

Understanding National Accounts

2010-10-26

Chapter 10, The input-output table and integrated economic accounts

Basic identity

- $Y = P - IC$ (Production method)
- $Y = C + I + E - M$ (Expenditure method)
- $P + M = IC + C + I + E$

Supply (sales) = Use (purchases)

In supply and use matrices we combine Production and Expenditure methods.

Example



	SEK million current prices
Furniture etc	
Production	37000
Import	27000
<i>Trade margins</i>	<i>22000</i>
<i>Taxes on products</i>	<i>0</i>
<i>Subsidies on products</i>	<i>0</i>
<i>VAT</i>	<i>10000</i>
Total supply	96000
Intermediate consumption	18000
Final consumption	44000
GFCF	11000
Export	23000
Total Use	96000

Valuation

$$P + M < > IC + C + I + E$$

Due to taxes, margins etc.

Supply side (basic prices)

What the producer obtain from the production (excluding taxes etc, that are only passed on to the government)

Use side (purchaser price)

The price paid by the customers (including taxes and margins)

Supply matrix 2002

• SEK Million current prices.

Product	Description	Output	Imports	Trade margins	Product taxes, net	Purchasers prices
01-05	Jord, skog, fisk	68 153	19 849	16 464	-771	103 695
10-14	Mineraler	14 808	40 741	4 242	817	60 608
15-37	Tillverkningsind.	1 302 097	590 214	288 582	165 992	2 346 885
40-41	El, gas, värme, vatt	85 671	4 116		30 594	120 381
45	Byggnad	183 345			28 356	211 701
50-52	Handel, reparationer	60 001	4 238		4 280	68 519
55	Hotell, restaurang	80 008	1 462		12 075	93 545
60-64	Transport,kommunik.	388 887	30 533		5 901	425 321
65-67	Finansiella tjänster	70 979	8 542		2 928	82 449
70	Fastighetsverksamhet	402 696	59		13 326	416 081
71-74	Företagstjänster	533 045	109 143	2 321	20 123	664 632
75	Offentlig förvaltn.	183 133	50			183 183
80-85	Utbildning, sjukvård	480 737			993	481 730
90-95	Andra tjänster	158 474	2 279	1 681	12 271	174 705
FISIM	FISIM	46 162				46 162
Resevaluta	Resevaluta		71 847			71 847
TOTAL		4 058 196	883 073	313 290	296 885	5 551 444

Use matrix 2002

• SEK Million current prices.

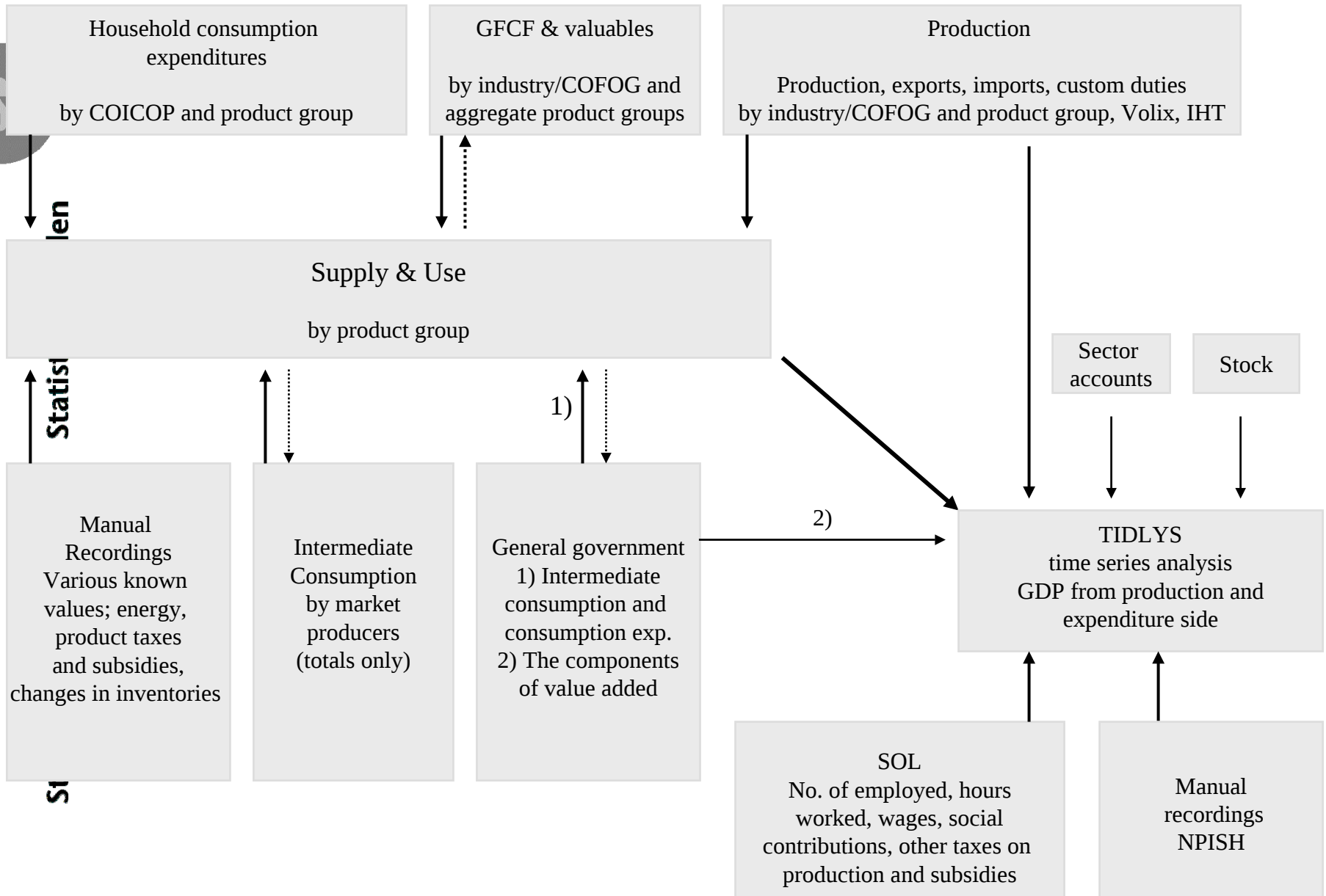
Statistics Sweden
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Product	Description	IC	Cons. Exp.'s	GCF	Exports	Residual	Sum purchasers prics
01-05	Jord, skog, fisk	59 124	29 848	8 197	6 526	0	103 695
10-14	Mineraler	54 722	563	-453	5 776	0	60 608
15-37	Tillverkningsind.	909 900	480 931	166 730	789 324	0	2 346 885
40-41	El, gas, värme, vatt	64 096	54 591		1 694	0	120 381
45	Byggnad	80 830	27	130 844		0	211 701
50-52	Handel, reparationer	24 394	17 572		26 553	0	68 519
55	Hotell, restaurang	36 440	57 105			0	93 545
60-64	Transport,kommunik.	256 748	111 263		57 310	0	425 321
65-67	Finansiella tjänster	40 405	32 072		9 972	0	82 449
70	Fastighetsverksamhet	159 074	250 540	6 245	222	0	416 081
71-74	Företagstjänster	451 051	42 163	79 531	91 887	0	664 632
75	Offentlig förvaltn.	23 757	157 574		1 852	0	183 183
80-85	Utbildning, sjukvård	24 480	457 250			0	481 730
90-95	Andra tjänster	60 519	109 191	2 631	2 364	0	174 705
FISIM	FISIM	46 162				0	46 162
Resevaluta	Resevaluta	23 731	1 012		47 104	0	71 847
TOTAL		2 315 433	1 801 702	393 725	1 040 584	0	5 551 444

Level of detail (approx.)

- 400 product groups, ProdSNI02, SPIN
- 135 industries, SNI02
- 140 household cons. exp. by purpose, COICOP
- 50 gvt. cons. by function, COFOG
- GFCF: 80 industries
20 COFOG

Available systems, overview



The calculation process

- Starting point: the result the previous year in current prices.
- Time series perspective
- Current and constant prices (t-1) simultaneously
- Changes in volume
- Implicit price index ($t / t-1$)

Step 1 in the process of the yearly calculations

- Assume that we will calculate GDP by production and expenditure approach in current and constant prices for 2009.
- We start off with the *available statistics* for the supply side and calculate a production value by product and industry/COFOG, as well as, imports and exports by product, in current and constant prices.

Step 2 – Price index for domestic supply (IHT)

- Price index for domestic supply, IHT, is the NA's own index used to reflate and deflate all use in an early stage of the yearly calculations.

- The index is calculated *by product*:

$$= \frac{\text{Output} + \text{Imports} - \text{Exports} \text{ current prices}}{\text{Output} + \text{Imports} - \text{Exports} \text{ constant prices (t - 1)}}$$

Steg 3 – Extrapolation of the use side

- Starting point: GDP by expenditure approach for 2008 in current prices.
- Assume that the allocation by product and use, *in constant prices*, has not changed between 2008 and 2009.
- In the extrapolation the price change between 2008 and 2009 for different products is taken into account.

Example – Extrapolation of IC



Assume that the statistics show that industry Z's volume growth of production is +10%.			Extrapolation of volume		Reflate to reach current prices		
	Product	Year 2008 current prices		Year 2009 constant prices = t-1	IHT		Year 2009 current prices
IC in industry Z	A	100	$100 * 1,1 =$	110	102,3	$110 * 1,023 =$	113
	B	300	$300 * 1,1 =$	330	110,2	$330 * 1,102 =$	364
	C	800	$800 * 1,1 =$	880	101,9	$880 * 1,019 =$	897
	D	200	$200 * 1,1 =$	220	104,5	$220 * 1,045 =$	230
	Total	1 400		1 540			1 604

Step 4 – Adaptation to statistical sources

- In the next step extrapolated values are adapted to the statistical sources for the use side.
- IC
 - totals per industry
- Household cons.
 - by COFOG and product
- GFCF
 - totals per industry/COFOG
- Exports
 - by product
- ”Known values”
 - by product and use

Example – Adaptation to totals, IC

- Assume that total IC in current prices for industry Z according to sources = 1750 MSEK.

$$\text{Adjustment ratio} = \frac{1750}{1604} = 1,091.$$

Example – Adaptation to totals cont.



		Extrapolated values		Values adjusted to totals according to source			
	Product	Year 2002 current prices	Year 2002 constant prices = t-1		Year 2002 current prices		Year 2002 constant prices = t-1
IC industry Z	A	113	110	$113 \cdot 1,091 =$	123	$110 \cdot 1,091 =$	120
	B	364	330	$364 \cdot 1,091 =$	397	$330 \cdot 1,091 =$	360
	C	897	880	$897 \cdot 1,091 =$	979	$880 \cdot 1,091 =$	960
	D	230	220	$230 \cdot 1,091 =$	251	$220 \cdot 1,091 =$	240
	Total	1 604	1 540		1 750		1 680

Step 5 – Balancing and industry analysis

- At this stage we have GDP by production and expenditure approach 2009 in current and constant prices according to all different statistical sources.
- Since supply is *not* equal to use at this stage we continue with balancing and industry analysis.

Balancing

Cases of inconsistencies in data:

- **Insufficient coordination**

Difference in units, multinational companies

- **Mistakes**

Wrong period in survey data, inconsistent data

- **Incomplete data**

Hidden economy

- **Source statistics and in the National accounts department**

Incorrect product allocation

Incorrect grossing up of sample

No estimate of hidden transactions

Mistakes in the break down of unspecified items

Balancing

Integration is making supply equal to use, ensuring a plausible production value added ratio for all industries

If possible: confrontation of data from different sources

- Improve data quality
- Limits to the number of solutions

Additional checks

- Labor data: labor productivity
- Constant prices: prices and volumes

Balancing and data flow

Source statistics

Adjustments to NA requirements

Balancing of the supply and use tables

National Accounts



Example - Balancing

- Example – balancing a service product. MSEK.

	Year 2001 current prices	Year 2002 current prices	Year 2002 constant prices =t-1	Volume growth 2001/2002
Supply (S)				
<i>Production</i>	24 100	22 050	21 000	-13%
Imports	11 600	11 550	11 000	-5%
Total	35 700	33 600	32 000	-10%
Use (U)				
IC	29 700	30 975	29 500	-1%
Changes in inventories	200	210	200	0%
<i>Exports</i>	5 800	8 505	8 100	40%
Total	35 700	39 690	37 800	6%
Residual = S-U	0	-6 090	-5 800	

Example - Balancing

- Example – balancing a service product – solution. MSEK.

	Year 2001 current prices	Year 2002 current prices	Year 2002 constant prices =t-1	Volume growth 2001/2002
Supply (S)				
<i>Production</i>	24 100	28 140	26 800	11%
Imports	11 600	11 550	11 000	-5%
Total	35 700	39 690	37 800	6%
Use (U)				
IC	29 700	30 975	29 500	-1%
Changes in inventories	200	210	200	0%
<i>Exports</i>	5 800	8 505	8 100	40%
Total	35 700	39 690	37 800	6%
Residual = S-U	0	0	0	

Example - Balancing

- Example – price index problem, goods product. MSEK.

	Year 2002 current prices	Year 2002 constant prices =t-1	Implicit price index
Supply (S)			
Production	400	378	105,8
<i>Imports</i>	730	543	134,4
Trade margin	800	778	102,8
VAT	400	394	101,5
Total	2 330	2 093	111,3
Use (U)			
<i>IC</i>	215	170	126,5
<i>Household consumption exp.</i>	2 020	1 990	101,5
Exports	120	117	102,6
Total	2 355	2 277	103,4
Residual = S-U	-25	-184	13,6

Example - Balancing

- Example – price index problem, goods product. MSEK.

	Year 2002 current prices	Year 2002 constant prices =t-1	Implicit price index
Supply (S)			
Production	400	378	105,8
Imports	730	727	100,4
Trade margin	800	778	102,8
VAT	400	394	101,5
Total	2 330	2 277	102,3
Use (U)			
IC	190	170	111,8
Household consumption exp.	2 020	1 990	101,5
Exports	120	117	102,6
Total	2 330	2 277	102,3
Residual = S-U	0	0	

Industry analysis

• BSEK.

NACE 15-37 Manufacturing industry			
	Code	2001	2002
Output	CUP	1 431	1 417
IC NA	CUP	1 011	991
IC Source	CUP	1 010	993
Difference NA-Source	CUP	1	-1
VA	CUP	420	426
VA	Change CUP	-3,3	1,5
VA	COPPY (t-1)	425	444
Output	Growth COPPY	-0,8	0,2
IC	Growth COPPY	-0,1	-2,1
FV	Growth COPPY	-2,2	5,7
Output	Implicit price index	101,9	98,9
IC	Implicit price index	103,1	100,2
Input coefficient Source	CUP	70,6	70,0
Input coefficient NA	CUP	70,6	69,9
Input coefficient NA	COPPY	69,8	69,0



Statistics Sweden

Statistiska centralbyrån

Industry analysis cont.

• BSEK

NACE 15-37 Manufacturing industry			
	Code	2001	2002
Taxes on production, net	CUP	6	8
VA, factor	CUP	412	418
Wages	CUP	206	207
Wages	Change CUP	4,5	0,5
Emp. social contributions	CUP	72	73
Emp. social contributions	Change CUP	8,4	1,2
Consumption of fixed capital	CUP	71	72
OS, net	CUP	63	66
OS, net	Change CUP	-34,5	4,4
Employed 100's	No. of empl.	7 536	7 330
Employed 100's	Growth emp.	1,1	-2,7
Hours worked	Hours worked	127 957	122 530
Hours worked	Growth hours	0,2	-4,2
Wages/employed 100 SEK	CUP	2 769,4	2 860,0
Wages/hour	CUP	163,4	171,6
Wages/hour	CUP	4,1	5,0
Labour productivity	Growth COPPY	-2,4	10,4



Input – output



Product supply table	Intermediate use table	Final use table
	Production account by industry	
	Generation of income account by industry	

Input – output analyses

- Can be used to analyze a change in the economy and its direct and indirects effects
- For example: Boat industry
- Different assumptions

Input – output analyses

$$x_j = X_{j1} + X_{j2} + \dots + X_{jn} + y_j$$

Where y is final demand

I.e. output of product j is equal to the sum of the intermediate consumption of product j by the industries 1 to n , plus the final demand for this product

$$a_{ji} = X_{ji} / x_i$$

Technical coefficient (what is needed to make a certain product)

where X is the IC of product j by industry i

x is the output of industry i

$$\Rightarrow x_j = a_{j1}x_1 + a_{j2}x_2 + \dots + a_{jn}x_n + y_j$$

$$\Rightarrow [x] = [A] \cdot [x] + [y]$$

$$\Rightarrow [x] = [I - A]^{-1} \cdot [y]$$

$$\Rightarrow [\Delta x] = [I - A]^{-1} \cdot [\Delta y] \text{ (assumes fixed technical coefficient)}$$