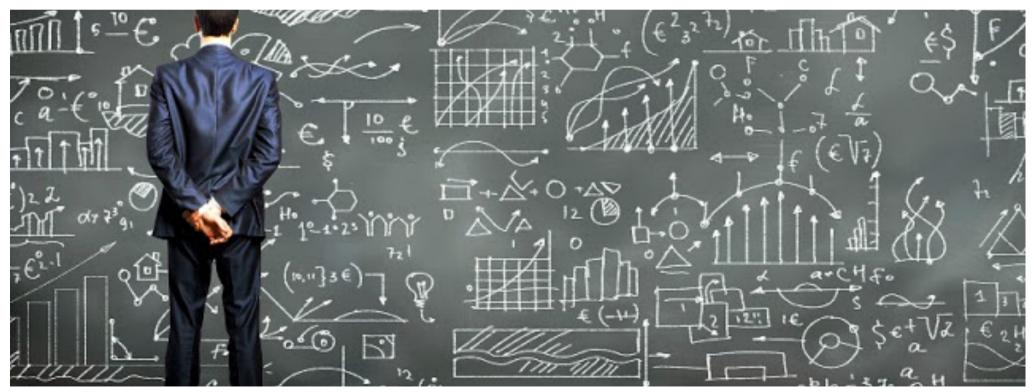


# FINANCIAL MEASURES OF EFFICIENCY

Measuring efficiency in monetary terms





## FINACIAL PRODUCTIVITY

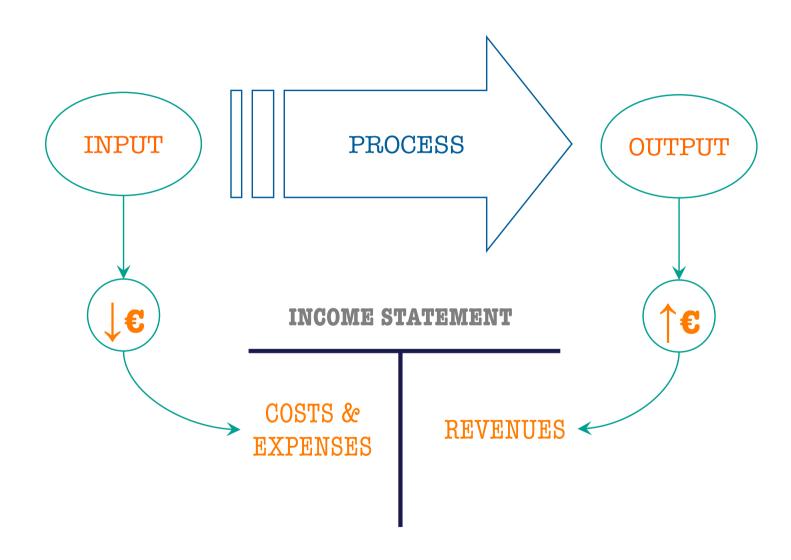








## **INCOME STATEMENT**





1. OPERATIONAL PRODUCTIVITY

O<sub>PHYSICAL</sub>

I<sub>PHYSICAL</sub>

2. FINANCIAL PRODUCTIVITY

OREVENUES

LEXPENSES

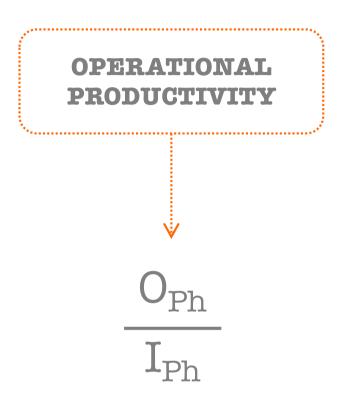
**EFFICIENCY** 

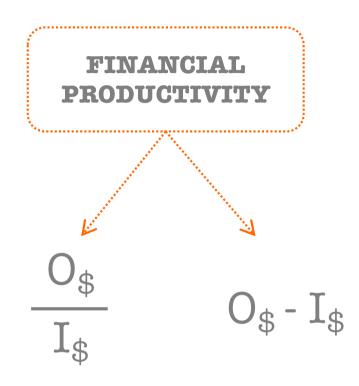
**3**. ...

4. ...



## **DIFFERENT TYPES OF METRICS**





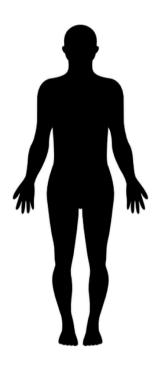
#### PROFIT: NET PROFIT AND OTHER PROFIT MARGINS

**Net Profit** (also called "Net Income" or "Net Earnings) is the "bottom line" of the "Income Statement". It is therefore computed as revenues, less cost of goods sold less, less other expenses, less taxes.

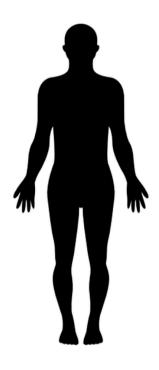
More broadly, **profit** is the difference between revenues and expenses. It can be assesses in a number of different ways because the appropriate measure depends on the specific question being asked. One can, therefore, determine different figures of profit (normally defined as "margins") taking into consideration different subset of revenues and costs or expenses, earned or incurred within a defined time frame.



# WHICH OF THE TWO IS IN BETTER SHAPE?







204 lbs.



## **MAKING COMPARISONS - BODY MASS INDEX**



148 lbs. - 147 cm 67 kg - 4' 10"

BM: 30.9



204 lbs. - 193 cm 93 kg - 6'4"

BM: 24.8

#### **PROFITABILITY**

1. the ability, attitude, potentiality of a business or an activity to yield profit or, more broadly, to offer an adequate level of return

#### PROFITABILITY

2. a relative number (a percentage) that gauge the level of profitability (in the sense specified above) and is normally expresses as the ratio between profit and another monetary term



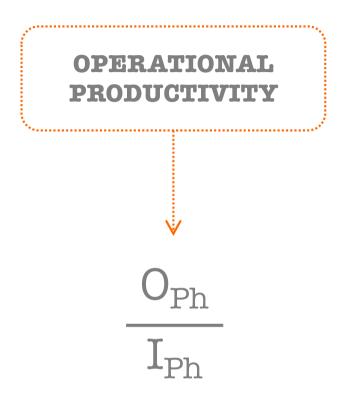
#### PROFIT AND PROFITABILITY

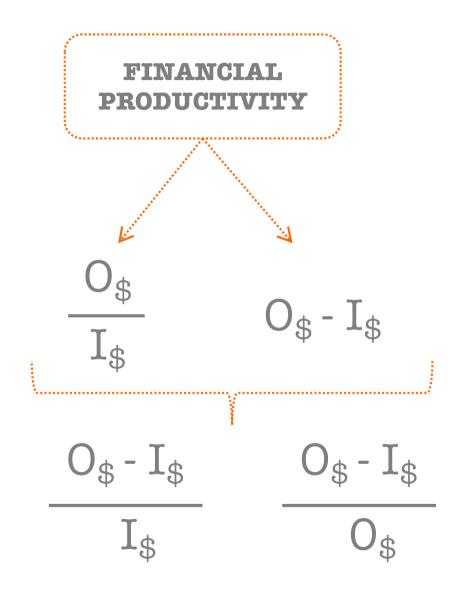
**Profitability** is a measure of profit compared to another "entity" ("sales", "assets", "capital employed", etc.) and it is therefore expressed in relative terms. This way of computing it, enhance the level of comparability of the measure considered.

**Profitability ratios** gauge a company's profitability—its profits as a percentage of various other numbers. They'll help you determine whether your company's profits are healthy or anaemic, and whether they're moving in the right direction. Examples of profitability ratios are return on sales, contribution margin ratio, return on assets, return on inventory, return on equity.



## **DIFFERENT TYPES OF METRICS**





## RELATIONSHIP BETWEEN MARK-UP ADD ROS

$$\frac{O_{\$} - I_{\$}}{I_{\$}} = x$$

$$\frac{O_{\$} - I_{\$}}{O_{\$}} = ?$$

$$\frac{O_{\$} - I_{\$}}{O_{\$}} = y$$

$$\frac{O_{\$} - I_{\$}}{I_{\$}} = ?$$

#### FROM MARK-UP TO RETURN ON SALES

$$\frac{O_{\$} - I_{\$}}{I_{\$}} = x \qquad \frac{O_{\$} - I_{\$}}{O_{\$}} = ? \quad \Rightarrow$$

$$O_{\$} - I_{\$} = x^* I_{\$} \quad \Box > O_{\$} = I_{\$} + x^* I_{\$} = I_{\$^*} (1+x)$$

$$\frac{O_{\$} - I_{\$}}{O_{\$}} = \frac{x * I_{\$}}{I_{\$ *} (1+x)} = \frac{x}{(1+x)}$$



#### ... AND VICE VERSA

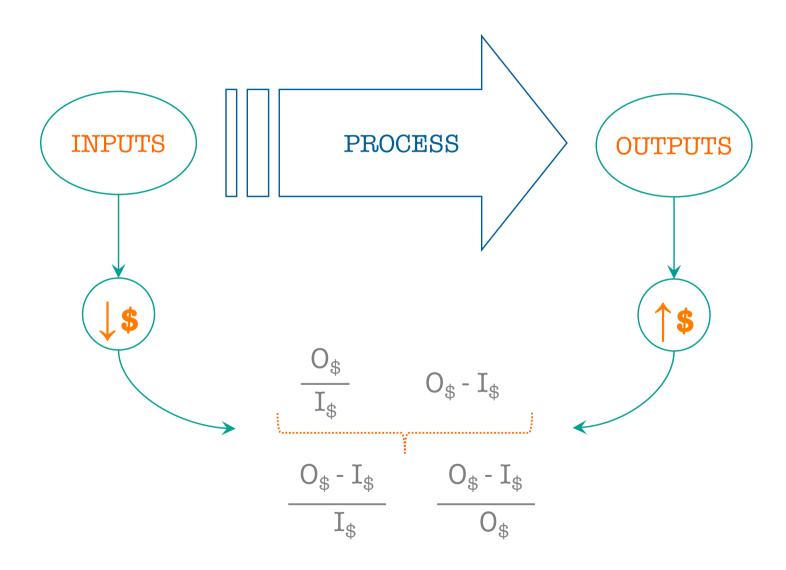
$$\frac{O_{\$} - I_{\$}}{O_{\$}} = y \qquad \frac{O_{\$} - I_{\$}}{I_{\$}} = ? \quad \Rightarrow$$

$$O_{\$} - I_{\$} = y^* O_{\$} \quad \Box > I_{\$} = O_{\$} - y^* O_{\$} = O_{\$} * (1-y)$$

$$\frac{O_{\$} - I_{\$}}{O_{\$}} = \frac{y^* O_{\$}}{O_{\$*} (1-y)} = \frac{y}{(1-y)}$$

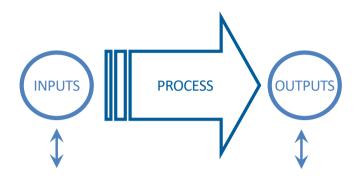


## FINANCIAL PRODUCTIVITY





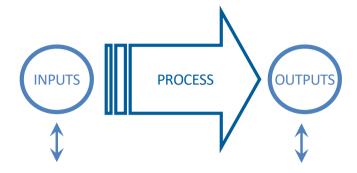
#### TWO DIFFERENT PERSPECTIVE



Total level of resources (productive factors) consumed to achieve the entire production (total output)

**Total output** made in the period

- + Sales Revenues
- + Changes in Inventory
- + Capitalized Expenses
- = Total Outputs
- Materials Expenses
- Personnel Expenses
- Expenses for External Services
- Depreciation & Amortization
- = EBIT



Cost of the goods sold: portion of the resources consumed to obtain the fraction of production that was sold

**Output sold** in the period

- + Sales Revenues
- Cost of Goods Sold
- = Gross Margin
- Selling, General & Administrative Expenses
- = EBIT



# **LINDE INCOME STATEMENT 2000**

	Note	2000	1999
Sales	13	8,450,279	6,193,923
Changes in inventories and own work capitalised	14	418,357	65,642
Total output		8,868,636	6,259,565
Other operating income	15	274,078	187,262
Material expense	16	- 3,986,321	- 3,039,673
Personnel expense	17	- 2,222,890	- 1,657,814
Depreciation on tangible and intangible assets	18	- 676,834	- 315,128
Other operating expense	19	- 1,544,010	- 973,147
nvestment income	20	7,020	6,933
Depreciation on financial assets and investment securities	18	- 111	- 1,072
Net interest income	21	- 193,518	- 26,506
Profit on ordinary activities		526,050	440,420
Taxes on profit		- 207,117	- 156,324
Other taxes		- 44,556	- 23,374
Net income	22	274,377	260,722



# **LINDE INCOME STATEMENT 2001**

	Note	2001	2000
Sales	11	9,076,395	8,450,279
Cost of sales		- 6,168,579	- 5,617,514
Gross profit on sales		2,907,816	2,832,765
Marketine and colling superses		1 202 712	1 270 220
Marketing and selling expenses		- 1,283,712	- 1,270,228
Research and development costs		- 168,335	- 170,994
Administration expenses	12	- 683,587	- 689,465
Other operating income	12	237,438	274,078
Other operating expenses	13	- 214,652	- 201,378
Amortization of goodwill		- 107,943	- 106,675
Operating profit		687,025	668,103
Net income from investment in other companies		7,692	7,020
Net interest expense		- 187,558	- 193,518
Depreciation of financial assets and			
investment securities		- 1,708	- 111
Financial result	14	- 181,574	- 186,609
Earnings before taxes on income		505,451	481,494
Taxes on income		- 216,690	- 207,117
raxes on meonic		- 210,090	- 207,117
Net income		288,761	274,377



#### **BACK TO BASIC FINANCIAL ACCOUNTING**

XYZ incurs the following classes of costs during fiscal year 20XO:

	Manufacturing	Other Phases
Materials Expenses	\$ 200,000	\$ 80,000
Personnel Expenses	\$ 350,000	\$ 420,000
Expenses for External Services	\$ 160,000	\$ 450,000
Depreciation & Amortization	\$ 290.000	\$ 550,000
Total	\$ 1,000,000	\$ 1,500,000

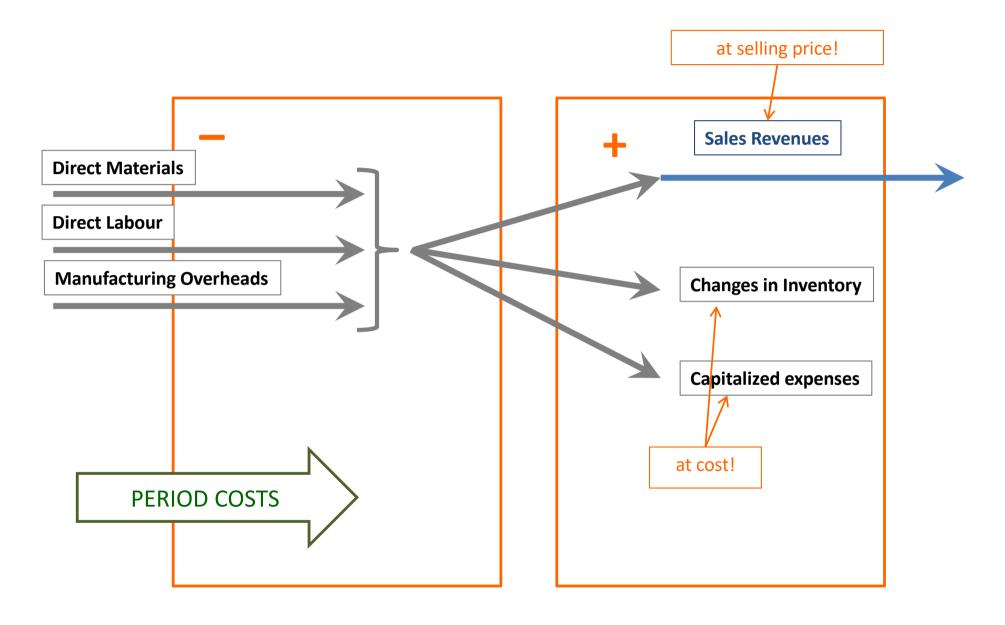
In addition to the typical product, a specific machine is built during the period for use in subsequent fiscal years. Its cost value (all made up of cost-line items belonging to manufacturing costs) is \$ 320,000.

The finished products manufactured during the period are 20,000. Of these the units sold are, instead, 17,600. The average selling price was \$ 130.00.

**Required:** determine the EBIT of the Company

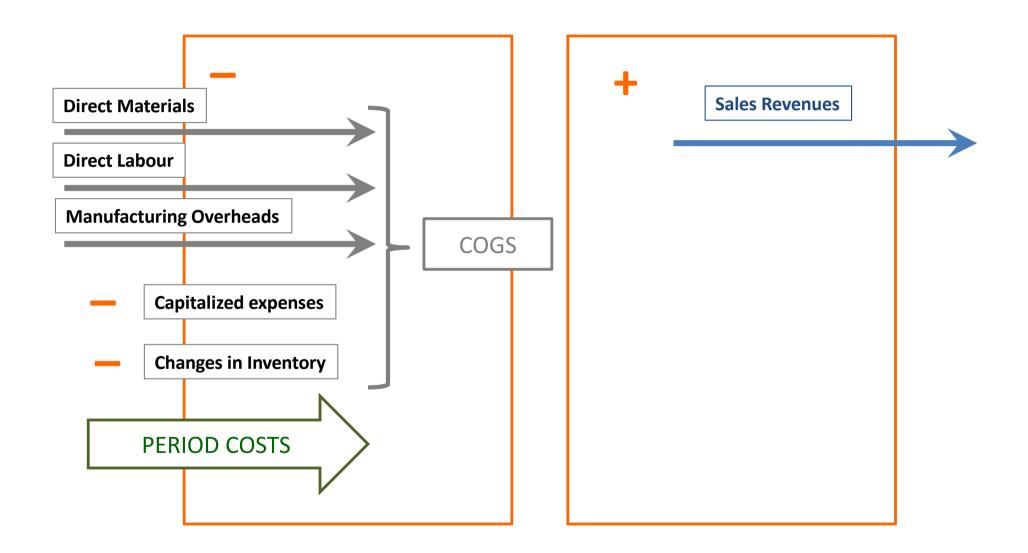


### **TOTAL OUTPUT INCOME STATEMENT**





## **COGS INCOME STATEMENT**





#### **BACK TO BASIC FINANCIAL ACCOUNTING**

XYZ incurs the following classes of costs during fiscal year 20XO:

	Manufacturing	Other Phases
Materials Expenses	\$ 200,000	\$ 80,000
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The finished products manufactured during the period are 20,000. Of these the units sold are, instead, 17,600. The average selling price was \$ 130.00.

#### **Required:** determine the EBIT of the Company

+ Sales Revenues	\$ 2,288,000
	. , ,
+ Changes in Inventory	\$ 81,600
+ Capitalized Expenses	\$ 320,000
·	
= Total Outputs	\$ 2,689,600
- Materials Expenses	\$ 280,000
·	
- Personnel Expenses	\$ 770,000
- Expenses for External Services	\$ 610,000
·	•
- Depreciation & Amortization	\$ 840,000
•	ć 400 coo
= EBIT	\$ 189,600

+ Sales Revenues	\$ 2,288,000
- Cost of Goods Sold	\$ 598,400
= Gross Margin	\$ 1,689,600
- Selling, General & Administrative Expenses	\$ 1,500,000
= EBIT	\$189,600



# SOME CONSEQUENCES

Measuring productivity for all inputs at once is called total productivity measurement.

In practice, it may not be necessary to measure the effect of all inputs. Many firms measure the productivity of only those factors that are thought to be relevant indicators of organizational performance and success. Thus, in practical terms, total productivity measurement can be defined as focusing on a limited number of inputs, which, in total, indicates organizational success. In either case, total productivity measurement requires the development of a multifactor measurement approach.

Two approaches that have gained some acceptance are profile measurement and profit-linked productivity measurement.



#### PROFIT-LINKED PRODUCTIVITY MEASUREMENT

Assessing the effects of productivity changes on current profits is one way to value productivity changes. Profits change from the base period to the current period. Some of that profit change is attributable to productivity changes.

Measuring the amount of profit change attributable to productivity change is defined as profit-linked productivity measurement.

Assessing the effect of productivity changes on current-period profits will help managers understand the economic importance of productivity changes.



#### PROFIT-LINKAGE RULE

Linking productivity changes to profits is described by the following rule:

For the current period, calculate the cost of the inputs that would have been used in the absence of any productivity change and compare this cost with the cost of the inputs actually used.

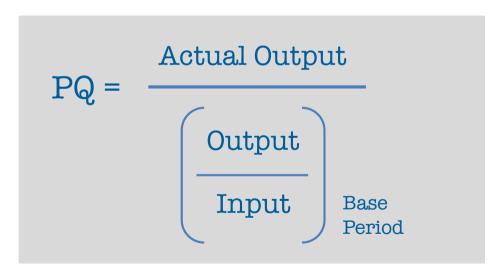
The difference in costs is the amount by which profits changed because of productivity changes.



#### APPLYING THE PROFIT-LINKAGE RULE

To apply the linkage rule, the inputs that would have been used for the current period in the absence of a productivity change must be calculated. Let PQ represent this productivity-neutral quantity of input.

To determine the productivity-neutral quantity for a particular input, divide the current-period output by the input's base-period productivity ratio:





#### PRICE-RECOVERY COMPONENT

The profit-linked measure computes the amount of profit change from the base period to the current period attributable to productivity changes. Generally, this will not be equal to the total profit change between the two periods.

The difference between the total profit change and the profit-linked productivity change is called the price-recovery component. This component is the change in revenue less a change in the cost of inputs, assuming no productivity changes. It, therefore, measures the ability of revenue changes to cover changes in the cost of inputs, assuming no productivity change.



	SOXO	20X1
Number of frames produced	240'000	250'000
Labor hours used	60'000	50'000
Materials used (lbs.)	1'200'000	1'300'000
Unit selling price (frames)	30.00 US\$	29.00 US\$
Wages per labor hour	15.00 US\$	15.00 US\$
Cost per pound of material	3.00 US\$	3.50 US\$
Operational productivity for labor	4.0000	5.0000
Operational productivity for materials	0.2000	0.1923
Quantity of labor that would have been u	sed	62'500
Quantity of material that would have be	1'250'000	



## PRICE RECOVERY EFFECT

Hypothetical cost of labor	62'500	15.00 US\$	937'500 US\$
Hypothetical cost of materials	1'250'000	3.50 US\$	4'375'000 US\$
Hypothetical cost of inputs			5'312'500 US\$
Actual cost of labor	50'000	15.00 US\$	750'000 US\$
Actual cost of materials	1'300'000	3.50 US\$	4'550'000 US\$
Actual cost of inputs			5'300'000 US\$
Productivity gain			187'500 US\$
Productivity loss			-175'000 US\$
Profit-linked productivity change			12'500 US\$
	ожо	20X1	- Difference -
Revenues	7'200'000 US\$	7'250'000 US\$	50'000 US\$
Cost of inputs	-4'500'000 US\$	-5'300'000 US\$	-800'000 US\$



**Price-recovery effect** 

- Profit-linked productivity change

**Profit** 

2'700'000 US\$ 1'950'000 US\$

-750'000 US\$

-762'500 US\$

-12'500 US\$

20X0						20X1					
Product XYZ	200	€	10,00	€	2.000,00	Product XYZ	200	€	9,75	€ 1	950,00
Resource A Resource B	490 400		,	€	980,00 400,00	Resource B	460 410		,	€	828,00 492,00
Margin				€	620,00	Margin				€	630,00

#### Required:

- determine the level of the partial operational productivity measures of the two resources over the two years;
- determine the variance in margin



20X0 20X1

Product XYZ	200 €	10,00	€	2.000,00	Product XYZ		€	9,75	€	1.950,00
_			_				_		_	
Resource A	490 €	2,00	€	980,00	Resource A	460	€	1,80	€	828,00
Resource B	400 €	1,00	€	400,00	Resource B	410	€	1,20	€	492,00
Margin		(B)	€	620,00	Margin			(A)	€	630,00

Partial Operational Productivity:

Partial Operational Productivity:

Resource A 0,4082 Resource B 0,5000 Resource A 0,4348
Resource B 0,4878

Variance in margin = (A) – (B) = € 630 - € 620 = + € 10

Variance in margin = + € 10

Variance in revenues = + € 1,950 
$$-$$
 € 2,000 =  $-$  € 50

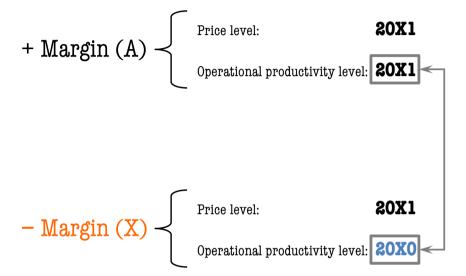
Variance in costs (res. A) =  $-$  € 828  $--$  € 980 = + € 980  $-$  € 828 = + € 152

Variance in costs (res. B) =  $-$  € 492  $--$  € 400 = + € 400  $-$  € 492 =  $-$  € 92

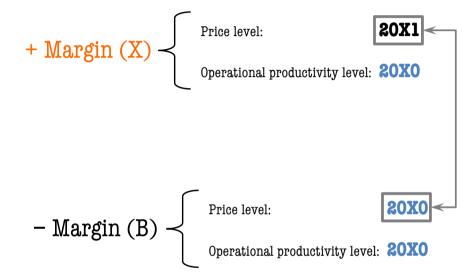
20X0						<b>20</b> X1	_						
Product XYZ	200	€ 10,00	€	2.000,00		Produ	ıct X\	Z	200	€	9,75	€ :	1.950,00
Resource A Resource B	490 400	•		980,00 400,00		Reso Reso			460 410		1,80 1,20	€	828,00 492,00
Margin		(B)	€	620,00		Marg	in				(A)	€	630,00
Partial Operational Pro	oductivity:					Partial Operational Productivity:							
Resource A Resource B	0,4082 0,5000					Resoi Resoi			0,4348 0,4878				
	F	Product XYZ		200	€	9,75	€	1.950,00					
		Resource A Resource B		490 400		1,80 1,20		882,00 480,00					
	N	Margin				(X)	€	588,00					



#### TWO COMPONENTS



This component of the overall variance measures the effect of changes in the levels of utilisation of different resources (operational productivity) by valuing this information (logically expressed in physical units) on the basis of the most recent prices.



This second component, on the other hand, values the same level of resource utilisation using two distinct price levels (final and initial) and thus provides a measure of the effect produced on the margin by the change in price level (upstream and downstream of the firm)

20X0				20X1					
Product XYZ	200 € 10,0	0 € 2	2.000,00	Product XYZ	220	€	9,75	€ 2	2.145,00
Resource A Resource B	490 € 2,0 400 € 1,0		980,00 400,00	Resource B	506 451		1,80 1,20	€ €	910,80 541,20
Margin	(B)	€	620,00	Margin			(A)	€	693,00
Resource A Resource B	2,45 2,00			Resource A Resource B	2,30 2,05				



Variance in the margin = (A) – (B) = 
$$[(A) – (X)] + [(X) – (Y)] + [(Y) – (B)] = + € 73$$

Product XYZ	220	€ 9,75	€	2.145,00
Resource A Resource B	539 440	€ 1,80 € 1,20	€	970,20 528,00
Margin		(X)	€	646,80
Product XYZ	220	€ 10,00	€	2.200,00
Resource A	539	,	€	,
Resource B	440	€ 1,00	€	440,00
Margin		(Y)	€	682,00

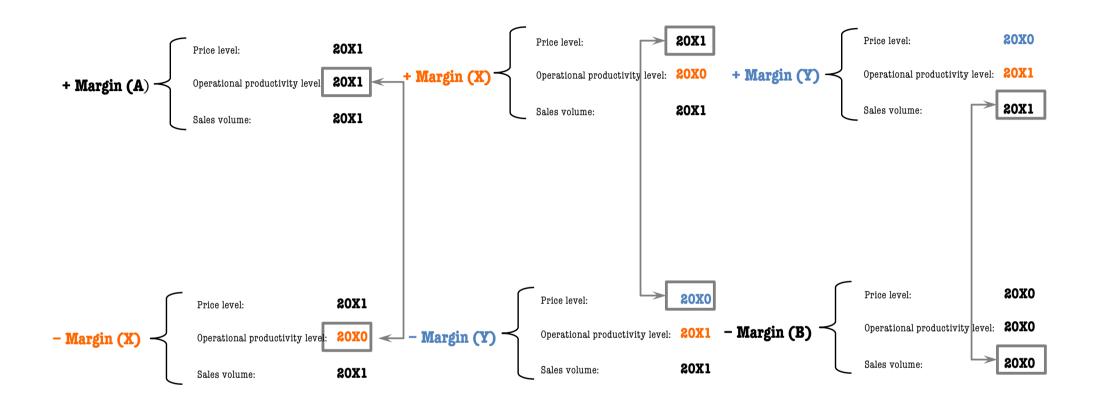


Variance in the margin = (A) – (B) = 
$$[(A) – (X)] + [(X) – (Y)] + [(Y) – (B)] = + € 73$$

Product XYZ	220	€	9,75	€	2.145,00	+ (A) - (X)	€ -€	693,00 646,80
Resource A	539	€	1,80	€	970,20	Scostamento efficienza	€	46,20
Resource B	440	€	1,20	€	528,00	+ (X)	€	646,80
						- (Y)	-€	682,00
Margin			(X)	€	646,80	Scostamento prezzi	-€	35,20
						+ (Y)	€	682,00
						- (B)	-€	620,00
Product XYZ	220	€	10,00	€	2.200,00	Scostamento volume	€	62,00
Resource A	539	€	2,00	€	1.078,00	Scostamento efficienza	€	46,20
Resource B	440	€	1,00	€	440,00	Scostamento prezzi	-€	35,20
						Scostamento volume	€	62,00
Margin			(Y)	€	682,00	Scostamento totale	€	73,00

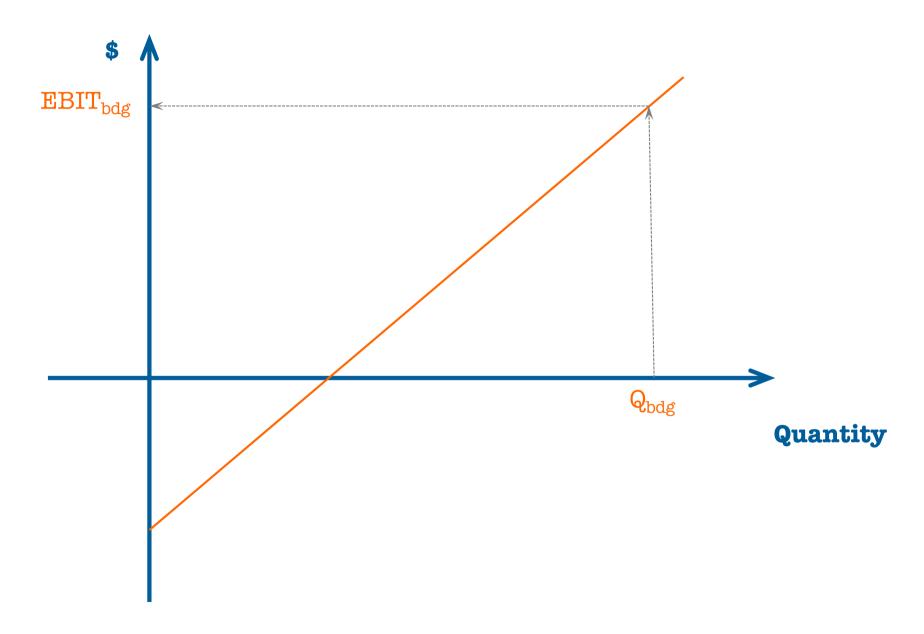


# THREE COMPONENTS



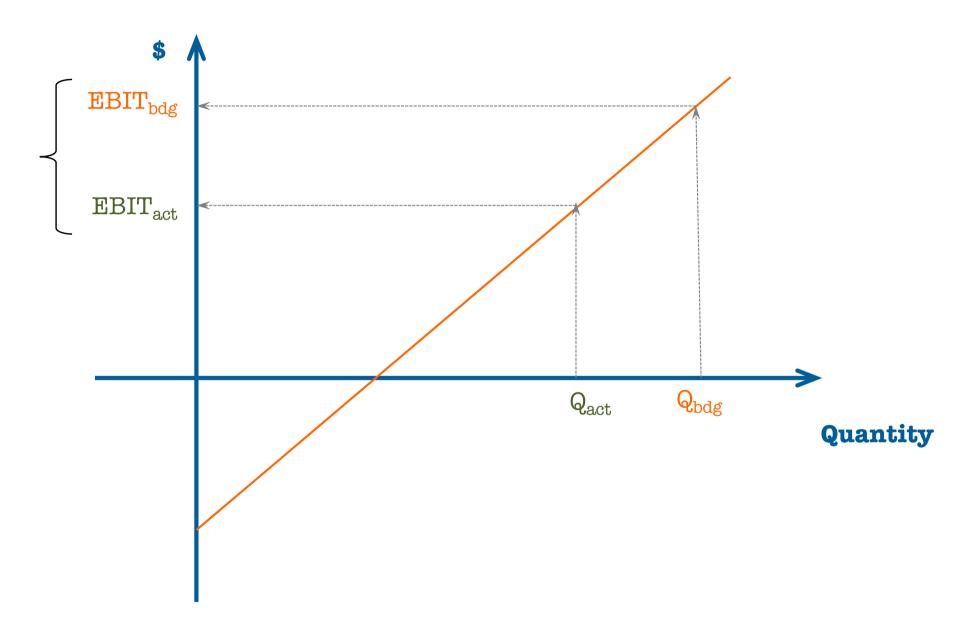


# BUDEGT



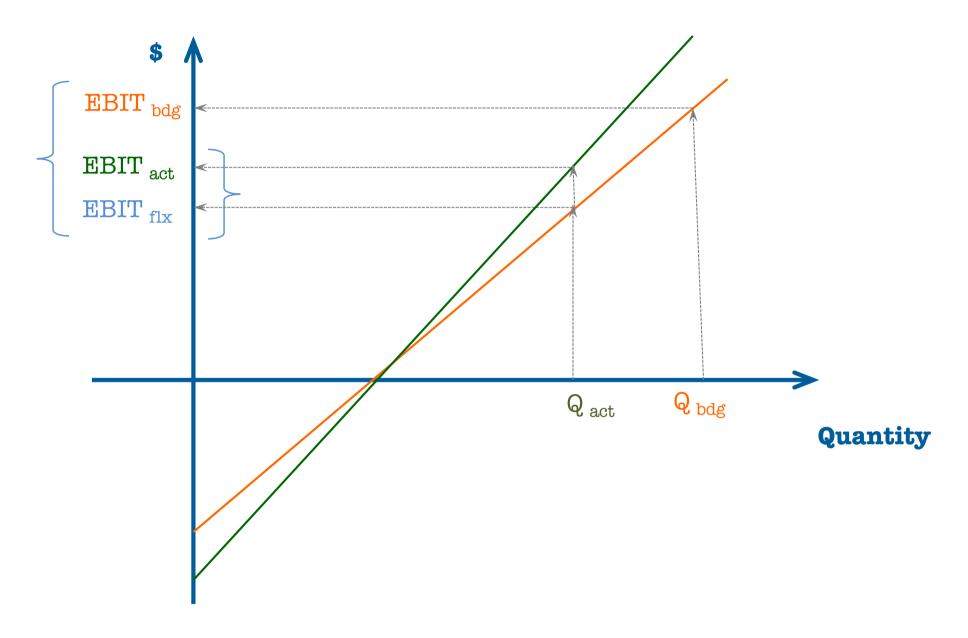


# FLEXING THE BUDEGT



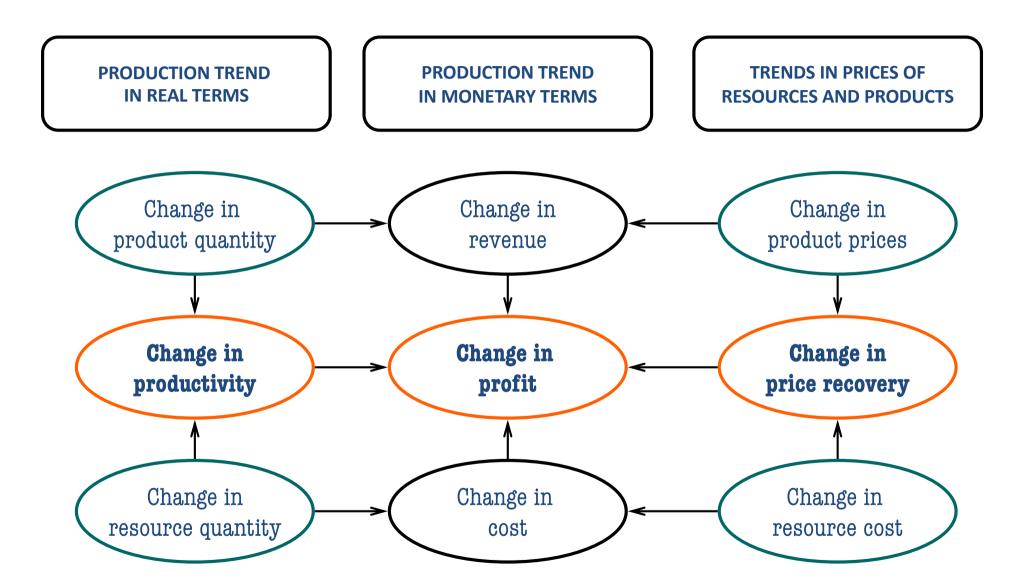


# **AGAIN: TWO COMPONENTS**





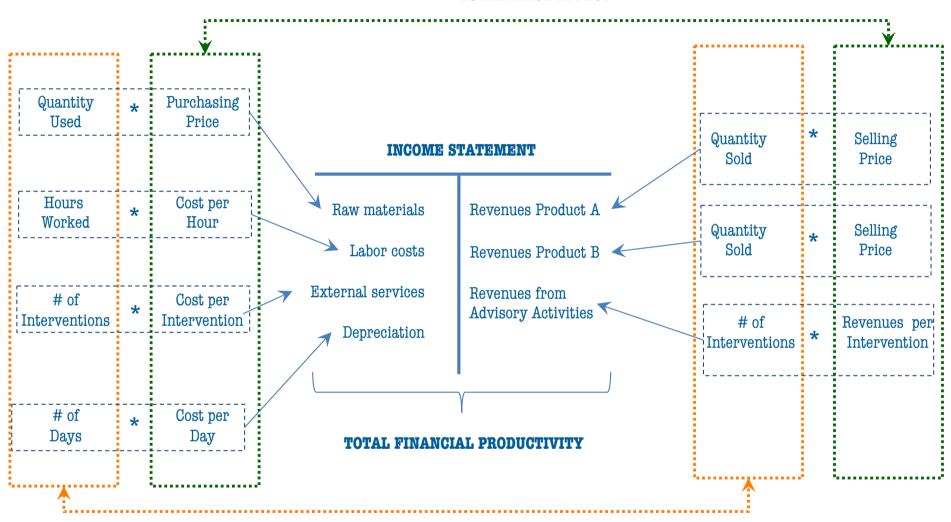
# PROFITABILITY = PRODUCTIVITY + PRICE RECOVERY





# **SOME IMPORTANT RELATIONSHIPS**

### TOTAL PRICE EFFECT



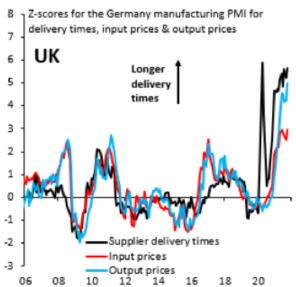
### TOTAL OPERATIONAL PRODUCTIVITY



# A GLIMPSE AT REAL DATA



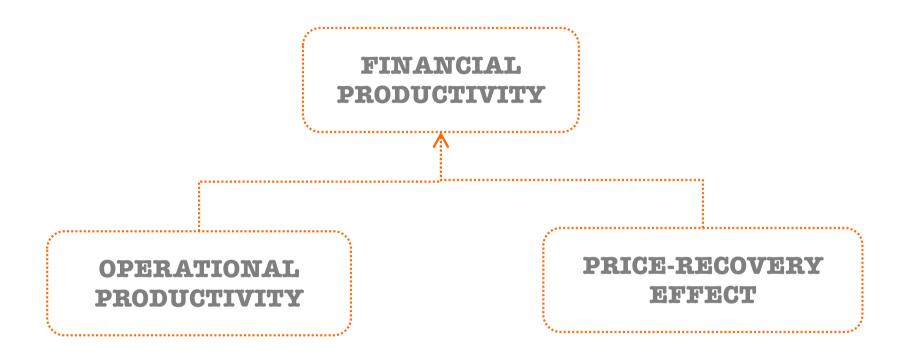








# CAUSES AND EFFECT





# **PORTER'S 5 FORCES**

# RIVALRY AMONG EXISTING COMPETITORS:

- Number of competitors
- Diversity of competitors
- Industry concentration
- Industry growth
- Quality differences
- Brand loyalty
- Barriers to exit
- Switching costs

# BARGAINING POWER OF SUPPLIERS

### BARGAINING POWER OF SUPPLIERS:

- Number and size of suppliers
- Uniqueness of each supplier's product
- Focal company's ability to substitute

### THREAT OF SUBSTITUTE PRODUCTS:

- Number of substitute products available
- Buyer propensity to substitute
- Relative price performance of substitute
- Perceived level of product differentiation
- Switching costs

# THREAT OF NEW ENTRANTS RIVALRY

RIVALRY
AMONG
EXISTING
COMPETITORS

THREAT OF
SUBSTITUTE
PRODUCTS

### THREAT OF NEW ENTRANTS:

- Barriers to entry
- Economies of scale
- Brand loyalty
- Capital requirements
- Cumulative experience
- Government policies
- Access to distribution channels
- Switching costs

## BARGAINING POWER OF BUYERS

### BARGAINING POWER OF BUYERS:

- Number of customers
- Size of each customer order
- Differences between competitors
- Price sensitivity
- Buyer's ability to substitute
- Buyer's information availability
- Switching costs



# DIFFERENT POSSIBLE PROFIT MARGINS

€	265.780	100,00%
-€	85.330	-32,11%
€	180.450	67,89%
-€	24.550	-9,24%
€	155.900	58,66%
-€	83.009	-31,23%
€	72.891	27,43%
-€	38.126	-14,34%
€	34.765	13,08%
-€	12.500	-4,70%
€	22.265	8,38%
-€	6.680	-2,51%
€	15.586	5,86%
		€       85.330         €       180.450         €       24.550         €       155.900         €       72.891         €       38.126         €       34.765         €       12.500         €       22.265         €       6.680



# **DIFFERENT PRIORITIES?**

	COMPANY "A"	COMPANY "B"
+ TOTAL OUTPUT	100 €	100 €
- INTERMEDIATE CONSUMPTION	(10 €)	(60 €)
= ADDED VALUE	90 €	40 €
- OTHER OPERATING COSTS	(85 €)	(35 €)
= EBIT	5 €	5 €



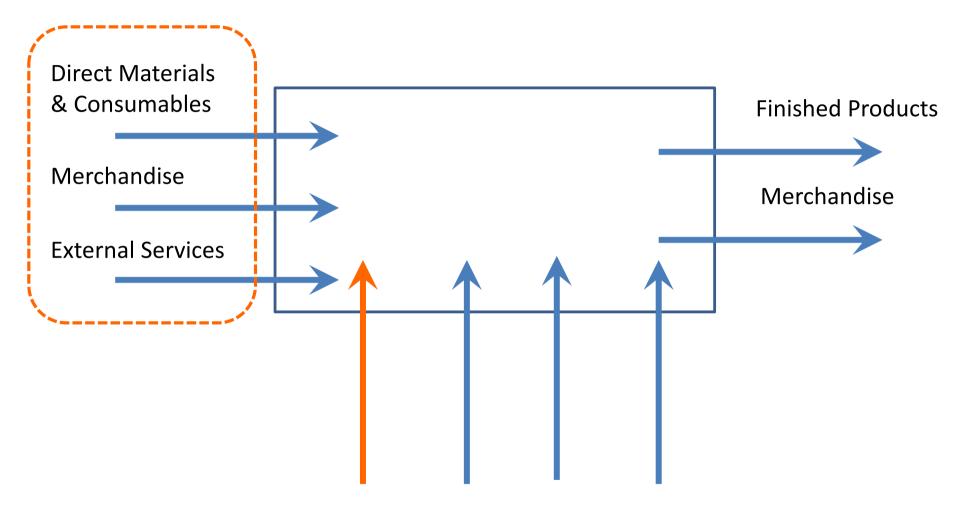
# ADDED VALUE

The term value added refers to the contribution of the factors of production that are considered "internal" to a specific entity – i.e. fixed assets (both tangible and intangible), internal labour (work performed by employees), financial capital (both borrowed or obtained as equity capital) and essential public services available to the firm – to raise the value of goods and services acquired outside the entity.

The value thus added is **ideally used to sequentially remunerate all the internal factors of production considered**, in a cascading process in which equity contributors are only rewarded in residual terms (with the possibility that instead of gaining value, they lose it to other parties)



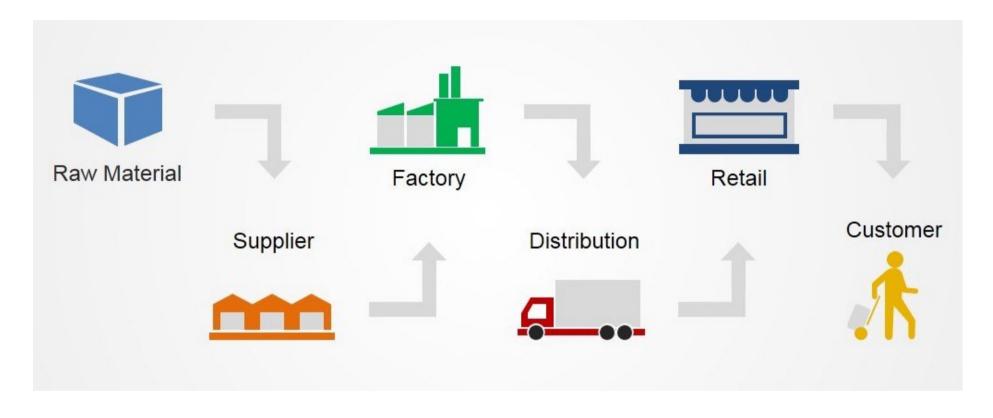
# ADDED VALUE



Productive Labour Capital Essential
Structure Public
Services



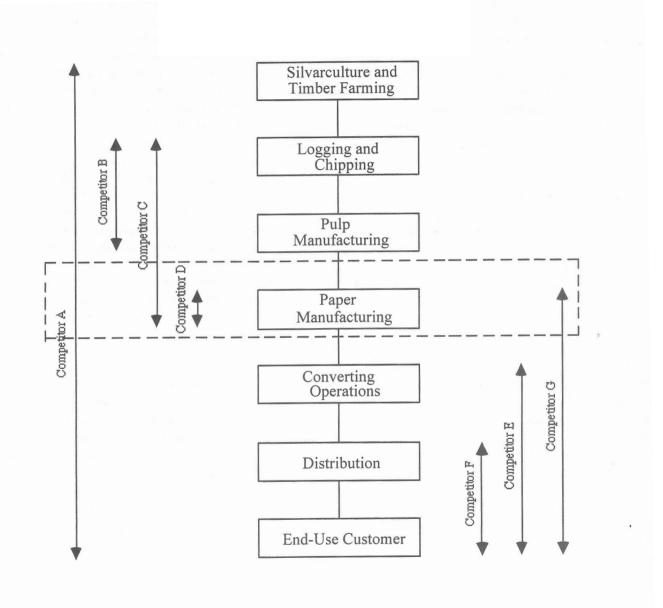
# SUPPLY CHAIN



In commerce, a supply chain is a network of facilities that procure raw materials, transform them into intermediate goods and then final products to customers through a distribution system. It refers to the network of organizations, people, activities, information, and resources involved in delivering a product or service to a consumer. Supply chain activities involve the transformation of natural resources, raw materials, and components into a finished product and delivering the same to the end customer.



# SUPPLY CHAIN IN THE PAPER PRODUCTS INDUSTRY

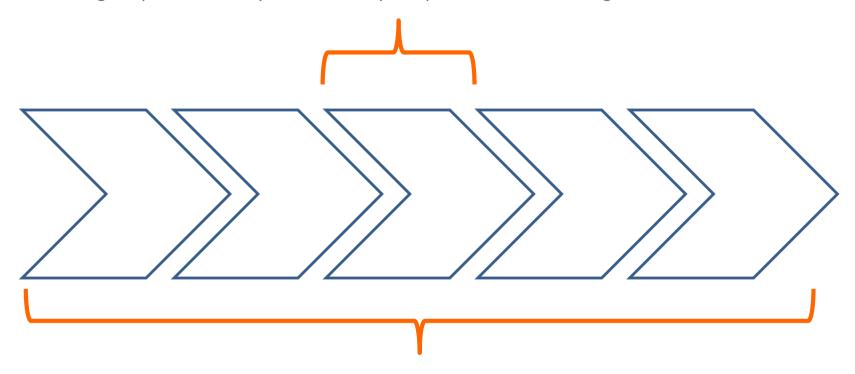


Source: John K. Shank, "Cases in Cost Management. A Strategic Emphasis", Third Edition, Thompson, 2006



# DIFFERENT STRATEGIES

**Outsourcing is** the business practice of hiring a party outside a company to perform services or create goods that were traditionally performed in-house by the company's own employees and staff. Outsourcing is a practice usually undertaken by companies as a cost-cutting measure



A vertical integration is when a **firm extends its operations within its supply chain**. It means that a vertically integrated company will bring in previously outsourced operations in-house. The direction of vertical integration can either be upstream (backward) or downstream (forward). This can be achieved either by internally developing an extended production line or by acquiring vertically.



# ANY CONNECTION?

	COMPANY "A"	COMPANY "B"
+ TOTAL OUTPUT	100 €	100 €
- INTERMEDIATE CONSUMPTION	(10 €)	(60 €)
= ADDED VALUE	90 €	40 €
- OTHER OPERATING COSTS	(85 €)	(35 €)
= EBIT	5 €	5 €
STRATEGY FOLLOWED:	VERTICAL INTEGRATION	OUTSOURCING

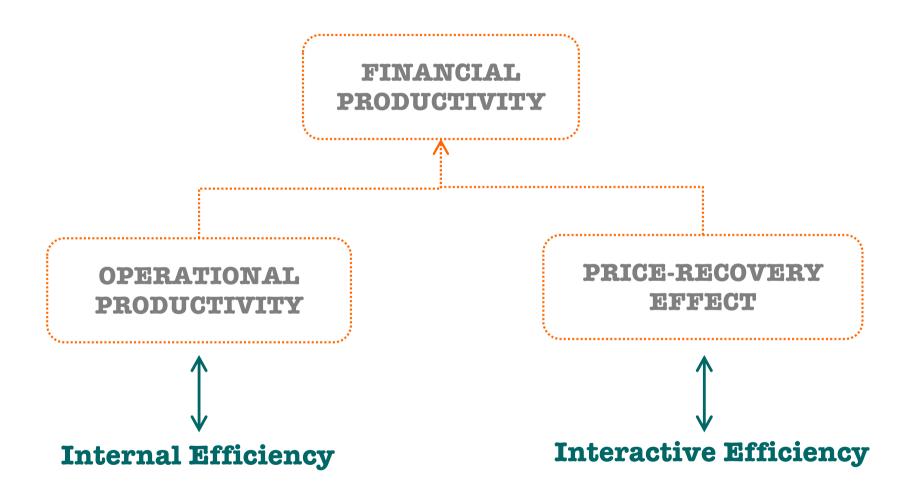


# **DIFFERENT PRIORITIES?**

	COMPANY "A"	COMPANY "B"
+ TOTAL OUTPUT	100 €	100 €
- INTERMEDIATE CONSUMPTION	(10 €)	(60 €)
= ADDED VALUE	90 €	40 €
- OTHER OPERATING COSTS	(85 €)	(35 €)
= EBIT	5€	5 €
PROBABLE PRIORITY OF CONTROL SYSTEM:	PRODUCTIVITY	PRICE RECOVERY



# **CAUSES AND EFFECT**





1. OPERATIONAL PRODUCTIVITY

O<sub>PHYSICAL</sub>

**I**PHYSICAL

- a) Partial 🗸
- b) Total X

EFFICIENCY

2. FINANCIAL PRODUCTIVITY

O<sub>REVENUES</sub>

IEXPENSES

- a) Partial X
- b) Total 🗸



# 1. OPERATIONAL PRODUCTIVITY

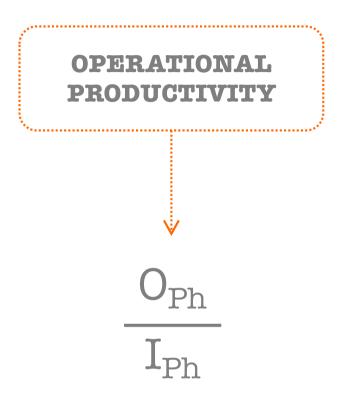
- a) Partial 🗸 <!----
- b) Total X
- 2. FINANCIAL PRODUCTIVITY

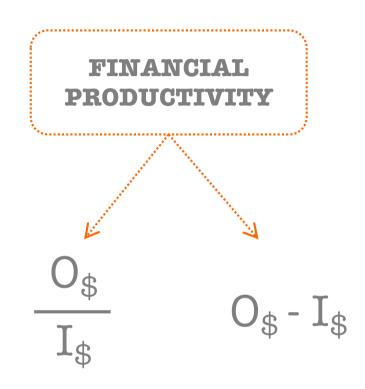
- 🤛 a) Partial 🗶
  - b) Total 🗸

# **EFFICIENCY**



# **DIFFERENT TYPES OF METRICS**





# DIFFERENT TYPES OF METRICS

