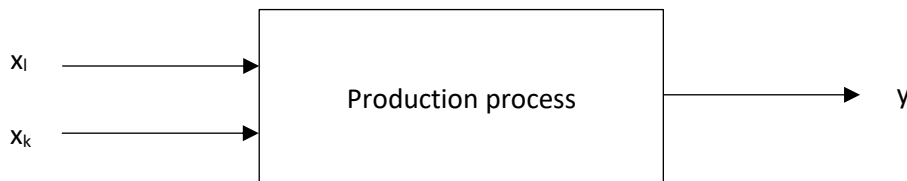


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PRODUCTIVITY IN A CAR-WASH PRODUCTION PLANT

Here we are going to assess the performance of a very simple production technology. With two inputs: operators (labor, x_l) and productivity-enhancing machines (capital, x_k), the production plant produces one output (car-wash, y):



In day zero there are three operators working each 8 hours per day at a wage of €8 per hour and a machine that is rented by the car-wash factory for €100 per day (but the introductory price is €50 on day zero). Customers pay €10 per car wash except for the half-price discount on day 1, which raises the number of cars washed from 32 to 40 per day. On day 3, the owner of the car-wash decides to hire a second machine at the discounted rent of €90 per machine because he plans to possibly expand his business in the future. Since the machine is assumed to be twice as productive as the workers, two operators are immediately fired. The remaining operator receives a wage increase to €12 per hour for taking over the additional duties.

With the above information:

1. Calculate the profits and loss account for days zero, one, two and three.

(Profits = Revenues – Costs)

Days	Inputs						Total Cost=LC+KC	Outputs		Total Revenues (TR)	Profits/ Losses Results= TR-TC	Interpretation
	Labor			Capital				Price	Quantity			
	Price w	Quantity L	Labor Cost (LC)	Price r	Quantity K	Capital Cost KC						
0	64	3	192	50	1	50	242	10	32	320	78	Profit
1	64	3	192	100	1	100	292	5	40	200	-92	Loss
2	64	3	192	100	1	100	292	10	32	320	28	Profit
3	96	1	96	90	2	180	276	10	32	320	44	Profit

2. Calculate the profitability ratio for days zero, one, two and three.

(Profitability = Revenues / Costs)

The Revenue is 68% of the costs

Days	Total Revenues (TR)	Total Cost (TC)	Profitability = Revenues / Costs	Interpretation
0	320	242	1.32231	Revenues are 32% more than costs
1	200	292	0.68493	Revenues are 68% less than costs
2	320	292	1.09589	Revenues are 9.5% more than costs
3	320	276	1.15942	Revenues are 16% more than costs

3. Calculate the partial productivity of operators' days zero, one, two and three.
4. Calculate the partial productivity of wash-machines for days zero, one, two and three.

Days	Outputs Y	Labor L	Capital K	Partial Productivities	
				Labor (Operators)	Capital (Wash-machines)
0	32	3	1	10.7	32.0
1	40	3	1	13.3	40.0
2	32	3	1	10.7	32.0
3	32	1	2	32.0	16.0

5. Calculate the Total Factor Productivity (TFP) level for days zero, one, two and three.

Days	Outputs Y	Labor Cost	Capital Cost	TFP
0	32	192	50	0.13223
1	40	192	100	0.13699
2	32	192	100	0.10959
3	32	96	180	0.11594

6. Calculate the daily changes in TFP (meaning for days one, two and three) by using:

- a. Laspeyres indices.
- b. Paasche indices.
- c. Fisher indices.
- d. Divisia/Törnqvist indices.

} isolating prices to focus on changes in quantity

Days	laspeyres	paasche	fisher	tornqvist
0	1	1	1	1
1	1.25	1.25	1.25	1.25
2	0.8	0.8	0.8	0.8
3	1.106061	1.3695652	1.23078111	1.2306405

Total Factor Productivity indexes

7. Calculate the daily changes in output and input prices (meaning for days one, two and three) by using:

- a. Laspeyres indices.
- b. Paasche indices.
- c. Fisher indices.
- d. Divisia/Törnqvist indices.

) Price recovery indexes

Days	laspeyres	paasche	fisher	tornqvist
0	1	1	1	1
1	0.41438	0.41438	0.41438	0.41336
2	2.00	2.00	2.00	2.00
3	0.77249	0.95652	0.85959	0.85949