



# **PFTAC GDP Compilation and Forecasting Workshop**

## **Measuring GDP by production**

Suva, Fiji

October 17-21, 2016

A decorative header featuring a world map in a light tan color, overlaid on a grid pattern. The map shows the continents of North and South America, Europe, and Africa.

# Session Outline

- The production account
- The production boundary
- The production account and value added
- Output
- Intermediate consumption
- Data sources

# Production account

- Starting point for the sequence of accounts
- Compiled for – institutional units, sectors, industries and also for the total economy
- **Examples:**
  - Production account for agriculture, manufacturing industries, etc.
  - Production account for financial corporations (banks, insurance companies, etc.), general government sector

# Production

- Production is an *activity* in which an enterprise uses inputs to produce outputs.
- It is a process carried out under the responsibility, control and management of an institutional unit
  - Where labour and assets are used to transform *inputs* of goods and services into *outputs* of other goods and services.
  - It does not cover purely natural processes without any human involvement or direction (e.g. natural fish stocks, wild forests)
- The production account describes this transformation and the *additional value* created through the production process.

# Production account

- Output from production - resources
- Intermediate consumption and consumption of fixed capital - uses
- Value added is the balancing item – intended to measure the value created by production
- At the economy level, resources include taxes less subsidies on products as well
  - Sum of GVA by sectors + T&S on prods = GDP

# Products

- Products are goods and services (including knowledge capturing products) that result from a production process
- A particular enterprise may be involved in production of goods / services or both
- **Example:** Boeing – manufactures airplanes (goods) and also provides engineering services (services).
- Can we tell this from your data?

# Goods

- Goods are **physical**, produced objects for which a **demand** exists, over which **ownership** rights can be established and whose ownership can be **transferred** from one institutional unit to another by engaging in transactions on markets.
- Ownership, existence of demand and transferability – main characteristics of goods
- Satisfy needs or wants of households or community or for production of other goods and services

# Services

- Services are the result of a production activity that changes the conditions of the consuming units, or facilitates the exchange of products or financial assets.
- Change effecting services
  - Change the conditions of goods (e.g. transport)
  - Change the physical condition of persons (e.g. medical, beautician services)
  - Change the mental condition of persons (e.g. educational, entertainment services)
- Margin services – trade and many financial services

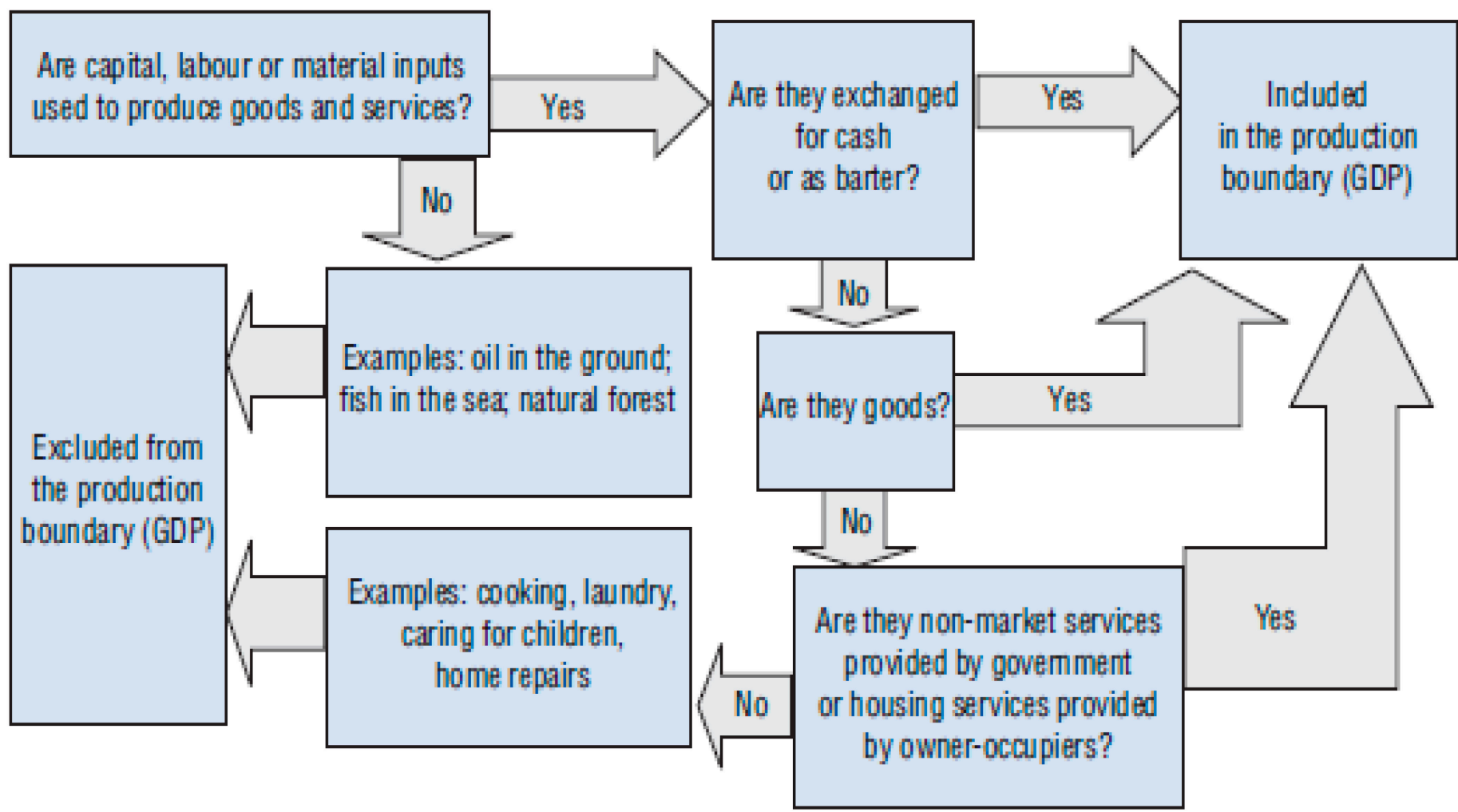
# Production boundary

- The production boundary of the SNA includes the following activities:
  1. Production of all goods or services that are supplied to units other than their producers, or intended to be so supplied, including the production of goods or services used up in the process of producing such goods or services;
  2. Own-account production of all goods that are retained by their producers for their own final consumption or gross capital formation; e.g.
    - Taro retained by farmers for own final consumption
    - Furniture manufactured and kept by a carpenter for use in his household unincorporated enterprise

# Production boundary (continued)

3. Own-account production of knowledge-capturing products retained by their producers for own final consumption or gross capital formation but excluding (by convention) such products produced by households for their own use;
  - own-account production of customised software by statistical offices for national accounts compilation
4. The own-account production of housing services by owner occupiers; and
  - Where a person living in his own house is treated as production of housing services for final consumption and this activity is included production boundary
5. The production of domestic and personal services by employing paid domestic staff.

## The production decision tree



# Production boundary – inclusions and exclusions

- Illegal activities (e.g. cocaine production) are *included* for exchanges between willing buyers and willing sellers
  - But an illegal activity like theft is *excluded*.
- Non-observed activities concealed from tax authorities or other regulators are *included*
- Informal sector activities are *included*
- Activities that cannot be performed on behalf of another person (e.g. eating, sleeping) are *excluded*
- Most services produced by households for own final use (e.g. cleaning, cooking, care of the young, old and sick, transportation) are *excluded*

# Production boundary – household production

- Includes production of **all goods** by households even if some or all are for own final consumption
- Includes production of **only two services by households**
  - own-account production of housing services by owner occupiers
  - production of domestic and personal services by employing paid domestic staff

# Types of output

- Market output
- Output for own final use
- Non-market output
  - To explain the difference need concept of economically significant prices

# Economically significant prices

- Economically significant prices are prices that have a significant effect on the amounts that producers are willing to supply and on the amounts purchasers are willing to buy. These prices normally result when:
  - The producer has an incentive to adjust supply either with the goal of making a profit in the long run or, at a minimum, covering capital and other costs; and
  - Consumers have the freedom to purchase or not purchase and make the choice on the basis of the prices charged
- ❖ **Rule of thumb: A particular price is considered economically significant , when price of goods and services cover more than half of the cost of production**

# Market output

- ✚ Market output consists of output intended for sale at economically significant prices.
- Consists of:
  - sales, barter, products used for compensation in kind, inventories of finished goods and work-in-progress, margins on supply of goods and services, margins on acquisition of financial assets etc; and
  - some goods and services delivered by one establishment to another in the same enterprise.

# Intra-enterprise deliveries

- Intra-enterprise deliveries are recorded only when the establishment receiving the goods assumes responsibility for making the decisions about the levels of supply and prices at which their output is delivered to the market.
- Related to revised treatment of goods sent abroad for processing in *2008 SNA / BPM6*

# Valuation of market output

- A computer manufacturer that sells computers at economically significant prices in the market
  - Sells 1000 computers during the year;
  - Gives 5 computers to employees free of cost;
  - Installs 5 computers in its Accounts Department; and
  - Has stocks of 5 computers at the beginning and 10 computers at the end of the year.
- Value of output = value of  $(1000+5+5)$  + value of change in stocks  $(10-5)$

# Output for own final use

- ❖ Output for own final use consists of products retained by the producer for his own use as final consumption or gross capital formation.
  - Household subsistence activity,
  - Output of paid domestic staff,
  - Housing services of owner-occupiers,
  - Own-account capital formation (software; buildings; R&D)
  - Inventories of finished goods or work-in-progress for one of these purposes

# Non-market output

- Non-market output consists of goods and individual (e.g. education, health) or collective services (e.g. public administration) produced by NPISHs or government that are **supplied free**, or **at prices that are not economically significant**, to other institutional units or the community as a whole.
- Output is measured as total cost of production
  - Sum of intermediate consumption, compensation of employees, consumption of fixed capital and other taxes (less subsidies) on production

# Example: Non-market output

- Government public school provides education completely free during the year:
  - Compensation of employees (100);
  - Expenditure on books, pens, pencils, electricity, telephone, etc. (40);
  - Consumption of fixed capital (10)
- Non market output (i.e. provision of educational services during the year) = 150 and obtained as the sum of costs of production.

# Intermediate consumption

- Intermediate consumption consists of the value of the goods and services consumed as inputs in the process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital.
- Inputs to ancillary services (e.g. Accounts Unit).
- Research and development is intermediate consumption only if it does not bring economic benefits to the owner.

# Intermediate consumption - borderline cases

- ...between IC and GFCF:
  - Small tools (threshold/bundled purchases)
  - Maintenance and repairs (asset life impact?)
- between IC and Income-in-kind (part of COE):
  - Work tools and clothing; work accommodation, business travel: all IC
  - After hours car use; free canteen; gym: all COE
  - If required to conduct work, it's IC; otherwise, it's a non-pecuniary staff benefit so it's COE

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# Why the Production Approach

- It is the primary measure (no income or expenditure without production)
- Usually the approach for which countries possess the most data – but not always
- Importance for analysis – industry mix, production efficiency...potentially lots of granularity

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# Identification and Assessment of Data Sources

- Assessment of data and indicators:
  - Are they well-defined?
    - coverage, units, classifications
  - Are they accurate/reliable?
    - bias, noise
  - Are they available on a regular basis?
    - Timeliness (lags), frequency, longevity

# Value Added

Variables	current values	prices	volumes
Output	√	√	√
Intermediate consumption	√	√	√
Value added	Residual	Implicit	Residual

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# Main Data Sources for Production Approach

- Business censuses and surveys
- HIES
- Population censuses
- Business accounts
- Government accounts
- Administrative records
- Prices and price indices

# Issues in Data Sources

- Lack of detail – this is key to accurate measurement
  - Weak industry classifications
  - Limited low-level price information
- Overlaps between surveys and (free!) administrative sources
- Consistency between infrequent surveys

# Issues in Data Sources

- Sometimes inputs used if no direct data relating to output
  - Employment (e.g. NPF)/ hours worked
  - Earnings
  - Major components of intermediate consumption – e.g. diesel>electricity; flour>bread.
    - Why?

# Issues in Data Sources

- Don't always provide every element you need
- Output, inputs, prices, physical volumes
- Fixed Input/Output (VA/GO, IC/GO) ratios often assumed:
  - In the short-run, production technology is fixed so input/output ratios are fixed, at least in real terms
  - E.g. I/O relationship for bread fixed, but price of loaves versus cost of yeast/flour will vary
  - Rebasing every 5 years ensures GDP keeps up with technological changes (every 10 is the max!)

## More on current price GVA

- Possible to obtain GVA or IC from actual data rather than ratios?
  - Desirable if ratios are variable **which they will be!**
  - Possibly available for public enterprises, major producers from **accounting information**
  - **Government**, via sum of costs components
  - Also, **tax returns** that record sales and expenditure indicate levels of production
  - Or, residual approaches – output less final demand. Can involve lots of assumptions, though

# More on constant price GVA

- Ideal approach is to 'double-deflate'
  - Use specific output deflator or volume revaluation approach
  - Use (suite of) specific deflator(s) on inputs
- In the general absence of good input deflators, countries often deflate output and inputs by a single CPI series
  - This is the same as simply deflating GVA by that CPI series
  - If input and output prices move independently, this distorts volume GVA by including unwanted price change in volume change

# More on constant price GVA

- So the recommended alternative is to assume a fixed I/O relationship in the short-run
  - Bread, copra, fishing – manufacturing
  - Used for services too but some caution may be needed for new/rapidly changing industries where it might be worth really hunting for good output and input deflators
- In practice, the ratio is the IC to GO ratio in the base year (current = constant prices)
  1. Work out constant price output (deflate/vol revalue)
  2. Apply the base year IC/GO ratio to constant price output
  3. Constant price GVA is the residual

# Note on sum-of-costs approach

- Government and NPISH measured on a 'sum-of-costs' as output is (mostly) "FATPOD"
- Value of output thus equal to sum of current inputs. In full:
  - $TOTAL\ OUTPUT = COE + non\text{-}mkt\ ConCap + IC - mkt\ output - own\text{-}account\ output$
- With limited GFS data, simplified to:
  - $TOTAL\ OUTPUT = COE + IC - mkt\ output$
- Assuming no mkt output, GVA is assumed to be equal to COE
  - $= (COE + IC) - (IC)$

# Estimating production activity from administrative returns

- PFTAC is working in PNG, Cook Islands and Tonga to use tax and other returns to estimate production as:
  - Business surveys often inefficient – response rates, coverage, cost – and duplication of effort by respondents
  - Tax data are ‘free’, timely, comprehensive and well-defined
- Great for private formal sector - likely other sources for government (GFS), NPISH, finance and informal sector
- NB: Tax data are not ‘ready-made’ for GDP
  - concepts of output and intermediate consumption must be derived from tax returns with additional assumptions (e.g on capital expenditure)
  - But with regular benchmarking, tax returns provide solid indicators of GO, IC and GVA

# Common approaches in this region

- Use of some form of business survey
  - Coverage not always good; can overlap with other sources
  - Response rates not always good
- Supplementary or primary use of tax data
  - Covers registered/larger businesses only
  - Issues of access, transformation
- GFS or other government accounting information
  - Government production activity plus taxes and subsidies; employment
- NPISH accounting information (often weak)
- Household Income and Expenditure Surveys
  - Covers informal production
  - ...but not very good for imputed rental estimates

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# Common bad practice in the region

- Calculation errors
  - Lack of consistency between industries in terms of deflation, volume revaluation formulae
  - Confusion between volume and CPI indices sometimes
  - Not locking/unlocking formulae correctly
  - Incorrect use of simple versus compound growth

# Common bad practice in the region

- Lack of industrial detail
  - Split them further
  - Fix misallocations; estimate secondary activities and allocate them appropriately
- Low CPI detail and some bad usage
  - Think: how do they make this product? What price indicators can I weight together to approximate this?
  - Look for examples of single deflation and replace them with base year IC/GO ratio approach if production function assumed stable
  - NEED TO BE ABLE TO PRODUCE COMPOSITE DEFLATORS

# Common bad practice in the region

- Reflation issues
  - Sometimes you know constant prices and need to work out current prices afterwards
  - Common with household production/fishing where volumes based on ad hoc surveys, carried forward by a volume indicator such as population growth
  - Current price estimates require both the volume change AND the price change, not just the price change

# Common bad practice in the region

- Coverage gaps
  - What do you know your country produces but your existing GDP model misses?
  - E.g. illegal activities; tax evasion
  - Even a simple additional model is better than nothing
  - SHARED BUSINESS REGISTER AND ADMINISTRATIVE DATA ARE KEY!
- Conceptual gaps
  - Valuation issues
  - Own-account production by businesses
  - Income-in-kind
  - Stocks

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# Common bad practice in the region

- Hmm, is there one more issue we've forgotten...
- ...
- ...

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# REBASE EVERY 5 YEARS

- This is perhaps the single-most overlooked procedure
  - Benchmark then rebase, don't just rebase
  - Chance to update all your methods as well as use broadest range of new data
- Getting better across the region but most countries at or beyond 10 year old base year
- More on this later in the week