CBA Complements: Dynamic Effects

CAF - ECLAC

P. Rozas & J. Rivera

Buenos Aires, June 2008

Variables and Information Sources

- Household Survey for different years in the countries studied
  - Bolivia: Continuous Household Survey 1999,2000, 2002, 2003
  - Brazil: National Household Sample Survey (PNAD) 1996, 1997,1999, 2001, 2003, and 2005
  - Chile: Social & Economic Characterization Survey (CASEN) for years 1996, 1998, 2000, 2003 and 2006
- CEPALSTAT (ECLAC´s Statistics Database): BADEINSO bases, Poverty in Latin America, and Economic Statistics and Indicators
- Reports and statistics supplied by the Bolivian Highway Administration (Bolivia), the Ministry of Public Works of Chile, and the Transport Ministry (Brazil)
- World Bank's World Development Indicators
- International Telecommunication Union Database (2007)

Collected Data

- **Growth & Employment Variables:**
  - GDP per capita
  - GDP by levels
  - GDP growth rate
  - Urban unemployment rates
- **Education:**
  - Illiteracy rate
  - School attendance percentage (within different age ranges)
  - Spending on education as a percentage of the GNP
  - Per capita education spending in constant 2000 US dollars
- **Public Spending Variables:**
  - Public spending as a percentage of the GDP
  - Social spending as a percentage of public spending

- **Poverty & Inequality Variables:**
  - Gini index
  - Income of first decile over tenth decile
  - Percentage of population living in poverty
- **Health Variables:**
  - Mortality
  - Child mortality
  - Life expectancy
- **Infrastructure:**
  - Kilometers of highways per capita
  - Number of beds per capita
  - Telephone land lines per 100 inhabitants

Information Problems

- In almost all variables mentioned, no continuous information is available for long time horizons; hence it was necessary to **interpolate** certain data in order to produce a continuous series

- Poor infrastructure data

- In spite of the interpolation, the information obtained in relation to road infrastructure was not complete enough to be included in the analysis

Road Information

- Brazil: information was obtained for years 2001-2005
- Bolivia: only data for the 2000-2002 period were supplied.
- Bolivia: even if information about the trunk highway system (managed by the Bolivian Highway Administration) were available, it would still be complicated to determine whether expansions were due to the transfer of roads that had been previously managed by local governments (artificial network growth), or to the construction of new road legs

Alternative

Investment in Highways ➔ Aggregate Public Spending

Model: VAR

$$g(tfijo) = \beta_0 + \sum_1^i \beta_{1i} pbi\_per_{t\_i} + \sum_1^i \beta_{2i} educ13\_19_{t\_i} + \sum_1^i \beta_{3i} gpub\_pbi_{t\_i} + \sum_1^i \beta_{4i} camas\_per_{t\_i}$$

$$h(educ13\_19) = \gamma_0 + \sum_1^i \gamma_{1i} tfijo_{t\_i} + \sum_1^i \gamma_{2i} pbi\_per_{t\_i} + \sum_1^i \gamma_{3i} gpub\_pbi_{t\_i} + \sum_1^i \gamma_{4i} camas\_per_{t\_i}$$

$$i(gpub\_pbi) = \delta_0 + \sum_1^i \delta_{1i} tfijo_{t\_i} + \sum_1^i \delta_{2i} educ13\_19_{t\_i} + \sum_1^i \delta_{3i} pbi\_per_{t\_i} + \sum_1^i \delta_{4i} camas\_per_{t\_i}$$

$$j(camas\_per) = \lambda_0 + \sum_1^i \lambda_{1i} tfijo_{t\_i} + \sum_1^i \lambda_{2i} educ13\_19_{t\_i} + \sum_1^i \lambda_{3i} pbi\_per_{t\_i} + \sum_1^i \lambda_{4i} gpub\_pbi_{t\_i}$$

Variables

pbi_per	:	GDP per capita
tfijo	:	Landline telephone teledensity per 100 inhabitants (represents telecommunications infrastructure)
educ13_19	:	Percentage of 13 to 19 year-olds attending an educational institution
Gpub_pbi	:	Public spending as a percentage of the GDP
Camas_per	:	Number of beds (health infrastructure)
I	:	Coefficient that may range between 1 and 2

Results and Analysis

- Causality Test
- Significance of estimated parameters

Bolivia:

- The model indicates that the *pbi_per* variable equation depends in a positive manner on its own lag, as well as on the communication infrastructure (*tfijo*), school attendance, and health infrastructure (*camas_per*) lags.

- The communication equation depended significantly on the GDP lag.

- School attendance of children aged 13 to 19 shows a positive relation with its own lag, as well as with the per capita GDP (*pbi_per*) and health infrastructure lags. The relations observed in this variable, however, do not seem to be significant.

Bolivia:

```
              |      Coef.    Std. Err.       z     P>|z|     [95% Conf. Interval]
--------------+----------------------------------------------------------------
pbi_per       |
pbi_per       |
          L1  |   .4575265    .1706171     2.68    0.007      .123123       .79193
tfijo         |
          L1  |   19.32449    10.38941     1.86    0.063    -1.038371     39.68736
educ13_19     |
          L1  |   27.10207    7.603141     3.56    0.000     12.20019     42.00396
gpub_pbi      |
          L1  |  -.2220801    3.474875    -0.06    0.949     -7.03271      6.58855
camas_per     |
          L1  |   95.55259    50.27609     1.90    0.057    -2.986748     194.0919
_cons         |  -2007.576    557.4258    -3.60    0.000    -3100.111    -915.0416
--------------+----------------------------------------------------------------
```

Bolivia:

```
tfijo           |
pbi_per         |
          L1 |     .012472    .0059817       2.09    0.037     .0007482     .0241958
tfijo           |
          L1 |    .3512085    .3642412       0.96    0.335    -.3626912     1.065108
educ13_19       |
          L1 |   -.1319102    .2665578      -0.49    0.621    -.6543539     .3905335
gpub_pbi        |
          L1 |    .1257523    .1218253       1.03    0.302    -.1130209     .3645255
camas_per       |
          L1 |    1.536072    1.762625       0.87    0.383    -1.918609     4.990753
_cons           |   -.6237198    19.54274      -0.03    0.975    -38.92678     37.67934
```

Bolivia:

Graphs by irfname, impulse variable, and response variable
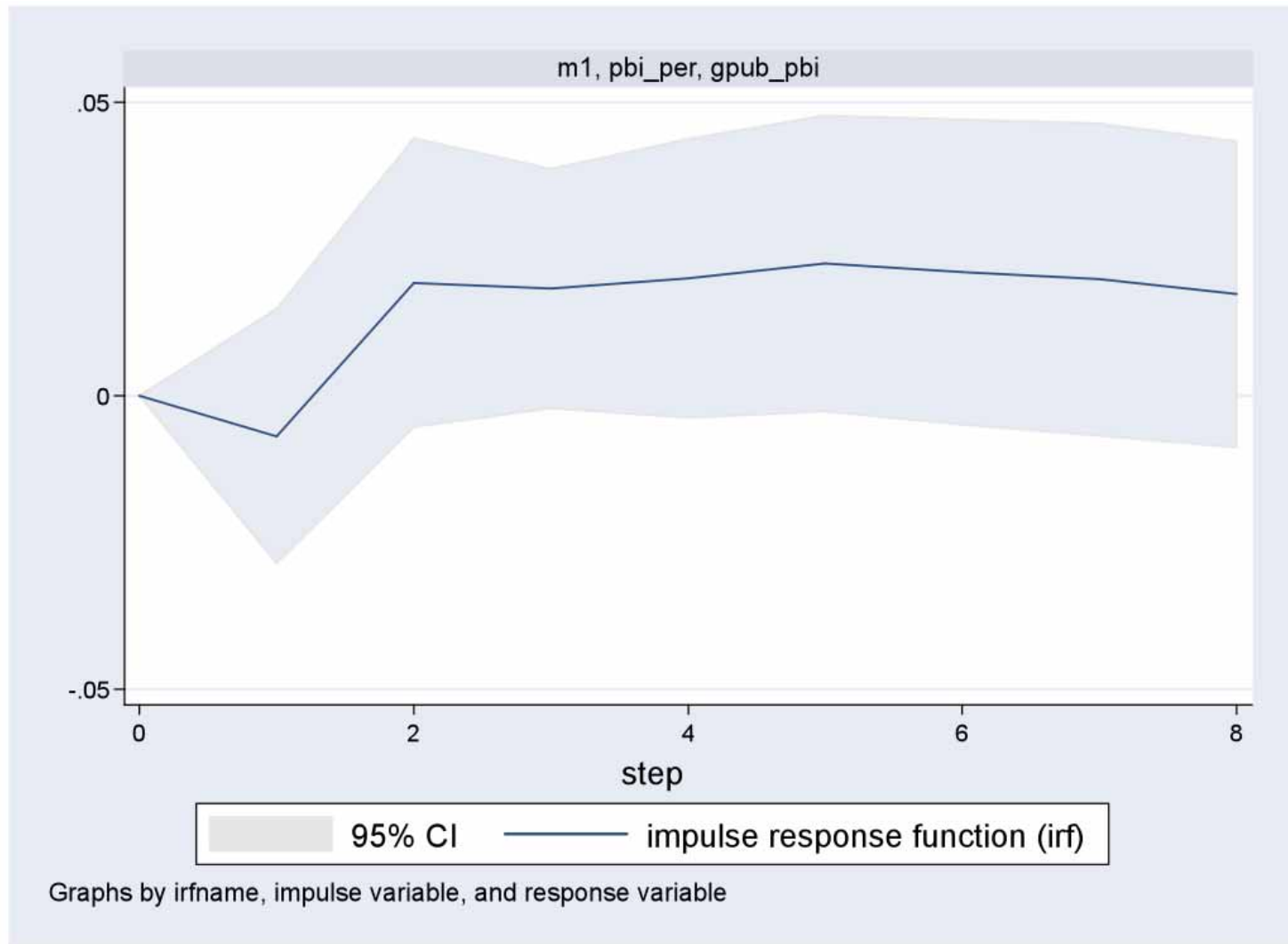
Brazil:

- Ecoefficient associated to the *tfijo* variable in the GDP per capita equation, it shows an insignificant negative sign. The impulse of this variable has a positive impact in the mid-term.

- School attendance of 13 to 19 year-old children yields an interesting result: the negative coefficient of such variable in the GDP per capita equation happens to be unexpected; yet, when the indirect effects of the educational factor are included, the initial effect is reverted as from the first year and remains that way until the third year; this would be indicative of the productivity gains from education.

- Public spending as a percentage of the GDP shows an insignificant negative sign in the GDP per capita equation.

Brazil:

Graphs by irfname, impulse variable, and response variable
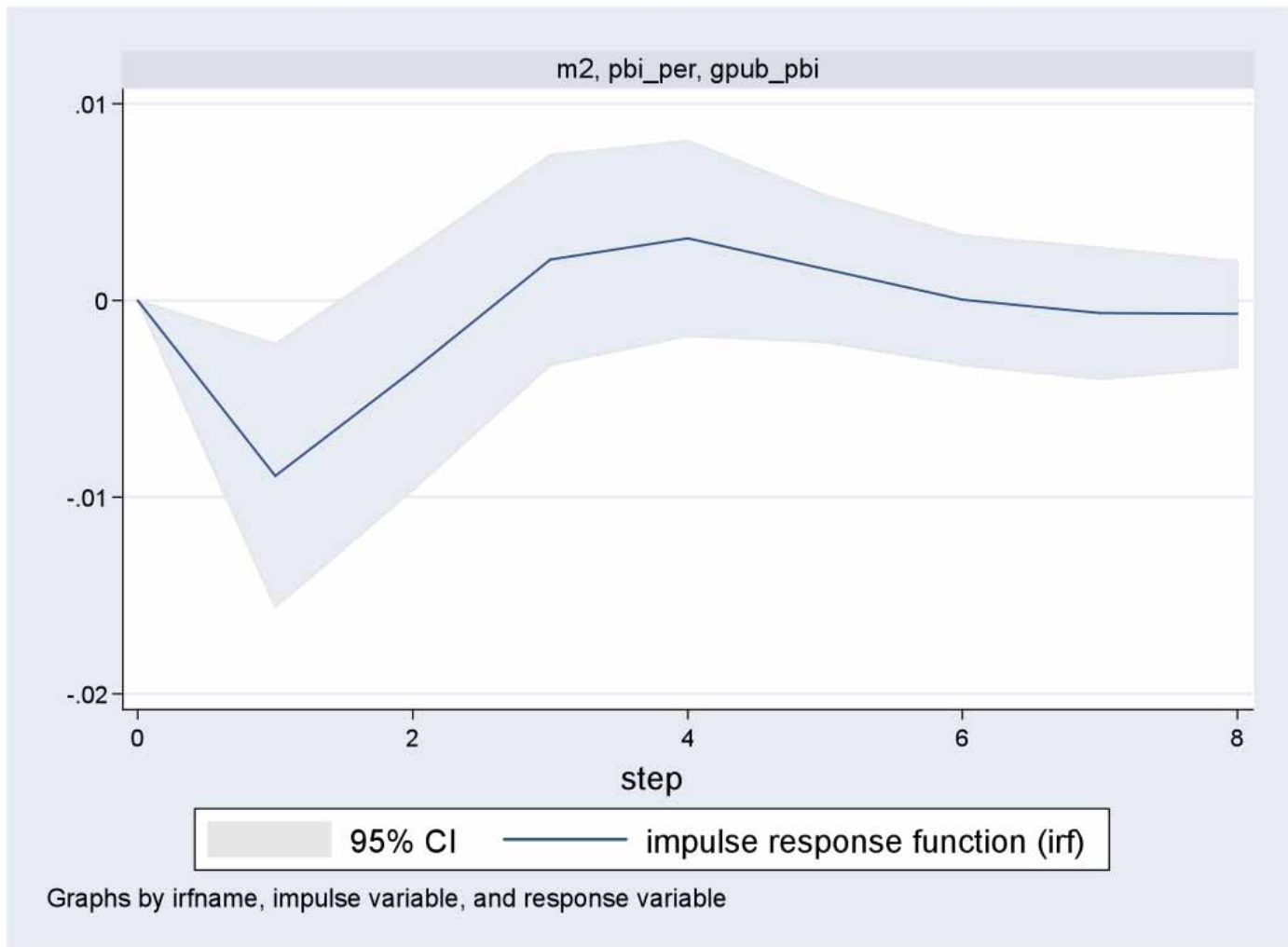
Conclusions

- The dynamic effects may be quantified through the VAR model.

- Considers the existence of endogenous effects that may change the overall sign of the impact of a variable on the GDP

- May be estimated with better information

- Elasticities may be obtained

- May be disaggregated at geographic level

Conclusions

- CBA complementary method

- Defects:
  - Highly information-demanding
  - Does not discriminate by type of investment