Case study : “Ex Post Evaluation Cyprus RDP 2007-2013: An Application of Input-Output Analysis”

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Context of evaluation

- This presentation is based on work in progress on the Ex-Post Evaluation of the Cyprus RDP, which was assigned in May 2016.
- Current status: on-going
- Specification of data needs and analytical methods; design and organization of surveys (some surveys have started)
- Collection of analytical raw data from the Information System in order to feed the model and also, generate the samples of the case study surveys.
- Authors are members of the project team of the ex post evaluation of the RDP 2007-2013

Methodology: IO Analysis

- The essence of macro-economic approaches utilized for the evaluation of development policy impacts lie in their capacity to estimate aggregate economic effects.
- Several methods exist; e.g. multiplier analysis, Keynesian income-expenditure model, spatial econometric models, IO, SAM, CGE models.
- IO analysis chosen due to:
  - Being more “sophisticated” than simple multiplier analysis and Keynesian income expenditure models;
  - Being much less difficult to apply (in this project and also by RDP authorities) than SAM and CGE models;
  - Despite its straightforward assumptions, it can generate valid and objective assessments of the economy-wide impacts of RD policy measures.
  - Data requirements are not prohibitive.
  - Can accommodate counterfactual analysis (joint application).

Methodology: IO Analysis

- An adaption of the neoclassical theory of general equilibrium to the empirical study of the quantitative interdependence between interrelated economic activities'.
- A quantitative technique for studying the interdependence of the producing and consuming units within an economy.
- An I/O table identifies the major industries in an economy and the financial flows between them over a stated time period (usually a year).
- It indicates the sources of each sector's inputs, which are purchased from the same or other sectors in the economy, imported, or earned by labour (household's wages and salaries).
- It provides a breakdown for each sector's output, which can be sales to other industries and to final demand (household consumption, government consumption, capital formation, and exports).
- The interdependence between the individual sectors of the given economy is described by a set of linear equations, representing fixed shares of input in the production of each output.

Methodology: IO Analysis

- IO modelling incorporates sectoral analysis into a macroeconomic framework, thus creating a basis for an evaluation of sectoral or/and investment policies to national or regional goals such as GDP, employment and the balance of trade.
- Hence, it provides more general information compared to a partial equilibrium model, which concentrates on one sector and more disaggregated information compared to a “pure” macroeconomic model.
- An IO model can be used to estimate the indirect effects of a change in the level of final demand for the output of a particular sector (impact analysis).
- Effects may be measured as output, income, and employment changes, calculated using sectoral multiplier coefficients, which express the ratio of total effect to the initial change in demand.
- Impact information is available in disaggregated as well as total form, and policy makers can thus be provided with information on which industries or sectors are impacted by a specific event and by how much

Methodology: IO Analysis

- Three types of effect
  - ***Investment Effects*:** given the structural linkages identified in each economy, financial flows associated with specific RDP measures can be inserted to the IO model in the form of sector-specific exogenous demand shocks. Subsequently, following the traditional Leontief procedure, economy-wide growth generating impacts are estimated for each RDP measure, in terms of average annual output, income and employment effects.
  - ***Capacity-adjustment effects:*** The procedure for estimating capacity-adjustment effects of Type A and B investments follows the 'mixed exogenous/endogenous variable version of the Leontief model'
  - ***Counterfactual:*** Same as CA effects but with different input data, i.e. counterfactual analysis estimates on change in GVA.

Methodology: IO Analysis

- Several applications: e.g. Johns and Leat (1987); Midmore (1993; 1998); Psaltopoulos and Thomson (1993); Psaltopoulos et al. (2004); Psaltopoulos and Balamou (2006); ENRD – TWG2 (2010); Skuras et al. (2011); RURAL ECMOD project (2012).
- RDP Measures to Assess:
  - Productive Investments: 121, 122, 123, 311, 312, 313
  - Infrastructure: 125, 321, 322, 323
- Areas of potential application:
  - National
  - Regional (through using various techniques to generate regional IO tables)
- Indicators quantified:
  - Economic growth
  - Employment creation
- Also, Gross cost per job created (not in CMEF, but useful….)

Working Steps and Data

- Step 1: Select measures to assess (M121, M123, M313)
- Step2: Obtain IO Table. Supply and Use Matrices for 2008 (Eurostat)
- Step 3: Sectoral employment data (Eurostat) – Issue with FTEs
- Step 4: Scope and decide on the disaggregation of Agriculture
  - Criteria: importance in terms of employment, output, number of farms. FADN data used – TF8
  - Cyprus: fieldcrops; wine; other permanent crops; other grazing livestock; mixed; other
- Step 5: Realised expenditure per annum (ideally for whole period and total cost)
  - No data per annum for M121 – Apply annual shares of public expenditure to total cost data (deflate using GFCF deflators)

IO Analysis: Working Steps and Data

- Step 6: Distribution of expenditure according to types of investment (e.g. buildings, machinery, etc.) and farm sub-sector. Per annum
- Step 7: Data on GVA impacts – source: surveys; ideally per type/sector of beneficiary
- Step 8: Run conventional IO model (investment effects).
- Step 9: Run mixed exogenous/endogenous Leontief model (capacity adjustment effects)
- Step 10: Obtain counterfactual data on GVA and run again Step 9

IO Analysis: Summary of data needs

- National/regional IO tables for a year close to 2007
- Data on study area economic structures (output, employment)
- Data on study area agricultural structures
- Study area RDP structure
- FADN data on farm sub-sectors IO structure
- Sectoral employment data (baseline)
- RDP measure annual expenditure data for the 2007-2013 (public expenditure and total)
- Distribution of investment expenditure per measure according to types of investment (e.g. machinery, equipment, construction, etc).
- Data on measure-specific adjustment of productive capacity (e.g. change in GVA or employment) per sector benefiting from investment.

IO Analysis: Indicative Findings - Cyprus

Table 1: Shocks to the Cyprus IO Model, Investment Effects (average annual investment, 2008 prices; ml Euros)						
Measures/Sector	**121**	**123**	**TOTAL**			
Construction	8,276	0,506	**8,782**			
Machinery and Equipment	18,510	3,697	**22,207**			
TOTAL	**26,786**	**4,203**	**30,989**			

IO Analysis: Indicative Findings - Cyprus

Table 2: Capacity-Adjustment Analysis - National Data: Inputs to the Cyprus IO Model (ml Eur)				
Measures/Sector	**Increase in GVA per annum**	**Increase in Output per Annum**	**Corresponding Sector**	
Measure 121	0,423	0,805	Agriculture	
Measure 123	3,365	19,022	Food Products	

IO Analysis: Indicative Findings - Cyprus

Table 3: Impact Analysis, Cyprus (average annual effects compared to 2008; ml Euros; % change)						
Type of Effect	**Change in output**	**%**	**Change in GVA**	**%**	**Change in Employment (persons)**	**%**
a) Investment Effects						
Measure 121	82,76	0,238	32,36	0,231	1142	0,290
Measure 123	12,64	0,036	4,91	0,035	189	0,048
TOTAL	**95,40**	**0,275**	**37,27**	**0,266**	**1330**	**0,338**
b) Capacity-Adjustment Effects						
Measure 121	1,04	0,003	0,48	0,003	16	0,004
Measure 123	28,06	0,081	7,03	0,050	233	0,059
TOTAL	**29,10**	**0,084**	**7,51**	**0,054**	**249**	**0,063**
c) Total Effects						
Measure 121	83,80	0,241	32,84	0,235	1157	0,294
Measure 123	40,70	0,117	11,94	0,085	422	0,107
TOTAL	**124,50**	**0,359**	**44,78**	**0,320**	**1579**	**0,402**

IO Analysis: Indicative Findings - Cyprus

Table 4: New Jobs Generated per ml Euro of Investment, Cyprus		
Type of Effect	**New Jobs per ml Euro**	
a) Investment Effects		
Measure 121	42,62	
Measure 123	44,94	
TOTAL	42,93	
b) Capacity-Adjustment Effects		
Measure 121	**0,59**	
Measure 123	55,45	
TOTAL	8,03	
c) Total Effects		
Measure 121	43,20	
Measure 123	100,40	
TOTAL	50,96	

Strengths and Weaknesses

Strengths:

- IO models can capture:
  - Scope: multiple economic and social sectors coverage
  - Economic interdependence between producing and consuming sectors within an economy; i.e. how economic structures influence policy outcomes.
  - Simplicity: structure and linear behaviour
  - Data: some is often available (e.g. regional accounts); techniques (e.g. GRIT) for data generation
  - Software: spreadsheet or equivalent
  - Economy-wide impacts distinguished into direct, indirect and induced; and (also) the geographical spread of policy effects.
  - Sectoral characteristics & impacts $\Rightarrow$ creates basis for the evaluation of interdependence and of policy impacts with respect to national or regional goals (policy effectiveness)
  - Both measure- and programme-specific impact estimates
  - Economic impacts of both investment and operation and counterfactual
  - Can show how Policy X has different effects in different regions

Strengths and Weaknesses

Weaknesses

- But (as any other method) have limitations:
  - Fixed production structures (static approach)
  - Linear economic behaviour even for small changes?
  - Perfect supply elasticity
  - No allowance for price changes (exogenous or induced)
  - Growth (development, investment) not really modeled
  - Some policies apply to many sectors in unknown way (e.g. “soft” enterprise aids)

IO Analysis: Lessons and Recommendations

- Simple can be beautiful and operational
- Some theory is not too bad to have
- Utilize link different methods can be efficient
- Never forget weaknesses of methods; there is no perfect method
- Is it worth to expand to more sophisticated GE models?

Lessons & recommendations – Open Issues

- Need to follow up investment projects
- Need to design data collection very early on
- Data on GVA change is very important
- Perhaps need to specify method and then design data collection

Open Issues

- How fast and on time the required data will be collected
- The response of beneficiaries in participating in the field surveys

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