4 sets of counterfactual experiments.	Quantify the effects of the trade liberalisation agreements negotiated under the Uruguay Round on sugar production, consumption, trade, and prices of the major sugar exporting and importing countries. Effects between countries and inter-sectoral effects among different sectors, including non-agricultural, or industrial and service sectors.	The trade liberalisation of the Uruguay Round will expand global trade and welfare of society would increase in all regions or countries, except China. Developing countries' gains are large relative to the size of their economies.
Fontana, M. (2003) Modelling Effects of Trade on Women, at work and at home: a Comparative Perspective	Bangladesh and Zambia	Gender-based CGE analysis based on a gendered SAM. Comparison of results with other approaches.	The impact on women's current material status and whether trade policies and outcomes contribute to more egalitarian gender relations modifying the gender division of labour in the labour market or in the household.	Differences in resource endowments, labour market institutions and socio-cultural norms shape the way in which trade expansion affects gender inequalities, resulting in more favourable effects in Bangladesh than in Zambia. SAM/CGE approach appears to be more effective than others in answering these research questions.
Bellù, L. G. (2009a) Burkina Faso: International price shocks and good agricultural practices: A CGE approach (forthcoming) EASYPol series, TCAS, FAO, Rome	Burkina Faso	General Equilibrium model with several sectors . Small country case open to international trade (exogenous international prices). Various labour market (and other factors) closures.	Extent to which international price shocks: notably energy, fertilisers, food price increases and cotton price decline between 2003 and 2008 affected poverty and welfare in the country. Extent to which the adoption of Good Agricultural Practices (GAP – Conservation Agriculture) countervail or mitigate price shocks.	Energy price increases affect welfare more than any other price change. Overall price shocks amount to around 2% loss of GDP per annum over five years. The adoption of GAP technologies only mitigates these negative impacts. Nevertheless, GAP has interesting re-distributive impacts from non-poor towards poor layers of the population.

7.6. Integrated macro-micro approaches

Technical Characteristics

These models allow for working in a coherent macro and flexible prices context, also integrating information from the micro (household/individual) level (e.g. information from a Living Standards Measurement Survey – LSMS). These models represent a quite comprehensive framework for analysing policy impacts. In actual fact, they allow for taking into account direct (first order) and indirect effects induced by a change in the reference policy benchmark. Taking into consideration effects also at the micro level, they are particularly suitable for the analysis of policy impacts on poverty and income distribution.

There are different ways in which macro and micro models can be integrated. One possible approach implies the use of a CGE model together with another model that links changes at the macro level to changes of variables at the micro level (e.g. household income). Depending on the specification of the micro model and the way of modelling the household sector, it is possible to distinguish between three main alternatives: 1) CGEs with Representative Households Groups (RHG) with direct transfer of CGE results at micro level; 2) CGE directly embodying full household information; and 3) CGEs with Representative Households Groups (RHG) and with "Micro-simulation model".

The first approach, based on the construction of a CGE with RHG uses data from household surveys to place households into different groups with homogenous characteristics. These RHGs are then inserted directly into the CGE module. Up to this level, the approach is the same as in the CGE described in the previous section. However, as a follow-up to the solution of the CGE, changes in the main variables resulting from the CGE and pertaining to specific household groups, are directly transferred at micro-level, associating changes in relevant variables (e.g. wages, incomes and/or prices) to all of the observations belonging to a given group. For example, if, according to the CGE, a given policy measure results in a 10% income increase for the RHG "poor rural households", in the household database the income of all the households classified as "poor rural" will be increased by 10%, in order to generate the new income distribution.

The principal shortcoming of this approach is that it does not consider the heterogeneity within the same group of households, so that the simulated change in the income distribution for each group captures only the shift in the "between-groups" component of inequality without considering any change in the within-group component.

The second approach integrates all the household level information directly into the CGE, without making use of RHGs[26]. It makes use of the full household information to directly simulate changes in the distribution of household income or expenditure with

[26] This category of macro-micro models, in actual fact makes use of all the RHGs available in the household survey database. In a household survey each sampled household represents a given number of real households, as reflected by the associated sample weight.

the CGE, without using any specification for the 'within' or the 'between-group' component of inequality. The difficulties of this approach are mainly in the identification of all the relevant elasticities correctly describing the behaviour of all the households involved[27]. .

The third approach makes use of both an RHG-based CGE model and, in sequence, a "micro-simulation model" which is fed, along with other factors, to create the results of the CGE model (Bourguignon et al, 2003). The CGE side of this approach is identical to the CGE approach described in the previous section and also the first approach. The "micro-simulation model" consists of a "household income generating model", i.e. a set of equations describing how income is generated by each household. This model allows: 1) attributing to each individual wage earner in the database a given wage level; determined on the basis of his/her socio-economic characteristics e.g. age, education, gender etc; 2) attributing to each household (or possibly, individual, depending on the structure of data) whose members carry out an entrepreneurial or self-employment activity a given level of earnings, determined on the basis of the household's features, including the number of its members; 3) attributing to each individual a "model of occupational choice", i.e. a model determining her/his working status (e.g. whether s/he is a waged worker, self-employed or inactive).
Most parameters of the micro-simulation model are estimated using econometric techniques of information contained in the household database. The others are "calibrated" on the database (i.e. determined in such a way that the micro-simulation model replicates the "benchmark" values for individual wages (w), total self-employment earnings (I) and occupational choices, specifically, number of wage workers (E) and number of self-employed (S). This is done by adjustment. In addition, the SAM is set in such a way that the total of wages per labour group, and the total of self-employment earnings correspond to the totals of the same variables in the survey.

Thanks to the calibration procedure of the CGE and to the consistency between the SAM and the household level data, the solution of the CGE model at benchmark level provides the construction of the same values of w, I, E and S which have been used to calibrate the micro-simulation model. This ensures full consistency between the CGE and the micro-simulation model.

When the CGE is 'shocked' for a policy simulation, it produces a new set of values for w, I, E and S. These new values are then used to "re-calibrate" the micro-simulation model[28], in order to ensure its consistency with the new set of values for the macro-variables above.

Once this calibration is done, the micro-simulation model is used to generate a new income/expenditure distribution (based on modified occupational choices) from which the analyst can calculate new poverty, inequality and/or food security indicators to assess the socio-economic impacts of the policy measure under investigation.

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[27] For a discussion on full integration of household level data into CGEs and related attempts, see e.g. Cogneau and Robillard (2001).

[28] This is done by adjusting the constants of the equations in the micro-simulation model.

The approach described above follows a macro-micro sequential "Top-Down" path: changes in macro-variables generated at the macro level by the simulation of a policy measure are used to feed the micro model with a new set of values for these variables[29]. As the sequence stops here, this approach does not account for effects that from the micro side could be transmitted back into the macro model. This aspect is considered by the so-called "Top-down - Bottom-up" approach. For a description of this approach see Savard (2003) [30].

Needs in Human Resources

In order to simulate policy impacts using this approach, it is necessary to set up a team comprising:

- An economist with knowledge of quantitative modelling and specific expertise in general equilibrium analysis, including a level of skill in using the software for the writing and solving of systems of equations (for example, GAMS, GAMS-MPSGE, Mathematica or other software);
- A statistician and/or econometrician, to deal with the organisation and treatment of required micro-level data; including econometric estimations of the micro-simulation model.
- Specific know-how in the technical issues which the policy measures focus on (e.g. knowledge of specific production sectors, fiscal systems, international trade issues etc); and
- Knowledge of relevant socio-economic issues under investigation (e.g. income re-distribution, poverty alleviation, food security).

Data Needs

The construction of macro-micro models for policy analysis requires a large amount of data. As for the CGE models, they require the availability of national accounts data, possibly already in a SAM format, information about supply and demand elasticities, and other elasticities such as the elasticities of substitution (transformation) between imported (exported) and domestic goods. They also require household-level data from household surveys.

Time Needs

The design and implementation of these models is very time consuming (up to six months). However, the time requirements for constructing a CGE-micro-simulation model vary a lot depending on the availability of an existing CGE model and the quality of household-level data.

[29] Recall that the micro side can be represented alternatively by a micro-accounting model, like those presented in the first section of the current module, or by (behavioural) micro-simulation models.

[30] For a more comprehensive and detailed classification and description of macro-micro approaches see e.g. Boccanfuso et al. (2007).

Figure 15: Integrated Macro-micro approaches: An assessment

General characteristics	It merges the features of CGE models and micro-accounting frameworks, working in a coherent macro context with flexible prices, considering also the behavioural aspects of economic agents.
Relevance for poverty / FS	Allows working with full income and expenditure distributions, thus calculating relevant indicators for poverty and food security.
Coverage of policy measures	Most of the policies concerned with markets, products products and income generation and expenditure.
Technical structure	Sequential use of Computable General Equilibrium models and micro-econometric modelling.
Resource needs	Very good knowledge of economic modelling, micro-econometrics, micro and macro data. Non-negligible investment in time and financial resources.

Table 7. Some applications of integrated macro-micro approaches.

Author/year/Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Bourguignon et al (2003) Representative versus Real households in the macroeconomic modelling of inequality	Indonesia	Comparative analysis of CGE with representative households and a "top-down" macro-micro CGE with micro simulation model. Comparisons use kernel density analysis[31].	The model captures the effects of a change in the foreign trade balance on "within group" inequality. The study compares these results adopting a "representative households" approach.	Micro-simulation and representative household group (RHG) approaches may lead to quite different estimates of the distributional effects of macroeconomic shocks and policy changes even taking into account the variation. The micro-simulation approach points to a strongly un-equalising effect of a devaluation due to a reduction in foreign savings, whereas the RHG approach predicts a slight improvement in the distribution of real household income.
Cogneau, D. and A.S. Robilliard (2004) Poverty Alleviation Policies in Madagascar: a Micro-Macro Simulation Model	Madagascar	A static micro-simulation model is used to estimate a labour income model and parameters of the occupational choice. The macro part is represented by a standard Walrasian[32] CGE model.	The model simulates the effects of targeted transfer schemes on poverty alleviation. In particular, three large-scale transfer schemes are simulated: (i) a price subsidy to agricultural producers, (ii) part-time job opportunities paid around the minimum wage and (iii) a uniform unconditional and untargeted transfer provided to each individual.	The introduction of all the transfer schemes increases agricultural prices. They direct the demand toward agricultural goods. At the same time, macro-economic results show a huge cost of all these targeted schemes. The model thus suggests that all the targeted schemes simulated favour poverty alleviation. A complementary module to assess the cost of the introduction of these programs could also help evaluation of the cost of these pro-poor policies.
Vos, R. Et al. (2004) Are export promotion and trade liberalization good for Latin America's poor? : A comparative macro-micro CGE analysis	16 Latin-American countries	Comparative analysis using a CGE for 16 countries in Latin America with a micro simulation model for poverty and inequality analysis	Impacts of trade liberalisation reforms on the overall GDP growth and on poverty and income distribution	Trade liberalisation policies are neither responsible for the GDP slowdown in the region nor for the rise in poverty and inequality. Overall, the impact of trade reforms is positive but small. So they do not appear to be the solution for all the economic problems in the Latin American region.

[31] Kernel density analysis refers to a statistical methodology to derive and estimate the probability density function of a random variable in a non-parametric way, i.e. without presupposing for that variable a specific known probability function based on some parameters (e.g. the mean and variance for the normal distribution). Kernel density is often used to represent the distribution of individual/household income (random variable) of some populations' sample.

[32] A Walrasian CGE (from the name of the economist Leon Walras who formalised the 'general equilibrium' of an economic system), determines only relative prices, i.e. all the prices (product prices, factor prices, the real exchange rate etc) are defined in relation to a price of a specific good or service which plays the role "numeraire" (the yardstick of the prices' system).

Author/year/Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Otte, J., Roland-Holst, D., Kazybayeva, S., Maltsoglou, I. (2005) Integrated Poverty Assessment of Livestock Promotion: The case of Vietnam. AGAL Research Report	Vietnam	Integrated Poverty Assessment of Livestock Promotion (IPALP) using a micro-simulation model for the estimation of labour market's parameters in a dynamic CGE model.	Understanding the role of livestock on poverty alleviation. Impacts of an economy-wide trade liberalisation with and without a concomitant livestock promotion.	Trade liberalisation with a simultaneous livestock promotion has higher and positive impacts on poverty reduction and plays an important role in offsetting the adjustment costs.
Molinas, J. R. and Cabello, C. (2006) The Role of Agriculture in the reduction of poverty in Paraguay. FAO-ESA working paper	Paraguay	Static CGE model associated with a micro-simulation model of the labour market. Closure rules allow unemployment and labour mobility among sectors. Six types of policies simulated, related in particular to trade policy, monetary policy, and change in the labour market and production sector (e.g. policy related to activities within the economy). 17 different scenarios.	Impact of policy changes in the following areas: foreign trade, foreign exchange market, labour market, supply and demand, as well as adjustments to exogenous shocks (a 10% rise in import prices, a 10% fall in export prices and a 10% increase in external savings.	Those policies which promote increases in factor productivity, both in general and especially in the primary sector; that lead to prudent exchange rate management, as well as tariff reduction and a possible export subsidy, would succeed in reducing levels of poverty and income inequality. For example, a particularly positive effect for economic growth and poverty reduction appears to come from technical assistance provided to the *campesino* sector.

7.7. Multi-period cost-benefit analysis

Technical Characteristics

Multi-period Cost-Benefit Analysis (CBA) is a method for assessing in monetary terms costs and benefits of a policy change occurring in different time periods. This method is particularly relevant for investment policies, which, by definition, imply incurring large immediate costs (investment costs) with a view to obtaining benefits in the future. Investment therefore, generates a stream of costs and benefits characterised by a time profile.

The net benefits (or net costs) accruing in each period: calculated as the balance between benefits and costs of that period, are not directly comparable with net benefits accruing in other periods because of the presence of a positive "time-value of money"; i.e. with positive interest rates, a given benefit accruing at an earlier stage is worth more than the same benefit accruing later on.

The stream of net benefits therefore needs to be "discounted". "Discounting" means calculating the "present value" of the net benefits accruing in each period, taking into account the "time-value of money", i.e. the interest rate on financial capital.

In the presence of a positive cost of capital, i.e. positive interest rates, "discounting" amounts to give a higher weight to cash flows that will occur sooner and a lower weight to those occurring later. Additionally, other things equalise, the higher the value attributed to the immediate availability of money, i.e. the higher the interest rate, the lower will be the weight attributed to net benefits accruing in the future. In actual fact, the weight to be attributed to the net benefit occurring in different periods is inversely linked to both the interest rate and the distance in the time of accrual.

Interest rates are usually positive for at least two concomitant reasons: 1) Consumers have a "preference for the liquidity" and 2) there is a positive "opportunity cost of capital".
Regarding the first point, people prefer to have the possibility of spending now rather than postponing their consumption of goods and services. If they have to postpone their consumption in order to temporarily shift their purchasing power to other economic agents, e.g. the investors, they will require a premium. This premium is the positive interest they get when they lend money.
Regarding the second point, the presence of investment opportunities that are likely to bring future returns greater than investment cost, implies that investors are willing to pay a premium to consumers to secure the availability of capital for investment. In addition, each investment project "competes" with other investment possibilities in the use of scarce capital. This implies that there is a positive "opportunity cost of capital", in the sense that investing in one project implies giving up other investment alternatives. An investment project, in actual fact, should return money in the future at least at the same rate as its best alternative investment, i.e. the investment opportunity that the investor gives up if he goes ahead with the first project. Consumers' preferences and

investors' expectations generate supply and demand for capital, with the interest rate as the positive "price" to be paid for availability of capital and to be received as compensation for postponed consumption. As a matter of fact, both from the point of view of consumers (savers) and investors, an amount of money received in the future is worth less than the same amount today.

The discounted net benefits accruing in each period (i.e. the present value of each net benefit) are then summed up to calculate the Net Present Value (NPV) of the net benefits.

The NPV is used to assess the economic viability of an investment project or policy or to compare different alternative projects in a "counterfactual" context i.e. to contrast a situation "with" policy change with a situation "without" policy change (the benchmark).

If the "incremental" NPV of an investment project or policy i.e. the change of the NPV with respect to the benchmark is positive, the investment project/policy is considered to have positive economic impacts. Vice-versa if it is negative.

Multi-period CBA has been widely used in the evaluation of projects and interventions related to large industrial or infrastructural policies. Multi-period CBA can also be used to assess policy measures providing investment incentives to small private entrepreneurs. In this case, different types of small-scale investment projects fitting the requirements set by the policy measure are assessed by means of multi-period CBA analysis. The aggregation of incremental NPVs of the different projects, weighted with the likely number of small-scale projects that will be undertaken by private entrepreneurs due to the investment policy, provides an indication of the net benefits generated by the investment incentive policy. Multi period CBA has also been widely used to assess policies presenting environmental implications, which are multi-period by nature. The only 'caveat' is that policies/projects/proposals that can be assessed using CBA are those whose costs and benefits can be clearly identifiable in monetary terms[33].

In order to perform a multi-period CBA for policy impact assessment, the analyst can follow these steps:

1. Set the objective and the underlying assumptions of the analysis;
2. Choose a specific time span for the analysis;
3. Identify relevant costs and benefits associated with the project/policy;
4. Set a benchmark;
5. Assess in monetary terms the costs and benefits (wherever possible) and "incremental" costs and benefits with respect to the benchmark;
6. Choose an appropriate "discount rate";
7. Discount incremental benefits and costs and aggregate them in order to obtain the Incremental Net Present Value (NPV);

[33] For a presentation of the available techniques to provide a monetary assessment of environmental goods see e.g. Markandia, Harou, Bellù and Cistulli (2002).

8. Calculate a series of indicators such as the NPV or other NPV-based indicators, such as the Internal Rate of Return (IRR), Cost/Benefit Ratio (CBR), switching values etc;
9. Assess the risks that may affect costs and benefits and run sensitivity tests;
10. On the basis of previous indicators, identify and choose the best project/policy option (that which has the larger incremental NPV) [34].

Some critical aspects of a multi-period CBA can be identified[35]:

- **The time span of analysis**: It should usually span the economic life of the main investment asset. twenty years is usually taken as the reference time span because after twenty years discounted net benefits at discount rates ranging between 5 and 20% (the most frequently used rates) tend to be quite small. Nevertheless, CBA involving environmental components (e.g. forestry projects) may require a time span of fifty years or more.
- **Measurement of costs and benefits**: sometimes monetary values have to be estimated in the absence of market prices, or market prices need to be adjusted to reflect the actual value of goods or service to the society (so called economic pricing or "shadow" pricing);
- **Choosing a discounting rate**: The discount rate is usually based on: the time-value of money, i.e. the value assigned to the money available now versus the value to be received later with no risk; and the class of risk of the investment project i.e. the likelihood of actually receiving benefits in the future from the investment. There is no agreed discount rate for all of the projects because factors mentioned above change depending on the specific situations. A possible approach is to use the "Weighted Average Cost of Capital" (WACC)[36].

Needs in Human Resources

In order to simulate policy impacts using a multi-period CBA approach, it is necessary to set up a team comprising:

- An economist with a specific knowledge in CBA techniques, including capacities. Specific knowledge of financial issues related to the choice of an appropriate discount rate and capability in using spreadsheets or dedicated CBA software;
- Specific know-how in different economic sectors relating to the focus of the policy measure to be assessed.

Data Needs

Data required for the implementation of a cost-benefit analysis refers to quantities and prices of the investment assets; inputs, factors and outputs required and generated by the investment project(s). Particular care has to be taken to collect and treat information for

[34] For an exhaustive discussion on how to take decisions using NPV, see any manual of corporate finance, e.g. Brealey & Myers, most recent edition.

[35] For details on how to implement a CBA analysis and how to use of the FAO software for multi-period CBA "WinDASI", see Bellu' (2005).

[36] The WACC is equal to a weighted average of the different interest rates to be paid in order to secure funds to finance the investment, where the weights are the shares of the different sources of funding in the total funding needs.

the adjustment of prices in order to make them reflect the actual values to society of the goods or services provided or absorbed by the investment proposal. Information is also required for the choice of a suitable discount rate and the assessment of risks related to the investment. Information in order to set up an appropriate benchmark and assess relevant alternatives to the project also has to be collected.

Time Needs

Time requirements vary according to the specific purpose and scope of the investment project or policy under investigation and according to the type, quality and quantity of data and expertise available. Multi-period CBA, run using appropriate tools such as a multi-period CBA software package, may take from one to several months, according to the complexity of the scenarios with and without investment and the consideration of possible alternative scenarios. Time for validation and fine-tuning, resulting from discussions with relevant stakeholders, has also to be accounted for.

Figure 16. Multi-period Cost benefit Analysis: An assessment

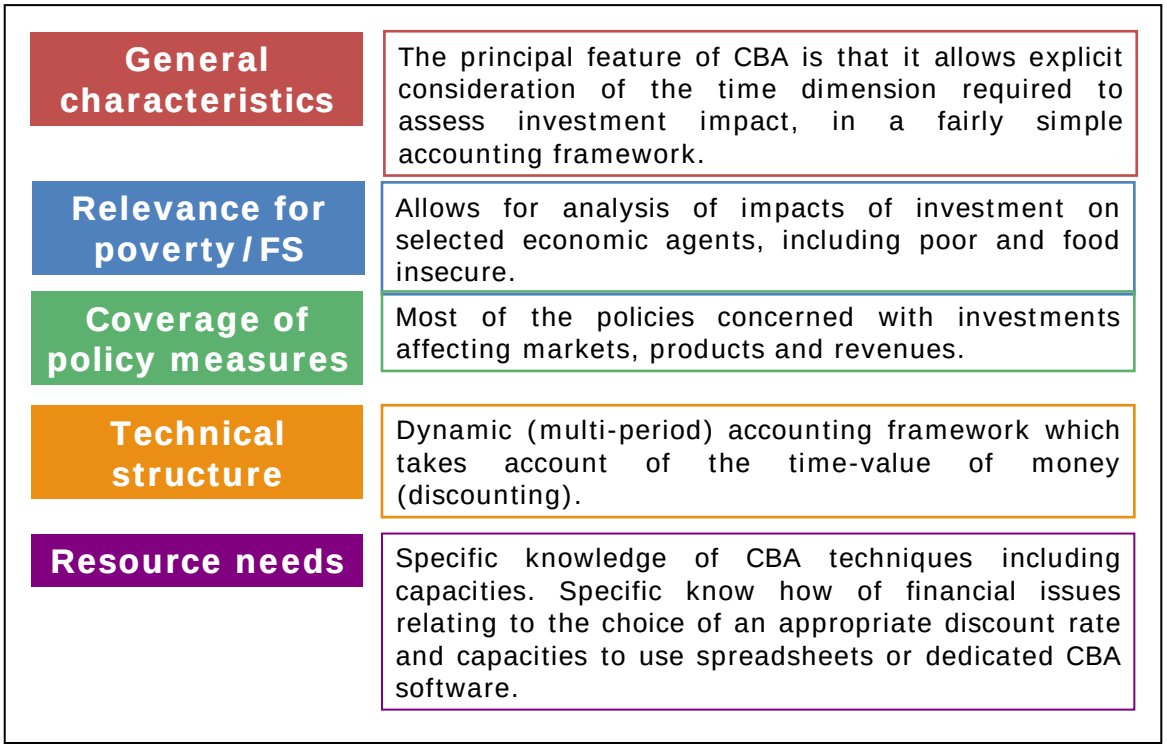

Table 8. Some examples of multi-period cost-benefit analysis

Author/year/ Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Harbison and Hanushek (1992)	Brazil	Cost-Benefit Analysis of the EDURURAL program in Brazil. The analysis assessed the payoffs of key components of the project.	Assess the net benefit of the programme that aimed at improving elementary schools in an impoverished part of the country.	Using estimates of the cost of a student-year of schooling, the study calculates the net benefits in terms of the reduction of repetition of a year and drop out by enhancing students' achievements with more investment in education. Results show that investments to improve schooling conditions in poor northeast Brazil have dramatic payoffs with respect to other rich parts of the country. Investing in writing materials and textbooks, for example, returns as much as $4 on one dollar, while in the most advantaged areas of the country, where grade progression is faster than in northeast Brazil, the returns to similar investments are correspondingly smaller. Investing in educational software, for example, would then return only $0.52 on the dollar.
Aehyung K. and B. Benton (1995) Cost-Benefit Analysis of the Onchocerciasis Control Program (OCP)	West Africa countries	A cost-benefit analysis of Onchocerciasis Control Program (OCP) based on the calculation of net present value (NPV) and economic rate of return (ERR) of the project over two project horizons: 1974-2002 and 1974-2012.	Assess the impacts of the OCP based on the elimination of the onchocerciasis, a major public health problem throughout several West African countries. The programme consists of the control of the blackfly that transmits the parasitic worm, which is the source of the disease.	The costs of OCP are actual expenditures incurred from 1974 through 1993 and projected expenditures from 1994 to 2002 - when OCP is expected to be concluded. The benefits are represented by the additional agricultural output produced as a result of the extra productive labour force and agricultural land made available through the control of onchocerciasis. The two different project horizons are used to examine the sensitivity of the benefits to the length of the project. The Program largely benefits the rural population by improving their health and living environment. In addition, it helps free previously oncho-ridden tracts of land for settlement and cultivation. The ERR of benefits over the 39 years time period is around 20%, and 18% over the shorter 29 years time period.
Van den Berg, C. and Y. Katakura (1999) Winners and Losers in Argentina's Water Utility Reform: an Analytical Economic and Financial Framework	Argentina	The authors use an Integrated Financial and Economic analysis to assess the impact of the programme which consists of: a conventional cost-benefit analysis; reform-orientated cost-benefit analysis (calculation of the incremental costs and benefits related to the reform; an analysis of stakeholders to determine the winners and losers of the program.	The integrated financial and economic analysis aims to determine (i) the overall net benefits from utility reform programs, (ii) the impact of utility reform programs on the different stakeholders, and (iii) whether the proposed reform model will attract private investors.	The cost-benefit analysis confirms that overall benefits from utility reform (partial privatisation) are positive. The *analysis of stakeholders*, however, found that there are "losers" (consumers) and "winners" (the government) from utility reform. Further analysis suggests that the poor are losers, as they face high barriers of entry into the program. The risk analysis shows, that the government will definitely stand to gain from utility reform. Finally, the *business analysis* shows that the proposed draft concession contracts are compatible with investors' expectations. While reform programs are highly beneficial to the economy, a closer look at the distribution of the benefits reveals that different stakeholders do not necessarily share the benefits equally. In particular, the consumers lose from the proposed reform programs.

Author/year/ Title	Country	Characteristics	Focus/ hypotheses to be verified	Some policy implications
Aehyung K. A. Tandon and E. Ruiz-Tiben (1999) Cost-Benefit Analysis The Global Dracunculiasis Eradication Campaign	Country interests in the Global Dracunculiasis Eradication Campaign (GDEC) programme (African countries plus Pakistan, India and Yemen)	Cost benefit analysis of the Global Dracunculiasis Eradication Campaign (GDEC)	As part of the CBA framework, expenditures on GDEC activities are compared with the economic benefit resulting from the campaign. In particular, spending on the campaign is compared with estimates of increased agricultural production due to reductions in infection-related morbidity as a result of the program using a project horizon of 1987-98.	Dracunculiasis disease usually results in some degree of work time lost. As a result of GDEC, this loss in productive potential is prevented. The additional output produced represents the benefits of the campaign. Based upon this methodology, we determine that the economic returns of GDEC are sensitive to assumptions regarding the average degree of economic incapacitation, in terms of percentage of work year lost, caused by a case of dracunculiasis. Nevertheless, even under conservative assumptions we find high IRRs that range from 11% to 44%, depending upon whether an average case leads to 4 weeks or 6 weeks of economic incapacitation. A sensitivity analysis was also conducted to assess the variance caused by changes in key parameters.

8. CONCLUSION

The quantitative socio-economic analysis of policies is an important support for decision making because it offers a wide range of instruments and approaches suitable for different kinds of analysis. Nevertheless, any policy impact analysis exercise has to be well-designed, taking into account several elements: the policy measures, objects of the analysis, the answers to provide decision makers, the type of audience, the data, time, know-how and the available monetary resources.

The feasibility and effectiveness of any quantitative socio-economic policy impact analysis depends in practice, on the institutional context in which it has to take place and on the choice of the most appropriate analytical approach for that context.

Finally, it should be remembered that most of the approaches reviewed here only give limited insights into the impacts of policy measures on the socio-economic system. Due to the complexity of economic relationships and interrelations of its components, sometimes results have to be taken with caution and not be considered as the only guide for policy-making. Moreover, it can be useful to use different approaches, including a mix of quantitative and qualitative tools for each case, in order to acquire a broader and more holistic view of possible policy impacts and immediate and longer-term consequences.

9. READERS' NOTES

9.1. Time requirements

The reading, the presentation and the discussion of the present document can take from two hours to one day if the public is already familiar with the basic concepts related to the structure of an economic system and the role of public policies.

9.2. Complementary capacity building materials

This Module belongs to a set of modules which are part of the EASYPol Resource package: **FAO POLICY LEARNING PROGRAMME : QUANTITATIVE SOCIO-ECONOMIC POLICY IMPACT ANALYSIS**

9.3. Links to other EASYPol material

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