Three approaches to measuring GDP

- Final expenditures: $C + I + G + (X - M)$
  - *Gross domestic product* in BEA accounts

- Income: (Compensation, taxes on production and imports less subsidies, gross operating surplus)
  - *Gross domestic income* in BEA accounts
  - GDP – GDI = *Statistical discrepancy*

- Production: Gross output less intermediate inputs
  - In BEA accounts, constrained to equal GDP

- In principle, all three approaches should produce identical results with complete information
Overview

- Review past research and BEA Advisory Committee discussions

- Discuss approaches for dealing with the discrepancy:
  - Improving source data and estimating methods
  - Averaging
  - Balancing and benchmarking

- Present BEA’s proposed plan to address these approaches
  - Request Committee’s feedback and advice
Statistical discrepancy: Past discussions

- May 2010
  - Nalewaik:
    - “statistical evidence strongly supports notion that GDP(I) is at least as good a measure of output as GDP(E)”
    - GDP(E) revises toward GDP(I) growth
    - GDP(I) has higher correlations with other cyclical series
  - Moulton – data timeliness and quality
  - Fixler – statistical support for weighted average
  - Nordhaus:
    - Signal extraction approach
    - Example based on Okun’s Law
    - Recent data suggest approximately equal weights
Statistical discrepancy: Past discussions

- **November 2011**
  - Rassier - research on sources of measurement error
    - Misreporting adjustments
    - Employee stock options
  - Fixler – research on revisions
    - Importance of revisions to seasonal adjustment factors
    - Improvements to source data and projection methods
  - Nordhaus:
    - “Two map problem” – weights based on variances
    - Combine income, expenditure with approx. equal weights

- Misreporting adjustments
- Capital gains and losses
- Employee stock options
- Produced intangibles
Statistical discrepancy: Past discussions

**May 2014**
- Strassner & Wasshausen – industry accounts
  - Benchmark GDI in a balanced I-O framework (eliminating discrepancy in benchmark period)
  - Introduce third “production measure” of GDP

**November 2014**
- Fixler – research on revisions
  - Regressions indicate early estimates of both GDP and GDI are informative about revised GDP
  - Weighted average would lead to modest reduction in revisions
Sources of the statistical discrepancy

- Sampling error
- Nonsampling error
  - Nonresponse
  - Misreporting
- Components that aren’t regularly benchmarked
- Timing differences
- Data gaps
- Conceptual/accounting differences
  - Adjustments to conform to national accounts concepts
Other BEA-affiliated research

▪ Rassier
  ▪ role of profits and income in statistical discrepancy
  ▪ *Survey of Current Business* Feb 2012

▪ Rassier, Howells, Morgan, Empey, and Roesch
  ▪ I-O balancing and reconciliation based on data quality
  ▪ *SCB* Dec 2007

▪ Chen
  ▪ balanced system of industry accounts and SD
  ▪ *J Bus and Econ Statistics* Apr 2012

▪ Chen, Di Fonzo, Howells, and Marini
  ▪ statistical reconciliation of time series accounts after benchmark revision
  ▪ Forthcoming, 2014 working paper

▪ Grimm
  ▪ statistical analysis across components, vintages
  ▪ BEA working paper, 2007

▪ Parker
  ▪ examined quality of source data across estimation cycle
  ▪ 2013 report
Approaches to dealing with discrepancy

- **Source Data**
  - Holdren, *SCB* June 2014 – data quality by vintage

- **Averaging**
  - Calculate *average GDP* as simple average of income, expenditure (and possibly output) measures
  - Maintain statistical discrepancies
  - Several ways to justify this approach
    - Measurement error; forecast combination; revision studies, etc.

- **Balancing/benchmarking** (supply-use integration)
  - Stone, Champernowne & Meade (1942)
    - Confront data inconsistencies and resolve them with measurement error model
  - Enforce accounting identities
  - Produce integrated, consistent estimates
## Averaging approach - Canada

<table>
<thead>
<tr>
<th>Income component</th>
<th>2014 Q4</th>
<th>Expenditure component</th>
<th>2014 Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation of employees</td>
<td>1,004.3</td>
<td>Final consumption expenditure</td>
<td>1,536.0</td>
</tr>
<tr>
<td>Gross operating surplus</td>
<td>561.6</td>
<td>Household</td>
<td>1,087.3</td>
</tr>
<tr>
<td>Gross mixed income</td>
<td>228.3</td>
<td>NPISH</td>
<td>28.4</td>
</tr>
<tr>
<td>Taxes less subsidies on production</td>
<td>77.4</td>
<td>General government</td>
<td>420.3</td>
</tr>
<tr>
<td>Taxes less subsidies on products and imports</td>
<td>122.4</td>
<td>Gross fixed capital formation</td>
<td>475.6</td>
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<tr>
<td><strong>Statistical discrepancy</strong></td>
<td>-1.4</td>
<td>Inventory investment</td>
<td>9.8</td>
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<tr>
<td>Exports of goods &amp; services</td>
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<td>623.3</td>
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<tr>
<td>Less: Imports of goods &amp; services</td>
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<td></td>
<td>653.4</td>
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<tr>
<td><strong>Statistical discrepancy</strong></td>
<td></td>
<td></td>
<td>1.4</td>
</tr>
<tr>
<td>GDP at market prices</td>
<td>1,992.6</td>
<td>GDP at market prices</td>
<td>1,992.6</td>
</tr>
</tbody>
</table>
Averaging – international examples

- **Canada**
  - GDP is average of income & expenditure methods
  - Statistical discrepancy on both sides
  - Annual fully balanced supply-use tables, but aren’t fully benchmarked to eliminate statistical discrepancy

- **UK**
  - Annual supply-use balancing eliminates discrepancy
  - Prior to balancing, GDP is based on output approach; discrepancies shown for income, expenditures

- **Australia**
  - Annual supply-use balancing eliminates discrepancy
  - Quarterly real GDP is average of three approaches
BEA to introduce average measure

- This July, the NIPAs will introduce a new series, "average of GDP and GDI"
  - **Current dollars**: simple, equally weighted average of GDP and GDI
  - **Chained dollars**: current-dollar value deflated by the GDP price index
  - Presented as an addenda item
    - Does not replace GDP as the headline estimate
  - Gives “official” status to a number that many users have been calculating
  - Shares & contributions to growth not available
Average of real GDP and real GDI

Real GDP, Real GDI, and the Average of Real GDP and Real GDI
2004:I to 2014:IV; Percent change, annual rate

Percent change from prior period, at annual rates

-9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9

GDP
GDI
Average of GDP and GDI
Longer term – Improve the reconciliation process

- Currently, industry accounts are fully integrated and balanced, controlling to the expenditure estimate
- Longer term, BEA would like to improve processes for reconciling the national and industry estimates
  - Reconcile & harmonize methodologies
  - Make (supply) & use tables would be balanced and reconciled confronting all three approaches
  - Balancing would reflect data quality
  - For fully reconciled estimates, GDI would be benchmarked and statistical discrepancy would be eliminated for period
    - Begin with **benchmark years**
    - Next step – **annual** estimates for year T–2
## BEA annual feedback

### Industries

<table>
<thead>
<tr>
<th>Agriculture</th>
<th>Mining</th>
<th>Construction</th>
<th>Manufacturing</th>
<th>Transportation</th>
<th>Trade</th>
<th>Finance</th>
<th>Services</th>
<th>Other</th>
<th>Total Internal Use</th>
<th>Final Uses (GDP)</th>
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<td>GDP</td>
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### Total Commodity Output

### Commodity Feedback

### Commodity

- Agriculture
- Minerals
- Construction
- Manufacturing
- Transportation
- Trade
- Finance
- Services
- Other
- Noncomp imports

### Total II

### Value Added

- Comp
- TLS
- GOS
- Total VA

### Total Industry Output
Example of gains from feedback (benchmark years)

- For most recent NIPA benchmark revision (2007 reference year – released in 2013)
  - Overall revision to PCE for goods was small (less than 0.1 percent)
    - but significant revisions to some categories:
      - PCE for “Other” Video Equipment
        - Video recorders, cameras, and DVD devices
        - Revised down $5.5 billion, or 23 percent
      - PCE for Therapeutic Medical Equipment
        - Revised up $2.6 billion, or 12 percent
Improved annual reconciliation & benchmarking

- Motivation:
  - Improve the consistency of integrated national level data that link industry production, final demand, and income

- Keys to project:
  - More collaboration among analysts sharing information on methodologies and estimates
  - Flexibility to adapt methodologies to improve consistency
  - Improved confrontation of alternative data

- Eventually, may consider improved reconciliation of quarterly national and industry estimates
  - Allow NIPAs to benefit from industry output data
  - Industry accounts to further benefit from reconciling expenditure and income data
Questions for committee?

- Does the Committee endorse the publication of average of GDP & GDI?
- Should BEA consider eventually adopting the average of GDP & GDI as its featured quarterly GDP measure?
- Does the Committee endorse benchmarking GDI in a fully integrated I-O framework, with a resultant SD that equals zero?
- Would BEA also need to publish a pre-benchmarked version of the estimates?