SESSION 3.1

DISTRIBUTION ANALYSIS

Introductory Course on Economic Analysis of Investment Projects

Economics and Research Department (ERD)

Why Distribution of Project Effects?

- Equity Considerations
  - Who benefits from the project, by how much?
  - Is distribution of effects consistent with project objectives?
  - How do benefits reach target groups?
- Incentive Considerations
  - Who receives, by how much?
  - Who pays, by how much?

Examples of Distribution Analysis

- Understand effects of price changes on stakeholder groups, net benefits of service projects
- Assess effects of foreign resources such as BOT projects with foreign sponsors - net capital flows, host country and foreign investor benefits division
- Assess the distribution of economic and financial costs and benefits, and net benefits between poor groups and other stakeholders

➢ Poverty reduction addressed where components effectively reach poor groups

Analytical Focus of Distribution and Poverty Impact Assessment

- Channels of effect: access to employment, markets, resources and assets, services, transfers
- Distribution effects: who receives, who pays
- Time dimensions and directness of effect: short to longer run and direct and indirect effects
- Design implications: mitigation and enhancement measures

Start Distribution Analysis During Sector Work

- Assess without project access to employment, markets, resources and assets, services, transfers
- Assess differences in access by group (such as income) and geographic location
- Identify stakeholder groups that stand to gain or lose by investments
- Assess alternatives that are likely to be effective and sustainable in increasing access, benefit incidence

During Feasibility and Appraisal

- Have the channels of effect been identified to see how costs will be incurred and benefits realized?
- How much are gains/losses from distributing project effects? Do they provide an incentive for response?
- How much is the cost burden to those who will pay? Is the burden acceptable?
- How do targeting/equity considerations affect the overall project performance and returns?
- Can the project and component design be modified and/or complementary measures be taken to enhance impact on target beneficiaries, minimize effect on efficiency?

How Far Can We Take Distribution Analysis?

- Revenue generating projects with quantitative financial/economic analysis

  → quantitative distribution analysis and poverty impact ratio

- Non-revenue generating projects with quantitative benefit analysis

  → quantitative benefit incidence analysis

- Limited quantitative analysis

  → qualitative channel of effect analysis

Stakeholder Groups Analysis

- Owners, operators of project enterprises
- Consumers, users of project outputs
- Goods and service suppliers to the project
- Hired workers, labor for the project
- The government
- Rest of the economy
- Lenders to the project

Example: Water Supply Project

- Project supplies piped water in a small town
- Three main stakeholders
  - Government/economy
  - Construction labor
  - Water consumers
- Consumers pay for water supplied
- Use domestic price numeraire
- Use discount rate of 12% for FPV and EPV

Example: Water Supply Project

Methodology:

1. Identify project stakeholders, for example, water consumers, labor, government, economy.
2. Calculate present value of financial costs and revenues by component and estimate who pays for the project

3 . Calculate present value of economic costs and benefits by component and identify who gains/loses from the differences

Example: Water Supply Project

4. Total project effect is **ENPV = FNPV + (ENPV – FNPV)** where ENPV gives addition to national income
5. Some groups must get both FNPV and the difference between ENPV and PNPV.
6. Some of the groups will be poor

Example: Water Supply Project

	1. Project Financial and Economic Effects			2. Distribution of Project Effects Among Stakeholders			
Project Costs and Benefits	FNPV	ENPV	ENPV-FNPV	Consumers	Labor	Government/ Economy	Total
Output Benefits	1000	1800	800	800			800
Capital Costs	-650	-600	50			50	50
Power Costs	-330	-250	80			80	80
Labor Costs	-80	-56	24		24		24
Project Effects	-60	894	**954**	800	24	130	**954**
Net Financial Effects	**-60**					-60	**-60**
Net Economic Effects		**894**		800	24	70	**894**

Poverty Impact Ratio

- An extension of distribution analysis with stakeholders further defined by income or other poverty indicators
- Identify the proportion of poor in stakeholder groups
- Calculate the benefits to poor stakeholders
- Calculate the Poverty Impact Ratio (PIR):
  - $PIR = ENPV_{poor} / ENPV_{total}$

Example: Water Supply Project

	Consumers	Labor	Government/ Economy	Total
Net Economic Effects	800	24	70	894
Proportion of Poor in Stakeholder Group	0.25	0.33	0.5	
Benefits to Poor Stakeholders	200	8	35	243
Poverty Impact Ratio (Benefits to Poor/Net Economic Effects)	243 / 894 = 0.27			

Example: Water Supply Project

- Net gain to poor of 243
- Only 25% of consumers treated as poor
- Assumes 50% of government income go to help poor
- High opportunity cost of government income in poverty terms
- Indirect poverty effects are difficult to establish

Use Poverty Impact Ratio with Caution

- PIR is a ratio and can be misleading
  - → how much NPV actually goes to the poor (absolute poverty impact)
  - → how much NPV goes to the poor per project cost (efficiency of poverty impact)
- Highly sensitive to assumptions on proportion of poor in different groups
- If uncertain about proportion of poor, test effect on PIR through sensitivity analysis

ADB project examples: Fujimura 2012

- Lessons learnt
- 1) Preferable to simple headcount of beneficiaries in poverty analysis
- 2) Forces more thorough basic economic analysis
- 3) Analysis of gainers and losers sharpens judgement on sustainability
- BUT
- 4) incomplete data makes analysis very crude
- 5) dynamic and indirect effects omitted
- 6) baseline survey data often needed

Table 1: Distribution analysis for Vietnam: Northern Power Transmission Expansion Project (billion dong)

Item	Fin NPV	Econ NPV	ENPV-FNPV	EVN	Residential Consumers	Non-res. Consumers	Govt/ Economy
Benefits							
Revenue from residents	38,232	38,232	0				
Revenue from non-residents	107,137	107,137	0				
Surplus – residents		56,281	56,281		56,281		
Surplus – nonresidents		2,313	2,313			2,313	
Costs							
Capital	-70,618	-76,312	-5,694				-5,694
O & M	-17,996	-19,935	-1,939				-1,939
Purchases from IPPs	-2,855	-2,855	0				
Profit tax	-50,906	0	50,906				50,906
Net benefits	2,994	104,861	101,867				
Gains and losses				2,994	56,281	2,313	43,273

Table 2: Distribution analysis for China: Pali-Lijian Railway Project (million Chinese Yuan)

Item	Fin NPV	Econ NPV	ENPV-FNPV	Railway Operator	Shippers	Passengers	Labor	Govt/ Economy
Benefits								
Freight revenue	1,576	1,576	0					
Passenger revenue	1,353	1,353	0					
Cost saving for freight		1,877	1,877		1,877			
Cost saving for passengers		1,009	1,009			1,009		
Generated production		5,074	5,074					5,074
Generated tourism		448	448					448
Costs								
Capital and O&M	-3,202	-3,682	-480					-480
Labor	-489	-328	161				161	
Tax	-219	0	219					219
Net benefits	-981	7,327	8,308					
Gains and losses				-981	1,877	1,009	161	5,261

Table 3: Distribution and poverty impact analysis for Nepal: Road Connectivity Sector I Project (million Nepal rupees)

Item	Fin NPV	Econ NPV	ENPV-FNPV	Passenger users	Freight users	Vehicle owners	Labor	Govt/ Economy
Benefits								
Road user benefits		2,245	2,245	416	559	1,229		41
Costs								
Capital	-987	-1,188	-201					-201
O & M	-23	-25	-2					-2
Labor	-503	-352	151				151	
Net Benefits	-1,513	680	2,193					
Gains and Losses				416	559	1,229	151	-1,675
Proportion of the poor				0.5	0.5	0	0.8	0.15
Benefits to the poor				208	280	0	121	-121
Poverty impact ratio				488/680 = 0.717				
Net benefit to the poor per project cost				488/1,513 = 0.323				

Table 4: Distribution and poverty impact analysis for China: Jilin Urban Environmental Improvement Project (million Chinese yuan)

Item	Fin NPV	Econ NPV	ENPV-FNPV	Service Providers	Consumers	Labor	Govt/ Economy
Benefits	4,001	7,235	3,234		3,234		
Costs							
Capital	-1,680	-1,703	-23				-23
O & M	-2,117	-2,154	-37				-37
Labor	-58	-48	10			10	
Profit tax	-200	0	200				200
Net Benefits	-54	3,330	3,384				
Gains and Losses				-54	3,234	10	140
Proportion of the poor				0	0.12	0.15	0.17
Benefits to the poor				0	388	2	20
Poverty impact ratio				410/3330 = 0.123			
Net benefit to the poor per project cost				410/3855 = 0.106			

Table 6: Poverty impact analysis for Bangladesh: Second Urban Primary Health Care Project (US$ million)

	Econ NPV	Service Providers	Users	Govt/ Economy
Benefits				
Resource cost saving	139.4		139.4	
Productivity gain				
Costs	-74.6	-4.0		-70.6
Net Benefits	64.8			
Gains and losses		-4.0	139.4	-70.6
Proportion of the poor		0	0.3	0.1
Benefits to the poor		0	41.8	-7.1
Poverty impact ratio		34.7/64.8 = 0.535		
Net benefits to the poor per project economic cost		34.7/74.6 = 0.465		

Thank you.