Aggregation Issues in Integrating and Accelerating BEA's Accounts

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on Architecture for the National Accounts

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Motivation for the Research

- Real value added growth for "all industries" from the GDP by Industry Accounts does not necessarily equal real GDP growth from the NIPA expenditure estimates

- Published industry contributions do not sum to real GDP growth, partly due to the differences in real growth rates

- These aggregates are conceptually equivalent, but they differ due to methodology, source data, and other factors

- Similar aggregation and contributions issues arise for the recent accelerated GDP by Industry estimates

Preview of Conclusions

- More consistent source data--regardless of methodology--should improve results

- Consistent data used within a consistent framework yields the same real GDP growth

- Same "exact" contributions formula used for the NIPA's can also be used for GDP by Industry

GDP by Industry Accounts

- Nominal estimates are based on the income-side NIPA estimates, <u>including</u> the statistical discrepancy

- Real estimates for 66 industries are obtained by double-deflation in a modified *production approach* framework

- Production approach estimate for "All industries" is computed in a single-stage Fisher formula to avoid "consistency in aggregation" issues

- "All industries" estimate is not published to avoid confusion with the NIPA expenditures GDP estimate

NIPA GDP vs. "All Industries"
Real Growth Rates, 1988 - 2001

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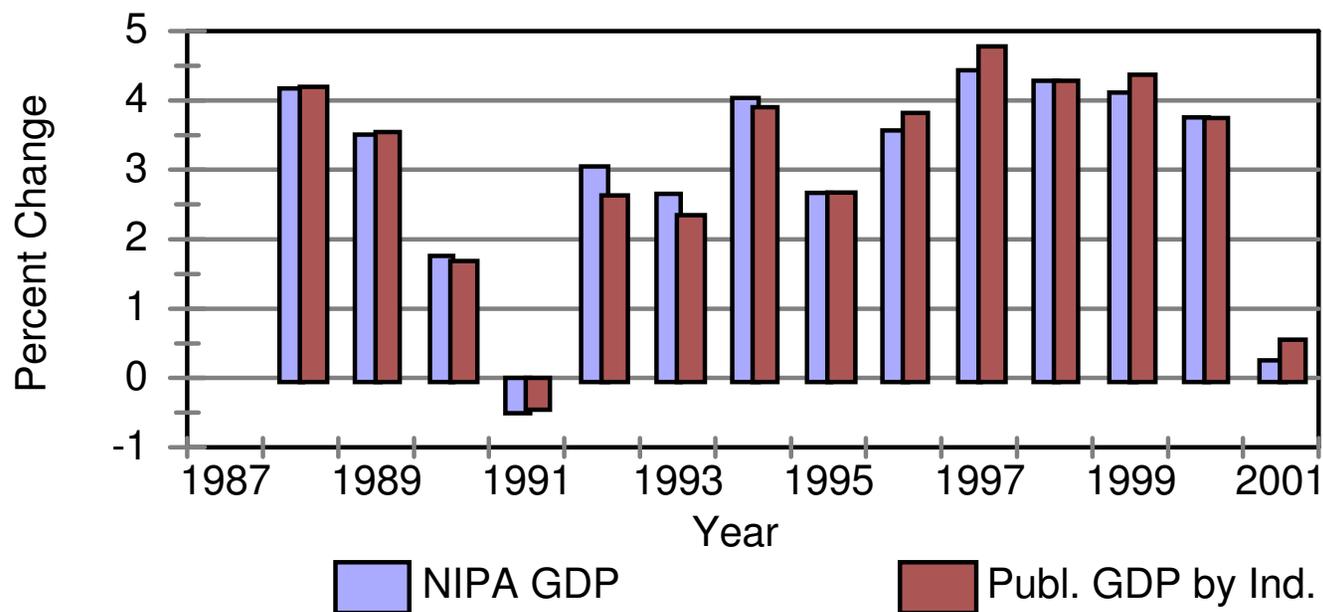
Industry Shares of GDP and Contributions to Real GDP Growth

	Shares			Contributions		
Industry Group	1999	2000	2001	1999	2000	2001
Gross domestic product	**100.0**	**100.0**	**100.0**	**4.1**	**3.8**	**0.3**
Private goods-producing industries	23.1	22.9	21.6	1.1	0.8	-1.0
Private services-producing industries	64.9	66.0	66.8	3.2	3.5	1.2
Government	12.4	12.4	12.7	0.2	0.3	0.2
Subtotal	**100.4**	**101.3**	**101.2**	**4.5**	**4.6**	**0.4**
Statistical discrepancy	-0.4	-1.3	-1.2	-0.1	-0.9	0.1
Not allocated by industry	NA	NA	NA	-0.3	0.1	-0.2

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Sources of Differences

- Treatment of the statistical discrepancy

- Methodology and source data

- Deflation and aggregation procedures

- Industry contributions formula

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Treatment of the Statistical Discrepancy

- Balancing item between the expenditures and income approaches to measuring GDP

- Included in the GDP by Industry Accounts as an "industry" for the same reason

- Deflated with the GDP "business sector" price index, reflecting BEA's views on its location

- Large swings can have a big impact on industry contributions to real GDP growth

Methodology and Source Data

- NIPA's follow the expenditures approach based on detailed final uses valued in purchaser's prices

- GDP by Industry uses a variant of the production approach with less detailed data--especially for nonmanufacturing industries--valued in producer's prices

- Source data within the industry accounts are not necessarily consistent (Census/BLS/IRS)

Input-Output Use Table

		INDUSTRIES										FINAL USES (GDP)							TOTAL COMMODITY OUTPUT
		Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Service	Other	Total Intermediate Use	PCE	PFI	CBI	X	M	GOV	GDP	
C O M M O D I T I E S	Agriculture																		
	Minerals																		
	Construction																		
	Manufacturing																		
	Transportation																		
	Trade																		
	Finance																		
	Services																		
	Other																		
	Noncomparable imports																		
	Total Intermediate inputs																		
VALUE ADDED	COMP																		
	IBT																		
	Other value added																		
	Total																		
TOTAL INDUSTRY OUTPUT																			

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Deflation and Aggregation

- Fisher-Ideal aggregation is used for both the NIPA expenditures and GDP-by-industry production approaches

- Deflation is performed at a more detailed product level for each of the NIPA expenditures categories

- Consistent data should yield the same real GDP estimate using either approach

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Industry Contributions Formula

- Current industry contributions formula is not exact; rather it is a Laspeyres-based approximation

- The exact Fisher contributions formula used for the NIPA's could also be used for the industry accounts

- Use of this exact contributions formula should reduce the contribution that is "not allocated by industry"

- Advantages of the exact Fisher formula are greatest if aggregate growth rates are the same or very close

Research Database 1

- Annual Input-Output (I-O) Accounts
  - Nominal use and make tables for 1998-99 at the summary level (95 commodities/industries)
  - Commodity price indexes constructed from detail underlying the GDP by Industry Accounts
  - Key assumption is that a commodity has the same price everywhere it is used
  - Deflated 1999 table compared with the reflated 1998 table provides the relevant quantity indexes

Empirical Results

- Real growth rates were the same for both the expenditure and production approaches to measuring GDP

- Industry contributions based on the production approach summed exactly to real GDP growth using the exact Fisher formula

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Fisher Contributions by Final Uses and by Industry, 1999

	Final Use of Commodities	Industry Value Added
Agriculture	0.0	0.1
Minerals	-0.1	0.0
Construction	0.3	0.0
Manufacturing	0.6	0.4
Transport & Utilities	0.4	0.3
Trade	1.0	1.2
Finance, insurance & real estate	0.9	0.9
Services	1.0	1.1
Government	0.2	0.2
IVA	-0.3	-0.3
Noncomp. imports & used goods	-0.1	NA
TOTAL	4.0	4.0

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Research Database 2

- "Integrated" GDP by Industry
  - Constrained to match 1992 benchmark I-O VA by industry and by major income component
  - Value added by industry for 1992 extrapolated with published NIPA income components
  - Constrained to match annual nominal GDP levels, with no statistical discrepancy
  - Deflated and aggregated to "all industry" level using published gross output and input deflators

Empirical Results Continued

- "Integrated" estimates slightly improved the "all industry" aggregate growth rates compared to GDP

- More improvement would be expected with a more systematic integration effort with better source data

NIPA GDP vs. "All Industries"
Published vs. Integrated GDP by Industry

Real Growth Rates

1997 - 2001

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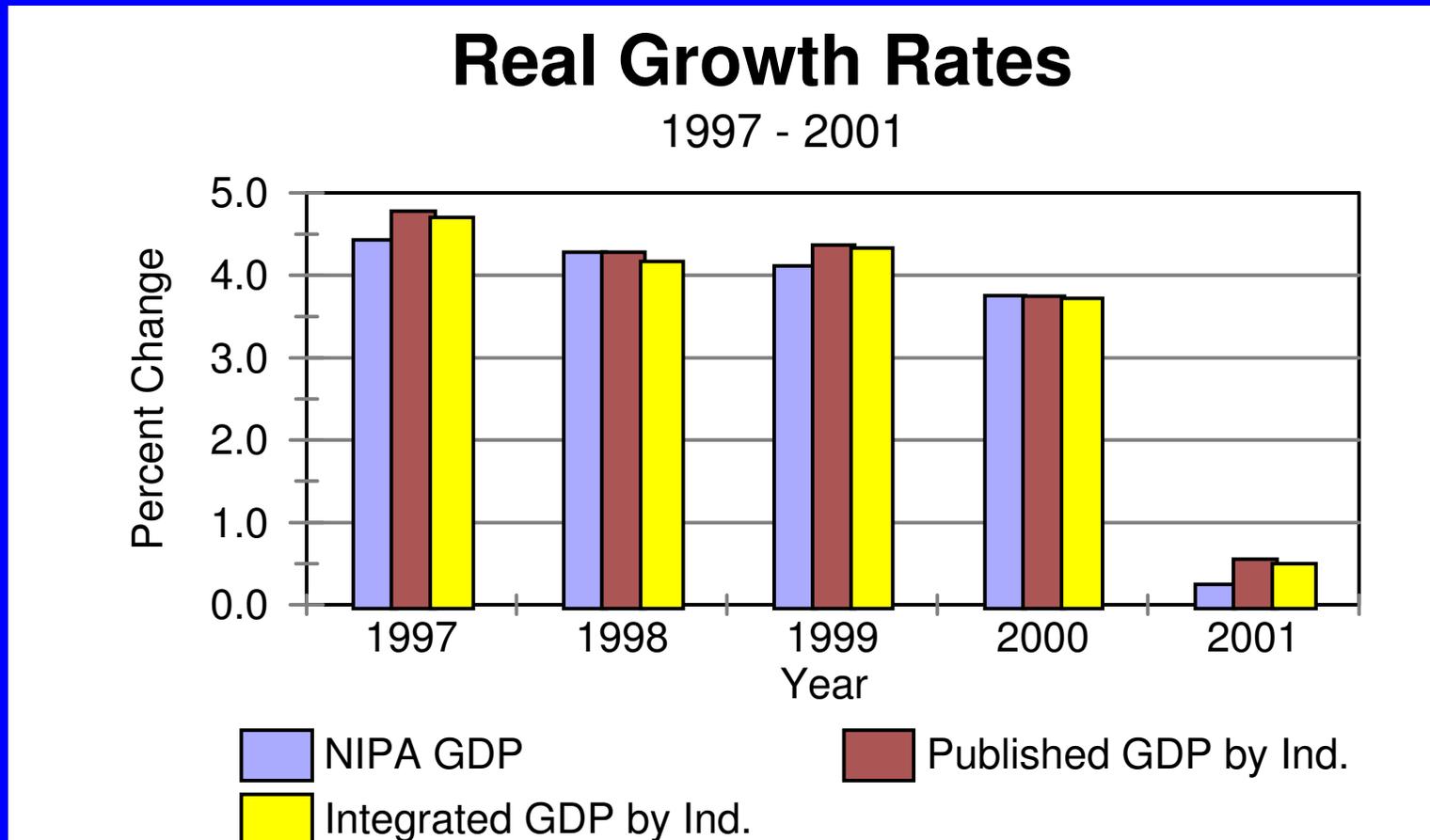
Conclusion and Future Work

- Implementation of the production approach in the GDP by Industry Accounts does not always yield the same real GDP growth as in the NIPA expenditures

- The most important factor appears to be the differences in source data and methodology

- A change in the industry contributions formula is a possible short-run improvement for GDP by Industry

- Future research includes applying Fisher-Ideal aggregation--including the exact contributions formula--to a more fully integrated time series of annual I-O accounts

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