



statistics for informed

decision making

Addressing cross cutting issues for SPPI's

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Why are we here?

- Establishing internationally comparable methodologies for service sector GDP
- Emphasis on SPPI's, classifications and turnover surveys
 - And bringing them together for GDP

Service Industry Statistics

- Unique services tailored to individual customers
- Pricing *mechanisms* that don't readily reflect the service delivered
 - How establishments bill their customers
- Tools & techniques used for goods don't always work
 - Different methods needed

The business of statistics



Constant balance required



Balancing conflicting priorities

- Time, \$ £ ¥ €



Balancing conflicting priorities

- Time, \$ £ ¥ €
- Final use of SPPI



Balancing conflicting priorities

- Time, \$ £ ¥ €
- Final use of SPPI
- Underlying conceptual model



Balancing conflicting priorities

- Time, \$ £ ¥ €
- Final use of SPPI
- Underlying conceptual model
- **Too much weight conceptually means survey never delivers**
 - **Time, cost, respondent burden, real data quality**

Balancing conflicting priorities

- Time, \$ £ ¥ €
- Final use of SPPI
- Underlying conceptual model
- **Too little weight conceptually means survey delivers wrong result**
 - **Unfit for purpose**

Wiesbaden 2006

- Common issues across different service types
- Need to articulate issues upfront
 - Rather than reiterate for each industry
- Need to discuss from the perspective of **Service Sector GDP**

Topics covered

- Industry vs. Product
- Exports
- Time based measures
- Challenge when confronted with new technology
- Bundling & Multi-modal solutions

A word on examples

- Examining *cross cutting issues*
- Discussion initiated by Road Freight and Management Consultancy from 2006
- Considering IT this year
- Examples will be based on services that best illustrate the problem
 - and include other service types

Product or Industry?

- Should we measure all the activities of establishments classified to an industry
 - Regardless of what the activities are?
- Should we measure specific activities
 - Regardless of which industry actually delivers them?

Example: consider two establishments

- *Management Inc.*
 - **HR management services**
 - Financial management services
 - Security broking and fund management
 - Insolvency and receivership management
 - Accounting and bookkeeping services
 - Legal representation in quasi-judicial tribunals
 - Executive search services
- *Arbeit Inc.*
 - **Executive search services**
 - Employment agency
 - HR management services
 - Supply of office support personnel
 - Market research
 - Marketing management consultancy services
 - Data processing

Industry: Management Consultancy Services

- *Management Inc.*
 - **HR management services**
 - Financial management services
 - Security broking and fund management
 - Insolvency and receivership management
 - Accounting and bookkeeping services
 - Legal representation in quasi-judicial tribunals
 - Executive search services
- *Arbeit Inc.*
 - Executive search services
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 - HR management services
 - Supply of office support personnel
 - Market research
 - Marketing management consultancy services
 - Data processing

Industry: Employment Placement

- *Management Inc.*
 - HR management services
 - Financial management services
 - Security broking and fund management
 - Insolvency and receivership management
 - Accounting and bookkeeping services
 - Legal representation in quasi-judicial tribunals
 - Executive search services
- *Arbeit Inc.*
 - **Executive search services**
 - Employment agency
 - HR management services
 - Supply of office support personnel
 - Market research
 - Marketing management consultancy services
 - Data processing

Product: Management Consultancy

- *Management Inc.*
 - **HR management services**
 - Financial management services
 - Security broking and fund management
 - Insolvency and receivership management
 - Accounting and bookkeeping services
 - Legal representation in quasi-judicial tribunals
 - Executive search services
- *Arbeit Inc.*
 - ~~Executive search services~~
 - ~~Employment agency~~
 - HR management services
 - Supply of office support personnel
 - ~~Market research~~
 - Marketing management consultancy services
 - ~~Data processing~~

Product: Employment Placement

- *Management Inc.*
 - HR management services
 - Financial management services
 - Security broking and fund management
 - Insolvency and receivership management
 - Accounting and bookkeeping services
 - Legal representation in quasi-judicial tribunals
 - Executive search services
- *Arbeit Inc.*
 - **Executive search services**
 - Employment agency
 - HR management services
 - Supply of office support personnel
 - Market research
 - Marketing management consultancy services
 - Data processing

What should we do?

- Measuring different things
- For GDP SNA93 recommends supply use framework
- Supply use framework requires SPPI's be **product based**
 - » National agencies may have additional uses for Industry SPPI's

Why does this arise?

- Ideally, define units such that each establishment only undertakes one activity
- Unrealistic ideal
 - Horizontal & vertical diversification
 - Similar production functions for different services
 - Different services often produced simultaneously

When can we substitute industry and products SPPI's?

- If individual products are produced by only one industry, and the industry produces no other products
- If price movements for secondary products align with those of primary products
 - And both move according to supply & demand rather than the industry that produces them

Why might this cause problems?

- Some services require specialist labour inputs
 - Different service products move differently even within the same industry
- Price discrimination is a key feature of service sector

Exports

- Distinction between resident and non-resident units crucial to measurement of GDP
- Export is the purchase of residential output by non-resident unit
- Not defined by *where* the activity takes places

Why does this arise?

- GDP is concerned with the measurement of all output
 - Not just business to business
 - Not just resident to resident
- Scope of SPPI's often B to B
 - Or if not, only concerned with domestic
- SPPI's need to *include exports*

Why might this cause problems?

- Prices may move differently for export markets
 - Potential bias if excluded
- “Customer substitution bias”
 - » “Outlet substitution” in CPI
- Volatility if observed data is changing mix of domestic/exports

Assessment needed

- Size of exports relative to size of total output
- Market behaviour
 - Price setting
- Ignoring exports assumes that the export market behaves identically to domestic market

Time based methods

- Methods based on working time
 - Hourly charge out
 - Turnover / hours worked
 - Models including significant proportions of time spent
- Frequent use in many SPPI's
- Known to be biased

Why do NSO's use time based methods?

- Service output cannot be readily defined
 - Measure instead in terms of key inputs
- Service varies with different customers
 - Use a model, with time spent a significant component
- Industry uses the pricing mechanism
 - Bills for service not fee per hour
- Compliance cost of other methods

The bias from time based methods

- Time based method is a compromise
 - Equates “service” with “time spent on service production”
 - Underlying assumption does not allow for changes in labour productivity
- For Services GDP, equivalent to saying that volume of output is equal to hours worked
 - Sector never grows except through more workers or same workers working longer hours

Example: An Architect

- Service is “design of a building”
- In year 0
 - Architect produces 12 building designs per year
 - Purchasers pay \$9,000 each
 - Total revenue \$108,000
 - 150 hours per design

Example: An Architect

- In year 1, uses new process
 - Computer Assisted Design (CAD)
- In year 1
 - Now produces 15 building designs per year
 - Purchasers still pay \$9,000 each
 - Total revenue \$135,000
 - CAD means 120 hours per design

What is the change in volume?

- Architect has increased output from 12 to 15 designs
- Volume has increased 25%
- But if we *didn't know the number of building designs*, how would national accountants derive this change from price and revenue data?

Using fee for service

- Year 0
 - Turnover
\$108,000
 - Price \$9,000

$$V^0 = P^0 Q^0$$

$$V^1 = P^1 Q^1$$

$$\frac{Q^1}{Q^0} = \frac{V^1}{V^0} \div \frac{P^1}{P^0}$$

- Year 1
 - Turnover
\$135,000
 - Price \$9000

$$= \frac{135,000}{108,000} \div \frac{9,000}{9,000}$$

$$= 1.25$$

$$\Delta Q = 25\%$$

How might a time based method work here?

- Total hours worked
= 12 designs by
150 hours/design
=1,800 hours
- Total hours worked
= 15 designs by
120 hours/design
=1,800 hours
- Realised revenue per hour
=\$108,000/1,800
=\$60
- Realised revenue per hour
=\$135,000/1,800
=\$75

Using time based method

- Year 0
 - Turnover
\$108,000
 - Price \$60/hour
- Year 1
 - Turnover
\$135,000
 - Price \$75/hour

$$V^0 = P^0 Q^0$$

$$V^1 = P^1 Q^1$$

$$\frac{Q^1}{Q^0} = \frac{V^1}{V^0} \bigg/ \frac{P^1}{P^0}$$

$$= \frac{135,000}{108,000} \bigg/ \frac{75}{60}$$

$$= 1.00$$

$$\Delta Q = 0\%$$

Detailed example

	Year 0	Year 1	Example
Price per design	9000	9000	9000
Designs per year	12	15	15
Turnover	108000	135000	135000
Hours per year	1800	1800	1800
Price per hour	60	75	75
Turnover change		25%	25%
Volume change		25%	25%
Price change		0%	0%
Change in price per hour		25%	25%
Derived volume change		0%	0%

Time based methods are biased

- If productivity improves
 - Price measures are biased upwards
 - Volume measures are biased downwards
 - Not mitigated through use of “staffing levels”
 - Although ignoring levels of expertise is worse

Would productivity measures help our architect?

- If some productivity measure indicated the change in production function (12 designs to 15 for same labour input) then a **quality adjustment** could be applied to the price index
 - Resource cost approach
- Volume measure would then be **unbiased**

What should we do?

- Time based methods will be used by NSO's
 - Compliance cost
- What can be done to mitigate the bias?
- Inform users of areas of risk!

Guidelines

- Do not use labour input costs for SPPI's
 - Better for national accountants to use labour price indexes
- Construct SPPI's from realised rates
 - **Actual** revenue per hour, not a forecast
- Avoid time based methods where subcontracting is used
- Define “bands of expertise”
 - More than just “staffing level”

Detecting changes in productivity

- Changes in roles, duties, outputs of staff
 - » Such as you might do for a labour price index
- Introduction of new technology
- Dedicated instruments
 - Extra questions on SPPI survey
 - » *Burden, cost*
 - Stand alone questionnaire
 - Other sources
 - Government agencies, industry associations
 - » Beware circularity
- Apply quality adjustment to reflect change in productivity



New technology

- Technology changes the production function
 - More output for same inputs
- Technology can also *change the product*
 - Different service
 - » Factors aside from technology can do this too of course, and this argument holds there as well

Why is this a problem?

- Change in product is a quality change
- Quality changes should appear as changes in volume in the national accounts
- Need to price to constant quality

Example

- Architect adopting CAD
- Blueprint design
- 3D model with interactive virtual tour
- Are these the same?



What should we do?

- Detect changes in technology
 - Or other influences on productivity
- Assess whether service is modified
 - Require expert assessment



Bundling

- Pricing *mechanism*
- Include many services on one bill
- Differences each period
 - Change in mix of customers
 - Change in mix of services
- Need technique for measuring prices & price change

Component Cost

- Establish a representative base model service
 - May be hypothetical
 - Components needs to be real
- Price individual components each period
- Price for service is aggregate of observed prices

Example: Telecommunications

Box 3. An example of component pricing

Pricing of local telephone services (called "unit value method") in the USA's PPI.³⁷

Average number per access line (weight) in the base period is obtained by dividing the total number of units for each type of charges by the total number of access lines.

Average revenue per unit in period t is obtained by dividing revenues for each type of charges by the total quantity used of each charge.

Weighted revenue in period t is calculated by multiplying average number per access line by average revenue per unit. The price is the sum of weighted revenues.

Type of charge	Average number per access line (a)	Average revenue per unit (b)	Weighted revenue (a) x (b)
Access line	1.000	26.7530	26.7530
Usage charges based on time:			
Peak minutes	162	0.2589	41.9418
Off-peak minutes	133	0.0824	10.9592
Roaming minutes	10	0.9722	9.7220
Usage charges other than time:			
Landline, per call	2	0.1500	0.3000
Other charges, daily rate	1	1.5000	1.5000
Features/Options and feature packages:			
Custom calling package	0.65	3.4600	2.2490
Call waiting	0.20	4.8500	0.9700
Call forwarding	0.10	5.1500	0.5150
3-way conference	0.05	5.7500	0.2875
No answer transfer	0.10	4.2500	0.4250
Voice messaging	0.20	4.8000	0.9600
Total (Price in period t)			96.5825

SPPI guide p37

Example: “Logistics Solution”

Component	Quantity	Average revenue per unit	Weighted revenue
Delivery of 40FE from Sydney (Port Jackson) to Canberra terminal	1	\$820	\$820
Transport of palette of beer from Canberra terminal to Supermarket distribution centre	72	\$12	\$864
Transport of palette of beer from Canberra terminal to Liquor wholesaler	5	\$19	\$95
Total price in period t			\$1,779

Problem?

- Suitable when components are all of the same service type
 - And fixed model service is representative
- What happens when “representative service” can’t be defined within service type?

More problematic example: “Logistics Solution”

Component	Quantity	Average revenue per unit	Weighted revenue
Delivery of 40FE from Sydney (Port Jackson) to Canberra terminal, including Stevedoring in Sydney and storage in Canberra for up to 2 weeks	1	\$2005	\$2005
Transport of palette of beer from Canberra terminal to Supermarket distribution centre	72	\$12	\$864
Transport of palette of beer from Canberra terminal to Liquor wholesaler	5	\$19	\$95
Total price in period t			\$2,964

The Problem

- Component cost is useful if service can be defined within a service classification
- Business operations don't always align with classifications
- Pricing mechanisms cross different business operations

Solutions?

- Define models to split our components into **fixed** different service types
 - Bills approach
 - Use of respondents internal pricing models
- Ongoing pricing might not be feasible
 - Pricing mechanisms may only exist for the aggregate
- Estimation of splitting factors
 - Reliability?
 - Ongoing representivity?
 - Burden?

Example with well defined components: “Logistics Solution”

Component	Quantity	Average revenue per unit	Weighted revenue
Stevedoring for beer shipment in Port Jackson	1	\$800	\$800
Delivery of 40FE from Sydney (Port Jackson) to Canberra terminal	1	\$820	\$820
Storage of palette of beer at Canberra Depot, 2 weeks	77	\$5	\$385
Transport of palette of beer from Canberra terminal to Supermarket distribution centre	72	\$12	\$864
Transport of palette of beer from Canberra terminal to Liquor wholesaler	5	\$19	\$95
<i>Total price in period t</i>			\$2,964

Example with estimated splitting factors: “Logistics Solution”

Component	Quantity	Average revenue per unit	Split factor	Weighted revenue
Delivery of 40FE from Sydney (Port Jackson) to Canberra terminal, including Stevedoring in Sydney and storage in Canberra for up to 2 weeks	1	\$2005		\$2005
<i>Stevedoring</i>			<i>0.40</i>	<i>802</i>
<i>Delivery</i>			<i>0.40</i>	<i>802</i>
<i>Storage</i>			<i>0.20</i>	<i>401</i>
Transport of palette of beer from Canberra terminal to Supermarket distribution centre	72	\$12		\$864
Transport of palette of beer from Canberra terminal to Liquor wholesaler	5	\$19		\$95
Total Road Freight in period t			<i>Delivery 802 + 864 + 95</i>	<i>\$1,761</i>
Total price in period t				\$2,964

More work required here

- How robust will this be?
 - And how much burden does this introduce?
- Can the Stevedoring and Storage estimates be used in their respective indexes?
 - Product SPPI's
 - » Timing?
- Can our CPI colleagues help?
 - Bundling of “phone, gas, water, internet” is the same example

Multi-modal solutions

- One service is consumed (used) in the production of another service
 - Example: Road Freight uses Sea Freight (Ferry)
- **Intermediate consumption** when provided by another establishment
- Production on **own-account** when provided by same establishment

What should we do?

- Supply Use approach to National Accounts requires measures of both outputs and intermediate consumption
- Road Freight SPPI should still include the road freight when it uses the ferry
 - Provided ferry service not produced on own account
- *Sea Freight should also include the ferry*

Double counting?

- Any combined SPPI measuring of both sea and road freight will include the ferry component twice
 - Once as part of Road Freight
 - Once as part of Sea Freight
- *Combined* SPPI has double counting!

Service Sector GDP

- SPPI for **national accountants** requires measure of **both components**
 - Double counting does not occur because the ferry service is measured as intermediate consumption
 - Use of SPPI occurs at product level, not aggregate level
- Recommendation is based on **needs of national accountants**
- Other uses require different solution
 - Service price index constructed on net sector approach

Summary

- **Product SPPI's over industry for GDP**
 - Industry useable under assumptions of price certain behaviour
- **Exports in scope of SPPI's**
 - Importance determined by size and price setting mechanisms

Summary

- Time based methods are biased
 - Need to account for productivity change
- New technology can change product itself as well as production function

Summary

- Bundling can be solved via component cost
 - Burden still an issue
 - » More work needed
- Services used as intermediate consumption still need to be measured for GDP
 - Double counting only an issue for other uses