Japanese National Accounts: Estimation Methodology

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Nihon University Population Research Institute

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The views and opinions expressed in this paper are the author’s only; ESRI does not share them.
0. Introduction

• What Are National Accounts?
  – The most essential and comprehensive economic statistics
    • Overall and detailed description of economic development
    • From flow to stock
    • Both in nominal, real, and price terms
    • Integration of basic source data
  – Established world standards
    • Academic background
    • *System of National Accounts 1993*
    • Time-series, cross-country, and regional comparisons
    • Consistency with other economic statistics
0. Introduction (continued)

• National Accounts in Japan
  – A long history…started in the Meiji era.
  – High quality, greater detail, and timeliness
  – Widely used: policymaking, economic analyses, and forecasts
  – Missions of Department of National Accounts
    • Publication of annual estimates (contain approximately 70 different kinds of tables, some in both nominal and real terms; and some in both annual and quarterly terms)
    • Publication of flash estimates (approximately six weeks later)
    • Other issues (research on satellite accounts, etc.)
1. National Accounts: Overview and Key Concepts

- Sequence of Accounts
  - Production, income, current and capital expenditure, and stock

- Sector Classification
  - Households, general government, financial/non-financial corporations, NIPSH

- Price and Volume Measurement

- Some Definitions
  - Difference between consumption and investment
Chart 1: Sequence of Accounts – simplified case of households

1) Production

Output

<table>
<thead>
<tr>
<th>Intermediate input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value added</td>
</tr>
</tbody>
</table>

2) Income generation

Value added

<table>
<thead>
<tr>
<th>Tax less subsidies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption of fixed capital</td>
</tr>
<tr>
<td>Compensation of employees</td>
</tr>
<tr>
<td>Operating surplus</td>
</tr>
</tbody>
</table>
### Chart 1 (continued)

#### 3) Income distribution

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation of employees</td>
<td></td>
</tr>
<tr>
<td>Operating surplus</td>
<td></td>
</tr>
<tr>
<td>Property income, receivable</td>
<td></td>
</tr>
<tr>
<td>Social benefits</td>
<td></td>
</tr>
<tr>
<td>Other current transfers, receivable</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Property income, payable</td>
<td></td>
</tr>
<tr>
<td>Tax on income, wealth, etc.</td>
<td></td>
</tr>
<tr>
<td>Social contributions</td>
<td></td>
</tr>
<tr>
<td>Other current transfer, payable</td>
<td></td>
</tr>
<tr>
<td>Disposable income</td>
<td></td>
</tr>
</tbody>
</table>

#### 4) Use of income

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposable income</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditure</td>
<td></td>
</tr>
<tr>
<td>Saving, net</td>
<td></td>
</tr>
</tbody>
</table>
### Chart 1 (continued)

5) Changes in capital

<table>
<thead>
<tr>
<th>Saving, net</th>
<th>Gross capital formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital transfers, receivable</td>
<td>(less) consumption of fixed capital</td>
</tr>
<tr>
<td>(less) Capital transfer, payable</td>
<td>Net lending (borrowing if negative)</td>
</tr>
</tbody>
</table>

6) Financial account

<table>
<thead>
<tr>
<th>Changes in financial liabilities</th>
<th>Changes in financial assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net lending (borrowing if negative)</td>
<td></td>
</tr>
</tbody>
</table>

7) Balance sheet (changes)

<table>
<thead>
<tr>
<th>Changes in financial liabilities</th>
<th>Changes in non-financial assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in net worth due to saving and capital transfers</td>
<td></td>
</tr>
<tr>
<td>Changes in net worth due to nominal holding gains/losses, etc</td>
<td></td>
</tr>
</tbody>
</table>

Opening balance sheet + 5) + 6) + revaluation, etc = Closing balance sheet
# Chart 2: Sectors in National Accounts

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sub-sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-financial Corporations</td>
<td>Private NFC</td>
</tr>
<tr>
<td></td>
<td>Public NFC</td>
</tr>
<tr>
<td>Financial Corporations</td>
<td>Private FC</td>
</tr>
<tr>
<td></td>
<td>Public FC</td>
</tr>
<tr>
<td>General Government</td>
<td>Central Government</td>
</tr>
<tr>
<td></td>
<td>Local Governments</td>
</tr>
<tr>
<td></td>
<td>Social Security Funds</td>
</tr>
<tr>
<td>Non-profit Institutions Serving Households</td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td></td>
</tr>
</tbody>
</table>
2. Methodology I : Frameworks for Nominal Figures

• Benchmark Year Estimates
  – Most detailed information available
  – Input-Output tables, Population Census, and other comprehensive surveys (available every five years)
  – Commodity-flow method

• Annual Estimates
  – Using detailed annual data with extrapolation
  – Commodity-flow method
  – Expenditure, production and income accounts
Chart 3: Input-Output and National Accounts

Intermediate Input
item 1, 2, …

Final Demand
Consumption, Investment

Output

GDE

Value Added
GDP = GDI

Output
## Chart 4: Components of GDE and GDI (GDP)

<table>
<thead>
<tr>
<th>GDE</th>
<th>GDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private consumption expenditure</td>
<td>Compensation of employees</td>
</tr>
<tr>
<td>Household consumption expenditure</td>
<td>Wages and salaries</td>
</tr>
<tr>
<td>NPISH consumption expenditure</td>
<td>Social contributions by employer</td>
</tr>
<tr>
<td>Government consumption expenditure</td>
<td>Tax on production and imports</td>
</tr>
<tr>
<td>Gross capital formation</td>
<td>(less) Subsidies</td>
</tr>
<tr>
<td>Gross fixed capital formation</td>
<td>Operating surplus and mixed income</td>
</tr>
<tr>
<td>Private investment</td>
<td></td>
</tr>
<tr>
<td>Public investment</td>
<td></td>
</tr>
<tr>
<td>Changes inventories</td>
<td></td>
</tr>
<tr>
<td>Net exports of goods and services</td>
<td>Consumption of fixed capital</td>
</tr>
<tr>
<td>Exports</td>
<td></td>
</tr>
<tr>
<td>Imports</td>
<td></td>
</tr>
</tbody>
</table>
Chart 5: Commodity-flow Method

- Import
- Export
- Inventory (finished goods, work-in-progress)
- Total Supply
- Trade/Transport Margins
- Inventory (wholesale/retail trade)
- Fixed Capital Formation
- Household Consumption
- Intermediate Consumption
- Inventory (materials/supplies)

Are components of GDE
Chart 6: Production and Income

- GDP for (i)th industry: \( Y(i) \)
  - \( Y(i) = \text{output (i)} - \text{intermediate input (i)} \)

- Decomposition of GDI by industry
  - Operating surplus estimated as residual, alternatively directly estimated from basic source data
  - Operating surplus \((i) = Y(i) - CE(i) - TS(i) - CFC(i)\)
    - \( CE(i) \): Compensation of employees
    - \( TS(i) \): Tax less subsidies
    - \( CFC(i) \): Consumption of fixed capital
Chart 7: Annual Estimates and Benchmark Revision
3. Methodology II: Estimation of Real Figures

- **What Is Real Figure?**
  - Nominal = real x deflator (price)
  - Volume and quantity
  - How are quality changes captured?

- **Index Number Theory**
  - 3 major index formula; issues of aggregation
  - The “substitution bias” problem in ICT-led economy
  - Chain-linking method

- **Practical Application**
  - Data used, level of detail, and introduced countries.
## Chart 8: Index Number Formula

<table>
<thead>
<tr>
<th>Type</th>
<th>Volume Index</th>
<th>Price Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paasche Index</td>
<td>$PV_t = \frac{\sum P_t Q_t}{\sum P_t Q_0}$</td>
<td>$PP_t = \frac{\sum P_t Q_t}{\sum P_0 Q_t}$</td>
</tr>
<tr>
<td>Laspeyres Index</td>
<td>$LV_t = \frac{\sum P_0 Q_t}{\sum P_0 Q_0}$</td>
<td>$LP_t = \frac{\sum P_t Q_0}{\sum P_0 Q_0}$</td>
</tr>
<tr>
<td>Fisher Index</td>
<td>$FV_t = \sqrt{LV_t \times PV_t}$</td>
<td>$FP_t = \sqrt{LP_t \times PP_t}$</td>
</tr>
</tbody>
</table>
Chart 9: Fixed-based and Chain-linking

- Example: Laspeyres Volume Index

**Fixed-based**

\[
LV_t = \frac{\sum P_{i,0}Q_{i,t}}{\sum P_{i,0}Q_{i,0}} = \sum w_{i,0} \cdot \frac{Q_{i,t}}{Q_{i,0}}
\]

**Chain-linking**

\[
LV_t = LV_{t-1} \times \frac{\sum P_{i,t-1}Q_{i,t}}{\sum P_{i,t-1}Q_{i,t-1}} = LV_{t-1} \times \sum w_{i,t-1} \cdot \frac{Q_{i,t}}{Q_{i,t-1}}
\]
Chart 10: Comparison of Fixed-based and Chain-linking Methods – e.g. GDP deflator –
Digression : A Quiz

• Some Buzzwords in National Accounts; Do you know the meanings of the following words?
  – Contributions (how to calculate?)
  – Current/capital transfer
  – CFC
  – Gross and net (double meanings)
  – Accrual and cash accounting

• National Accounts as Statistics; What is the meaning of “estimation”?
4. Special Topics I: Households and Government Consumption Expenditures

- Imputation in HCE
  - Owner-occupied dwellings

- Concept of Government Expenditure
  - Non-market activities; output estimated from input data
  - Final demand by government = output by government (A) – commodity and non-commodity sales (B) + purchases by government (C)
  - Composition of GCE
    - Intermediate input
    - Compensation of government employees
    - CFC
    - Tax less subsidies
    - (less ) Commodity and non-commodity sales (B)
    - Social transfers in kind (C)
Chart 11: Estimation of Imputed Rents

• Composition of HCE
  – Domestic final consumption expenditure of households: 274 trillion yen for 2003
  – Imputed rents: 53 trillion yen for 2003

• Estimation method of imputed rents
  – Unit rent in housing market (for equivalent category (i)): $UR\ (i) \ (yen/m^2)$
  – Floor space of owner-occupied dwellings: $FSOD\ (i) \ (m^2)$
  – Imputed rents: $\Sigma IR\ (i) = UR\ (i) \times FSOD\ (i)$
Chart 12: Household and Government Consumption Expenditure

- Relationship Between Household Expenditure and Government Sales
- Treatment of Medical and Long-term Care Expenditures (Social transfers in kind)

![Chart Diagram]

- Intermediate input
  - Medical
  - Government
- Value added
- Output

<table>
<thead>
<tr>
<th>Intermediate input</th>
<th>Final demand</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>HCE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GCE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
</tr>
</tbody>
</table>
4. Special Topics II: Compensation of Employees, etc.

- Composition of Compensation of Employees
  - Compensation of employees = wage and salaries + social contributions

- Operating surplus and mixed income
  - Operating surplus for owner-occupied dwellings
  - Mixed income
    - Proprietors’ income = profit + wage
Chart 13: Treatment of Social Contribution and Social Security Benefits

• Social Security Pension System – One Case

Employers → Households → Social security funds → Households

- Compensation of employees
  - Wage and salaries
  - Social contributions by employer

- Social contribution
  - by employee
  - by employer

* Social benefits comprise a part of household income.
Other Issues

• Ongoing Benchmark Revision in Japan
  – Quinquennial revision (to be published from this coming December)
  – Major revisions under consideration (may be announced in the next month)
  – Introduction of a chain index (introduced in advance)

• SNA Update (revision in SNA93)
  – Reflect economic development thereafter
  – More detailed explanation
  – Expansion of accounts incorporating recent academic works
  – “Revision I” will be finalized in 2008.
References and Sources

References

• “System of National Accounts 1993” (UN)
  – Current world standard
• “European System of Accounts 1995” (Eurostat)
  – European standards, almost same as the SNA93
• “Annual Report on National Accounts” (ESRI, Japan)
  – Annual estimates of Japanese national accounts, with explanatory notes

Sources

  – Japanese SNA website in English.
• http://www.oecd.org/topicstatsportal/0,2647,en_2825_495684_1_1_1_1_1,00.html
  – Member countries’ national accounts database run by OECD.
  – UN webpage on main aggregates by country.
• http://dsbb.imf.org/Applications/web/sddsnsdppage/
  – IMF’s Data Standard webpage; a short-cut of “jumping” to national accounts webpage of major member countries.
Thank you for your attention 😊