

Session 9

Assessing Welfare Impact of PBL Operations: Concept & Method

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Introductory Course on Economic Analysis of
Policy-Based Lending Operations
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Main Objectives

Introduction to:

- Quantitative Assessment Methods
- Different Methods and Applications

Non Objectives:

- Details of model specification and estimation
- Complete results of past analyses
- Road map for carrying out such analyses

Role of Quantitative Analysis (1)

- Economic analysis for policy operations: what is involved, can it be done?
- A proposed policy change is based on an opinion that the reform will improve the condition
- Issue is not if economic analysis can be done but how it can be done

Role of Quantitative Analysis (2)

- Fill the gap between Theory and Reality
Policy cannot be determined based on textbooks!
- Add to quantitative dimensions, leading to measurement : *What can't be measured can't be managed*
- Enable for Sensitivity/Scenario Analysis
Informs policy dialogue and provides options

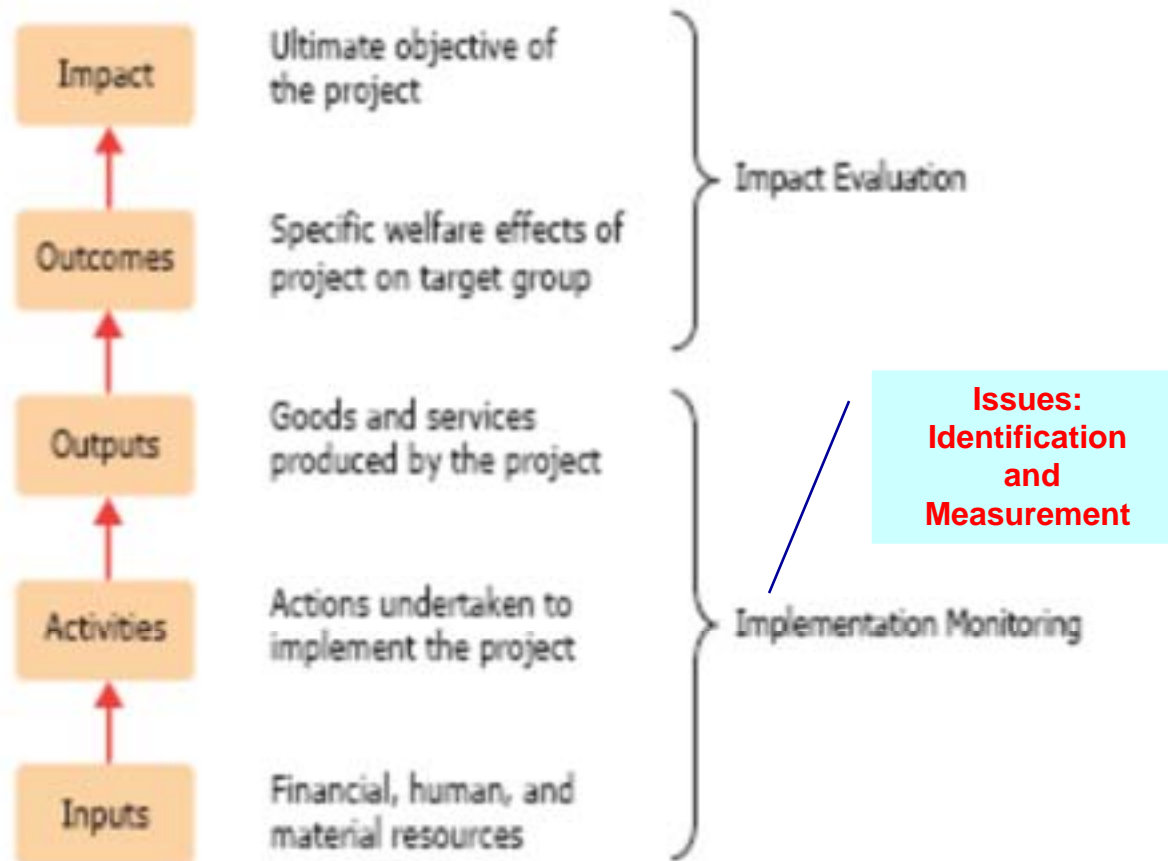
Conceptual Framework

Microeconomic analysis of:

- Consumers, Producers, Households, Single market, Sectoral Policy, Macroeconomic Policies and the links among them.
- Each of them has standard behavior reflected in the modeling analysis.

The Need for Assessments

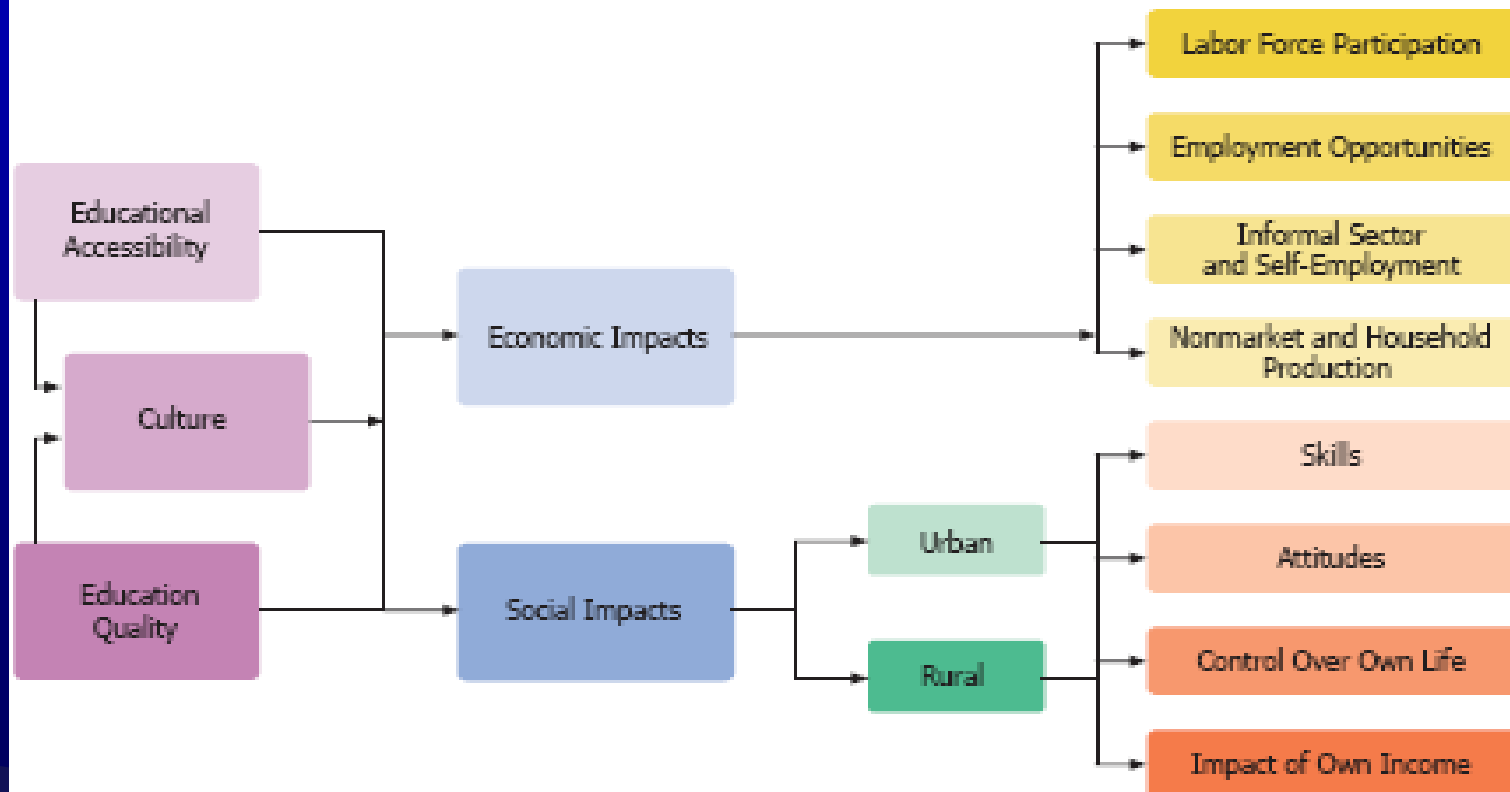
Figure 2.2 Simplified Model of Project Monitoring and Evaluation Framework Process



Source: Binh Nguyen and Erik Bloom 2006.

Example of Assessment Framework

Figure 2.3 Framework for the Analysis of the Impacts of Education on Women



Source: Taken from Valadez and Bamberger 1994.

Note: The framework can be modified for other sectors/programs !

Basic Idea of Assessments

- **Model :**

$$Y = f(X, P)$$

- **Where**

- Y = outcomes, endogenous variables concerned
- X = Uncontrollable Exogenous variables
- P = Policy Instruments
- Y_0, X_0, P_0 = Base run, base line, benchmark
- $(Y_r - Y_0)$ = Impacts, which should be analysed based on a set of criteria (i.e. welfare, poverty reduction, inequality, feasibility, etc)
- Note: f is the functional approach

Alternative Techniques

•Data Availability and Analytical Capacity

•Low

•Medium

•High

F e e d b a c k	Low	<ul style="list-style-type: none"> • Descriptive statistical analysis • Qualitative impact assessments with specified assumptions • Reduced use of tools in adjacent cells in conjunction with specified assumptions 	<ul style="list-style-type: none"> • Partial equilibrium analyses of prices, supply and demand parameters • Budget analysis • Benefit incidence analysis • Affordability and willingness-to-pay analysis 	<ul style="list-style-type: none"> • Survey-based household models • Full econometric demand and supply analysis • Fiscal impact and public expenditure analysis • Comparative institutional, transaction cost analysis
	E f f e c t s	High	<ul style="list-style-type: none"> • Qualitative impact assessments of inter-temporal and distributional effects • Descriptive statistical analysis 	<ul style="list-style-type: none"> • Reduced form input/output analysis and simulation models

Alternative Assessments

1. Ex Ante and Ex Post :

- Before and After
- Benchmark Monitoring

2. With and Without:

- Scenarios of With and Without cases
- Comparison with benchmark

3. Combination:

- Maximising the benefits
- Strengthen the case

Impact Assessments

1. *Of What*
2. *On What*
3. *On Whom*
4. *How , including effect channel*
5. *When*
6. *If and the risk*

Good Impact Assessments: Aspects

- 1. The right question*
- 2. Stakeholders*
- 3. Transmission channel*
- 4. Institutional context*
- 5. Data and information*
- 6. Measurements*
- 7. Impact analysis*
- 8. Risk assessment*
- 9. Monitoring and Evaluation*
- 10. Policy Dialogue*

Types of Models

Model/methods:

1. Statistics
2. Econometrics
3. Others (e.g. General Equilibrium)

Coverage:

1. Partial
2. General

Aspects:

1. Static
2. Dynamic

Statistical Modelling

1. Descriptive Statistics:

- Based on sample statistics
- Description of samples based on Summary of Statistics

2. Inference Statistics:

- Based on sample statistics
- Estimation and Hypothesis testing, parameter estimate, and general trend

Statistical Modelling (2)

3. Non parametric statistics

- No population distribution assumed

4. Other Statistical Modeling

- Index and Classification system, etc

Correlation Analysis

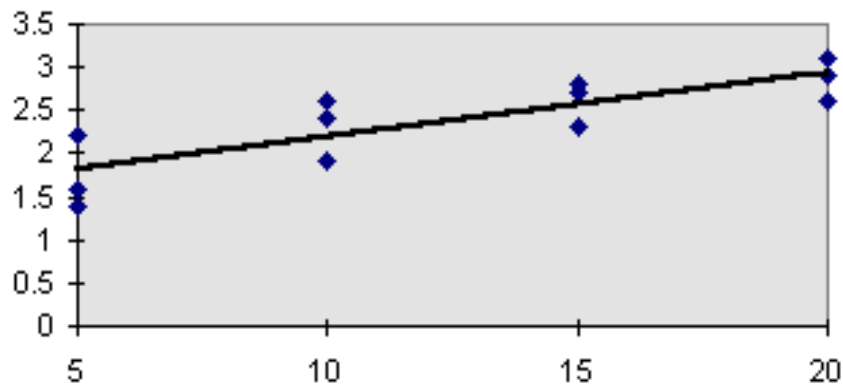
- To measure strength of association (linear relationship) between two numerical variables (output of project with another variable concerned)
 - Only concerned with strength of the relationship
 - No causal effect is implied
- Feature
 - Unit free
 - Range between -1 and 1
 - The closer to -1 , the stronger the negative linear relationship
 - The closer to 1 , the stronger the positive linear relationship
 - The closer to 0 , the weaker the linear relationship

Econometrics: Regression Analysis

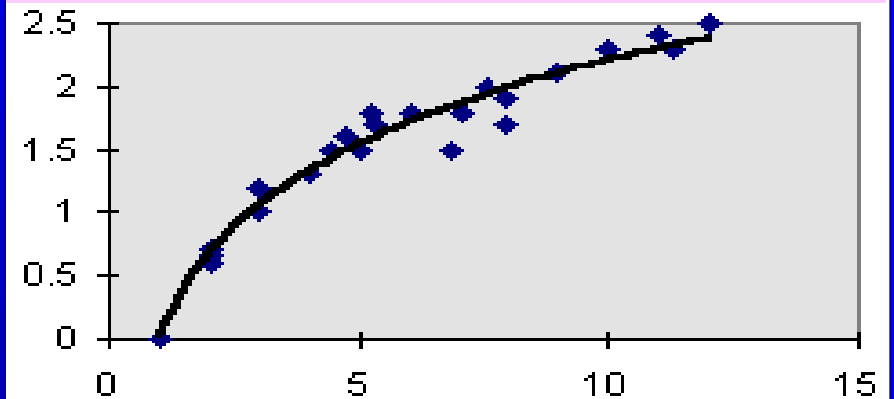
- Mainly to model causality (relationship) and provide prediction.
- Types of Model
 - Data: Cross section (Dependent (Y_i) and Independent (X_i) variables); Time Series (One variable only); and, Panel Data (Dependent and Independent variables across regions or sectors).
 - Variables: Discrete, continues, categorical/qualitative.
 - Equation: Single and simultaneous equations with many functional forms.
 - Other issues: Estimation methods and variable measurements.

Types of Regression

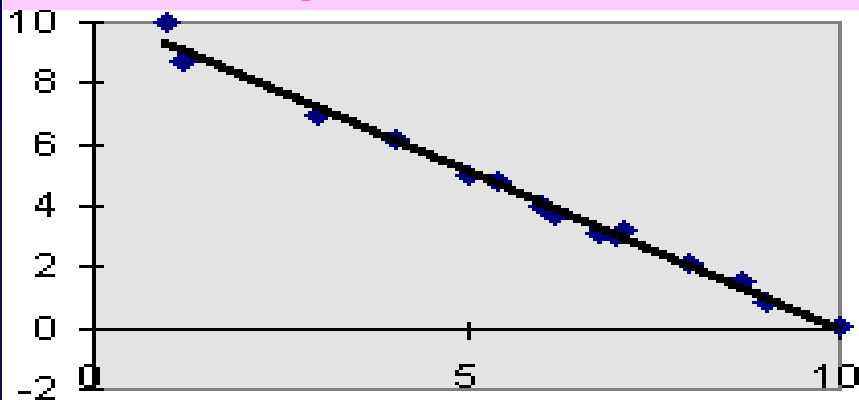
Positive Linear



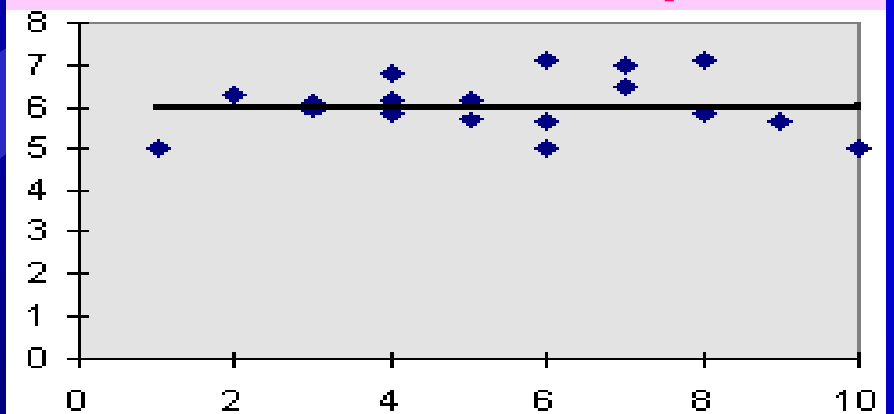
NOT Linear



Negative Linear



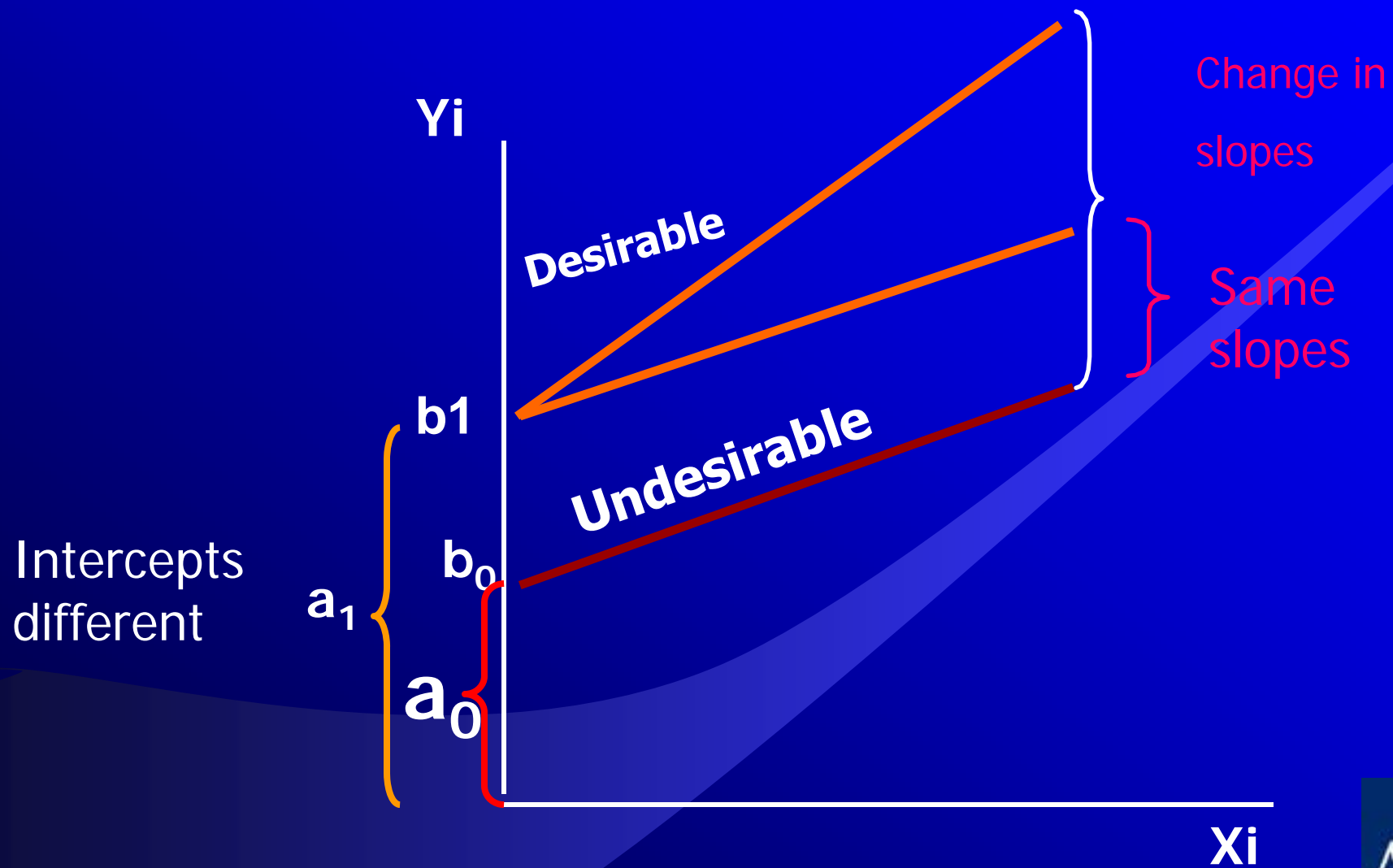
No Relationship



Dummy Variables

- Categorical explanatory variable (dummy/dichotomous variable).
- For **Yes** or **No**, **On** or **Off**, **Male** or **Female**, **With** or **Without**, **Before** or **After**, etc.
- Coded as 0 or 1 (1 for the case and 0 for otherwise).
- Can be used in Additive **and/or** Multiplicative/Interactive specification.

Additive and Interactive Dummies



Pitfalls of Regression Analysis

- Ignoring the underlying assumptions.
- Not knowing how to evaluate the assumptions.
- Not knowing the alternatives methods if a particular assumption is violated.
- Using a regression model without knowledge of the subject matter.

Time-Series Analysis: Components

Forecasting or identifying significant changes

based on time series model

Trend

Cyclical

Time-Series

Seasonal

Random

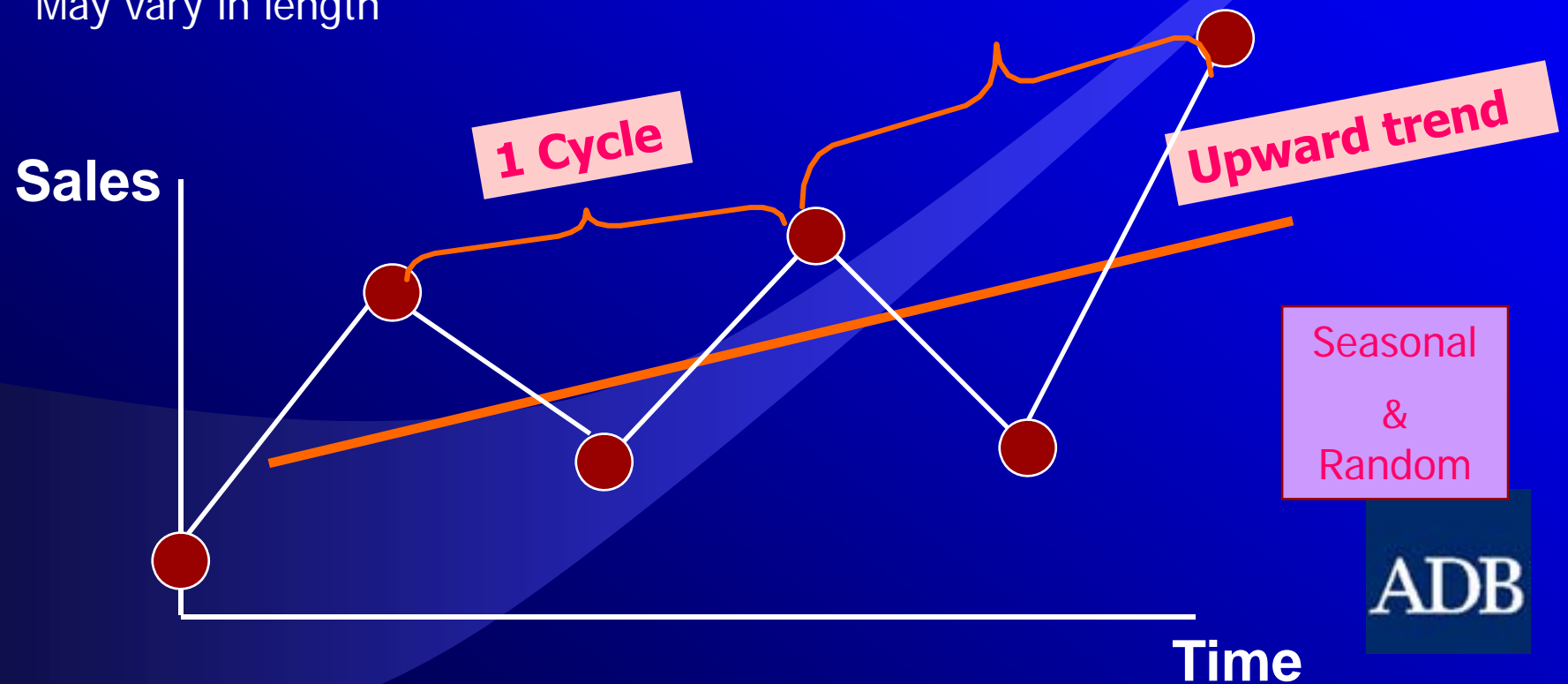
Trend and Cyclical Components

Trend:

- Overall upward or downward movement
- Data taken over a period of times (weeks, months, years etc)

Cyclical:

- Upward or downward swings
- May vary in length



Pitfalls of Time-Series Analysis

- Time series behavior in the past will still hold in the future.
- No consideration on personal judgments, experiences, changing technologies, and habits, etc.

Other Models: Partial Equilibrium Analysis

- Focus on one aspect of economic activity(demand or supply side), a single sector or good.
- Assumptions: *ceteris paribus* and does not allow for feedback effects
- Examples:
 - Demand: Effect of price/market/environment changes on demand (Increasing tax/reducing subsidy on consumers)
 - Supply: Effect of price/market/environment changes on supply (Increasing tax/reducing subsidy on producer)
 - Supply and demand: Combination of supply and demand.
 - Agricultural Household Models: Impact of policy/price changes on Agricultural Household.
 - Transactions costs assessments and analysis of interlinked markets, comparative institutional analyses, relative cost effectiveness etc.

Other Models: Partial Equilibrium Analysis

- Economy-wide Modeling Effects
- Based on a sound theoretical concept (microeconomics)
 - Consumers: Maximizing Utility, subject to budget constraints
 - Firms: Maximizing profit, choosing inputs and technology
 - Governments: ??? (2 alternatives: Planned or residual consumption)
- Examples:
 - Input-Output
 - Social Accounting Matrices (SAM)
 - Computable General Equilibrium (CGE)

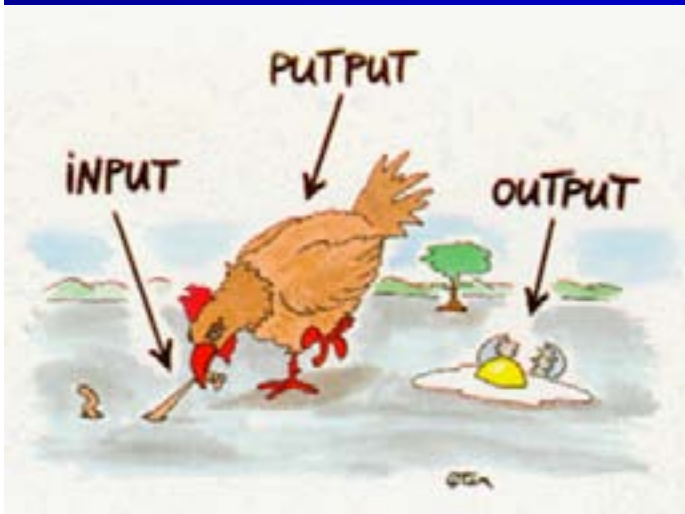
Input-Output Modelling

Main Issue

- Backward & Forward Linkages
- Multiplier Effects
- Induced Effects of Specific Intervention

Main Assumption

- Excess Capacity in the Economy
- Constant Technology
- Fixed Price



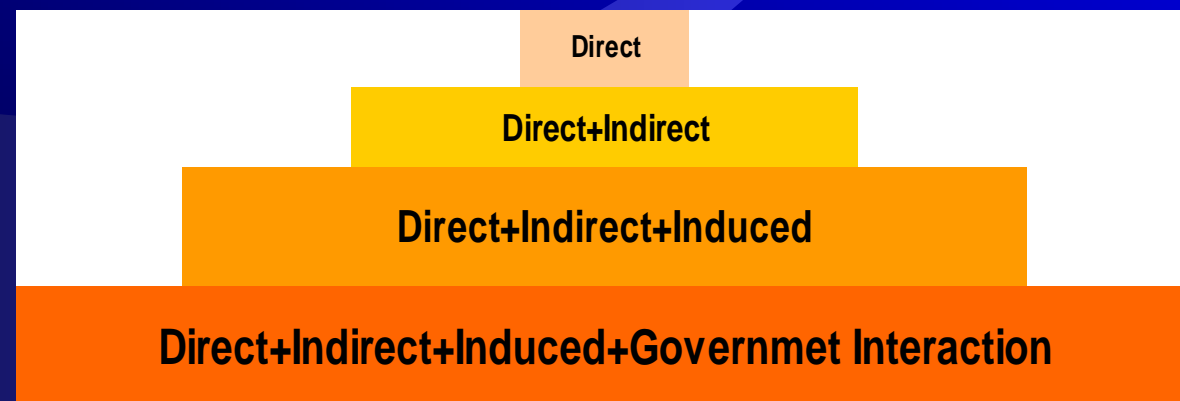
Use:

- ❖ Linkage Analysis across sectors
- ❖ Looking for the highest effect
- ❖ Project Sector output requirements
- ❖ Impacts on labor, income, value added etc.

Input-Output Modelling Framework

		Intermediate inputs				Final Demand (Y)				Gross output
		1	2	3	4	Consumption	Investment	Government	Export	
		<i>QUADRANT I</i>				<i>QUADRANT II</i>				
Intermediate outputs	1	X11	X12	X13	X14	Y1C	Y1I	Y1G	Y1E	X1
	2	X21	X22	X23	X24	Y2C	Y2I	Y2G	Y2E	X2
	3	X31	X32	X33	X34	Y3C	Y3I	Y3G	Y3E	X3
	4	X41	X42	X43	X44	Y4C	Y4I	Y4G	Y4E	X4
		<i>QUADRANT III</i>				<i>QUADRANT IV</i>				
value added	L	VL1	VL2	VL3	VL4	V1C	V1I	V1G	V1E	L
	N	VN1	VN2	VN3	VN4	V2C	V2I	V2G	V2E	N
Gross input		X1	X2	X3	X4	C	I	G	E	X

Effects



SAM-Based Modelling

Developed based on Social Accounting Matrix

What is SAM?

1. Transaction records of an economy in a particular time presented in a square matrix
2. Include Production, Consumption, and Investment
3. Further Development of IO

Types of Model:

1. Fixed Price – SAM Multiplier Analysis
2. Flexible Price – CGE Modeling

Main Characteristics:

1. SAM Multiplier Analysis : Fixed Price, Backward and Forward Linkages with more institutions (not only on production sectors)
2. CGE Modeling: Complete modeling of an economy.

Box 2.7 The Social Accounting Matrix (SAM)

A SAM is basically a system of presenting the economic and social structure of a country (region) at a particular time, by defining the representative actors or economic agents in the underlying economy and recording their transactions. The transaction values are presented in a square matrix (as opposed to the double entry format of standard accounting report of T-typed account, i.e. the one used in the accounting report) with its rows representing detailed receipts by each particular account and its columns recording the corresponding expenditures. It then follows that every income has its corresponding expenditure, and the incoming and outgoing of any account must always balance. The SAM is essentially constructed to correspond to the underlying economy and therefore the model's main features. Entries in a SAM can be categorized into two groups, one that reflects flows across markets to represent transactions in the product and factor markets, and another one that reflects transfer payments from one agent to another.

There is, however, no 'standard SAM' so that the disaggregation level and choice of representative actors depend entirely on the motivation underlying the SAM's development and the availability of data. For PIA, the classifications of factors (especially worker) and household should be relatively detailed to enable the models to capture the changes in the factor income allocation and, therefore, welfare status of different household and worker groups.

In a statistical system, a SAM provides complementary economic indicators, which concern not only the macroeconomic aggregates of the System of National Accounts (the SNA) but also on the socio-economic structure and distributional aspects of the economy. Accordingly, SAM can be thought of as a further development of input-output accounts, which concentrate only on the production side of the economy. It must be noted, however, that every SAM is only a static image or 'snapshot' of an economy. Nevertheless it can provide the statistical basis for the development of plausible models when more than a static image is needed (King, 1985). Table 2.4 provides a schematic representation of SAM for Indonesia as an example. As can be seen, the matrix records a comprehensive transaction conducted by economic actors in the economy for a period of time that includes economic and transfer payments.

Constructing SAM can be very time consuming and burdensome, involving reconciliations of various data from the input-output tables, national income accounts, foreign trade, and other sources. If the basic data are not readily available, however, some specific surveys must be conducted first before constructing a SAM.

Source: Author's summary

Example: Indonesian SAM

Table 2.4 Schematic Representation of Indonesian SAM

	EXPENDITURE								
	1. Factors	2. Institution	3. Activities	4. Trade and Transport Margin (TTM)	5. Domestic Commodities	6. Imported Commodities	7. Capital	8. Net Indirect Tax	9. Rest of the World (ROW)
1. Factors			Value Added						
a). Labour			Wages						
b). Capital			Profits/Rents						Remittance
2. Institution									
a). Households	Factor Income	Transfers							Transfers
b). Firm	Factor Income	Transfers							Transfers
c). Government	Factor Income	Direct Taxes						Ind. tax transfers	Transfers
3. Activities					Production Allocation				
4. TTM					Mark-up for TTM	Mark-up for TTM			
5. Domestic Comm.		Final Consumption	Intermediate Consumption	Transfers/Consumption			Investment		Exports
6. Imported Comm.		Final Consumption	Intermediate Consumption				Investment		
7. Capital		Savings							
8. Net Indirect Tax					Ind. Tax Payment	Ind. Tax Payment			
9. ROW	Remittance	Transfers				Imports	Capital Outflows		

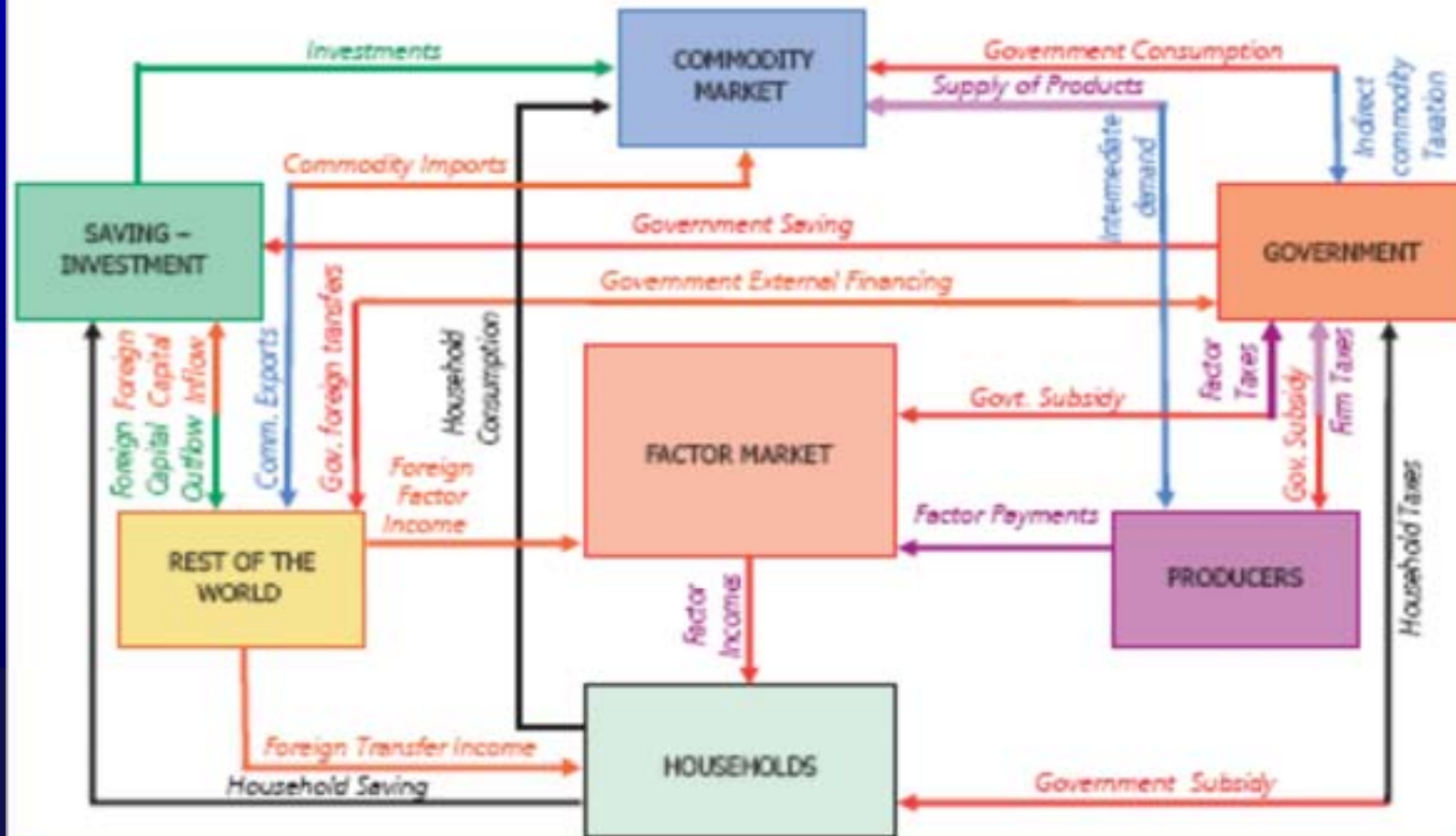
Source: Sugiyarto et al. (2003).

SAM Multiplier Analysis

		<i>Endogenous account</i>				
Receipts		1. Factors	2. Institutions	3. Productive activities	4. Exogenous accounts	Total
Expenses						
1. Factors				T_{13}	X_1	Y_1
2. Institutions		T_{21}	T_{22}		X_2	Y_2
3. Productive activities			T_{32}	T_{33}	X_3	Y_3
4. Exogenous accounts		L_1	L_2	L_3	LX	Y_4
Total		Y_1	Y_2	Y_3	Y_4	

CGE Model: Schematic Representation

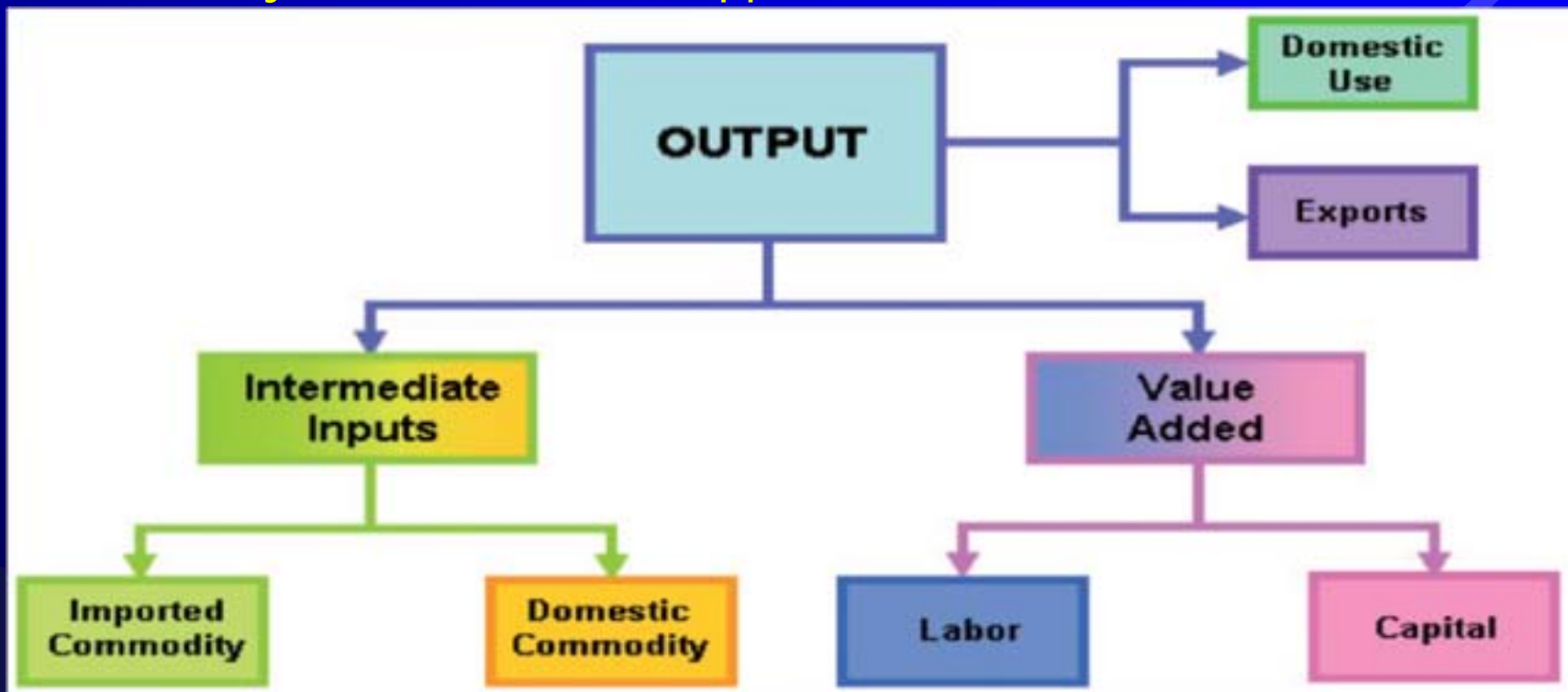
Figure 2.4 The Inter-linkage Nature of Economy Represented by CGE Model



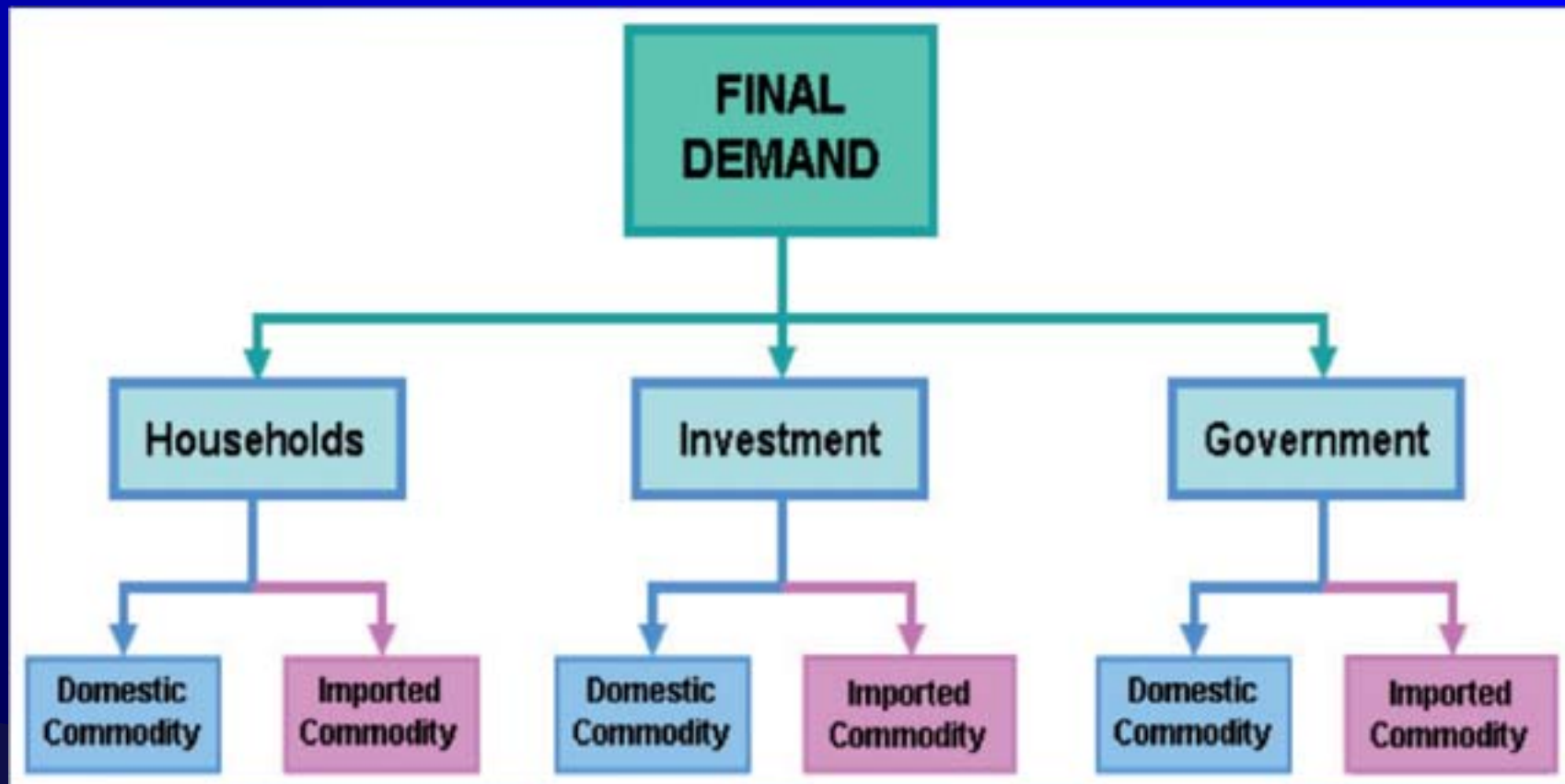
Source: ADB PRISM.

CGE Model: Production Structure

Based on microeconomics, maximization process, flexible price, no excess capital, relatively flexible functional specifications and widely used for different applications.



CGE Model: Consumption Structure



Summary

ASSESSING THE EFFECTS OF POLICY CHANGE

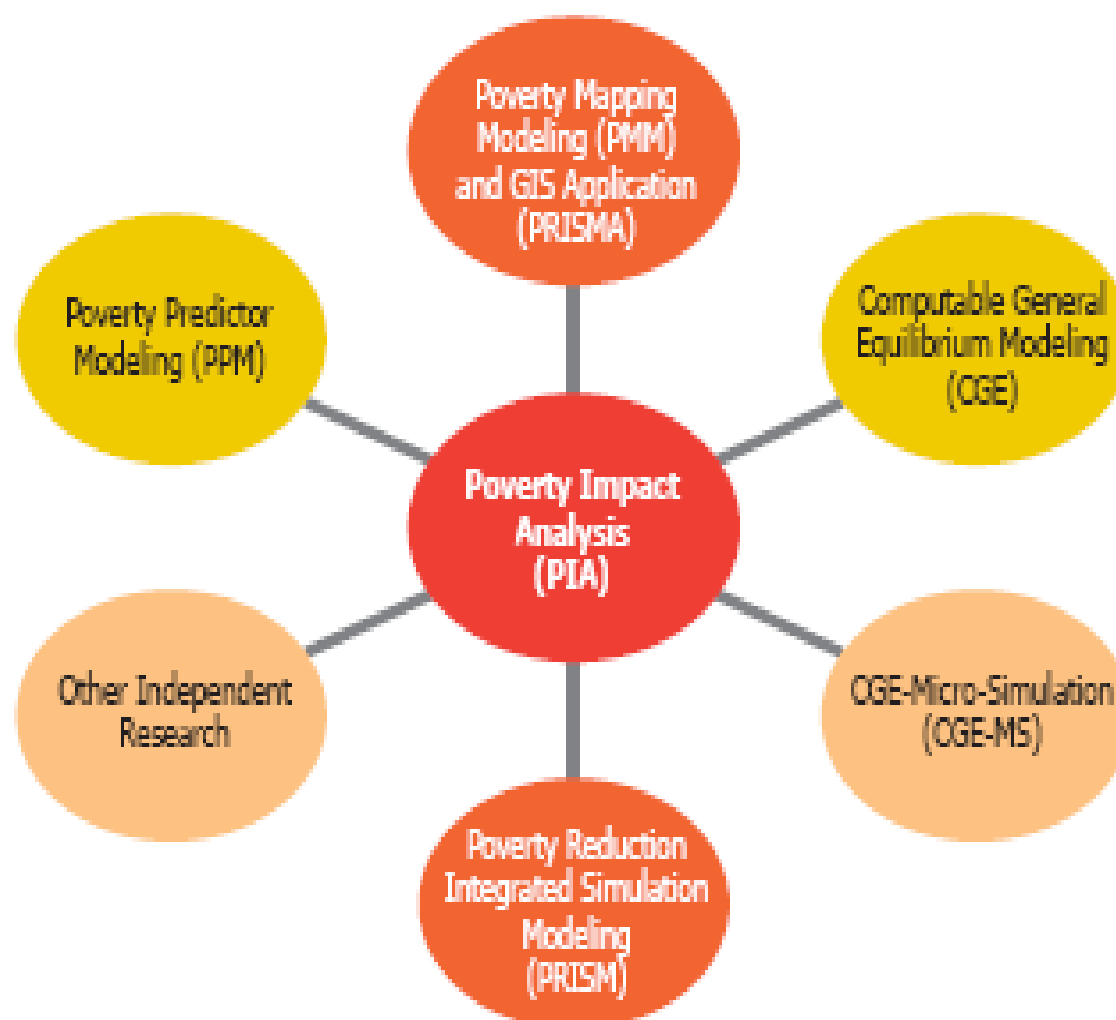
TABLE 7: Approaches to Assessment of Policy Operations

Approach	Advantages	Disadvantages	Possible Application
Descriptive statistical analysis and ad hoc calculations	<ul style="list-style-type: none"> • Simple to apply • Minor data and time requirement 	<ul style="list-style-type: none"> • Requires specific parameters such as demand and supply elasticities • Captures only one dimension 	<ul style="list-style-type: none"> • Power restructuring e.g., Loan 1662-PHI. • Health reform e.g., Loan 1568-MON. • Education e.g., Uzbekistan Education Sector Development Program
Partial equilibrium modeling: Market and price analysis	<ul style="list-style-type: none"> • Fewer data required than computable general equilibrium modeling • More workable and easier to interpret results qualitatively 	<ul style="list-style-type: none"> • Cannot capture computable general equilibrium modeling feedback effects • Not useful for complex reforms 	<ul style="list-style-type: none"> • Self-contained price changes such as agriculture subsidy e.g., Loan 1739-PHI
Partial equilibrium modeling: Comparative institutional analysis	<ul style="list-style-type: none"> • Considers the costs of institutional transactions that can be key to understanding incentives and efficiency improvements 	<ul style="list-style-type: none"> • Limited in ex-ante analysis because of the difficulty in estimating transaction costs 	<ul style="list-style-type: none"> • Transaction cost approach is relevant in analyzing the rural economy where small farmers and traders facing high transaction costs resulting in thin markets, market failure in the provision of credit, inputs, and services, and incomplete or imperfect land and labor markets e.g., Loan 1739-PHI
Applied computable general equilibrium	<ul style="list-style-type: none"> • Can simulate counterfactuals • Useful for impact of price changes like devaluation and interest rate rises 	<ul style="list-style-type: none"> • Considerable data and time requirements • Results are sensitive to assumptions and model specifications 	<ul style="list-style-type: none"> • Trade reform e.g., Loan 1680-PAK • Financial sector reform e.g., Loan 1485-VIE

Source: EREA staff.

Tools for PIA Developed by ERD

Figure 1.2 Tools for PIA developed by ERD



End Note

Main issue ?

Best Approach ?

**Constraints: Data,
Methods, Capacity,
Time, etc!**

- Main issue concerned
- Scope of attribute or impacts
- Best tools available- one model does not fit all !
 - Microeconomic foundations
 - Linking empirical data to policy outcomes
 - Partial versus general equilibrium
- Trade-offs between modeling approaches
- Modeling Application in operations, including the best time for incorporation



Appreciating models and their use !!

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Thank You

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