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

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Good Practice Workshop “Methods for Assessing Impacts of Rural Development Programmes 2007 - 2013”

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Presentation Contents

- Context of evaluation
- Methodology
- Working Steps and Data
- Indicative findings
- Strengths and Weaknesses of the method used
- Lessons & recommendations
- Open Issues
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)
- **Step 2:** 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.
### Table 1: Shocks to the Cyprus IO Model, Investment Effects (average annual investment, 2008 prices; ml Euros)

<table>
<thead>
<tr>
<th>Measures/Sector</th>
<th>121</th>
<th>123</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>8,276</td>
<td>0,506</td>
<td>8,782</td>
</tr>
<tr>
<td>Machinery and Equipment</td>
<td>18,510</td>
<td>3,697</td>
<td>22,207</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>26,786</strong></td>
<td><strong>4,203</strong></td>
<td><strong>30,989</strong></td>
</tr>
<tr>
<td>Measures/Sector</td>
<td>Increase in GVA per annum</td>
<td>Increase in Output per Annum</td>
<td>Corresponding Sector</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------</td>
<td>------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Measure 121</td>
<td>0.423</td>
<td>0.805</td>
<td>Agriculture</td>
</tr>
<tr>
<td>Measure 123</td>
<td>3.365</td>
<td>19.022</td>
<td>Food Products</td>
</tr>
</tbody>
</table>
## IO Analysis: Indicative Findings - Cyprus

Table 3: Impact Analysis, Cyprus (average annual effects compared to 2008; ml Euros; % change)

<table>
<thead>
<tr>
<th>Type of Effect</th>
<th>Change in output</th>
<th>%</th>
<th>Change in GVA</th>
<th>%</th>
<th>Change in Employment (persons)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Investment Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure 121</td>
<td>82,76</td>
<td>0,238</td>
<td>32,36</td>
<td>0,231</td>
<td>1142</td>
<td>0,290</td>
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<tr>
<td>Measure 123</td>
<td>12,64</td>
<td>0,036</td>
<td>4,91</td>
<td>0,035</td>
<td>189</td>
<td>0,048</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>95,40</strong></td>
<td><strong>0,275</strong></td>
<td><strong>37,27</strong></td>
<td><strong>0,266</strong></td>
<td><strong>1330</strong></td>
<td><strong>0,338</strong></td>
</tr>
<tr>
<td><strong>b) Capacity-Adjustment Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure 121</td>
<td>1,04</td>
<td>0,003</td>
<td>0,48</td>
<td>0,003</td>
<td>16</td>
<td>0,004</td>
</tr>
<tr>
<td>Measure 123</td>
<td>28,06</td>
<td>0,081</td>
<td>7,03</td>
<td>0,050</td>
<td>233</td>
<td>0,059</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>29,10</strong></td>
<td><strong>0,084</strong></td>
<td><strong>7,51</strong></td>
<td><strong>0,054</strong></td>
<td><strong>249</strong></td>
<td><strong>0,063</strong></td>
</tr>
<tr>
<td><strong>c) Total Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure 121</td>
<td>83,80</td>
<td>0,241</td>
<td>32,84</td>
<td>0,235</td>
<td>1157</td>
<td>0,294</td>
</tr>
<tr>
<td>Measure 123</td>
<td>40,70</td>
<td>0,117</td>
<td>11,94</td>
<td>0,085</td>
<td>422</td>
<td>0,107</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>124,50</strong></td>
<td><strong>0,359</strong></td>
<td><strong>44,78</strong></td>
<td><strong>0,320</strong></td>
<td><strong>1579</strong></td>
<td><strong>0,402</strong></td>
</tr>
</tbody>
</table>
IO Analysis: Indicative Findings - Cyprus

<table>
<thead>
<tr>
<th>Type of Effect</th>
<th>New Jobs per ml Euro</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Investment Effects</strong></td>
<td></td>
</tr>
<tr>
<td>Measure 121</td>
<td>42,62</td>
</tr>
<tr>
<td>Measure 123</td>
<td>44,94</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>42,93</td>
</tr>
<tr>
<td><strong>b) Capacity-Adjustment Effects</strong></td>
<td></td>
</tr>
<tr>
<td>Measure 121</td>
<td>0,59</td>
</tr>
<tr>
<td>Measure 123</td>
<td>55,45</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>8,03</td>
</tr>
<tr>
<td><strong>c) Total Effects</strong></td>
<td></td>
</tr>
<tr>
<td>Measure 121</td>
<td>43,20</td>
</tr>
<tr>
<td>Measure 123</td>
<td>100,40</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>50,96</td>
</tr>
</tbody>
</table>
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 ⇒ 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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