FIRM UP
PERFORMANCE

ATHENS, GREECE
SEPTEMBER 9-12, 2019

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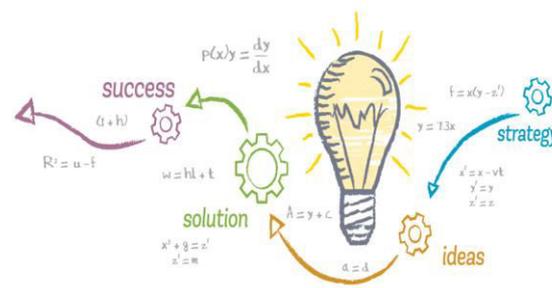
Case Study

Caio Piza – DIME Team
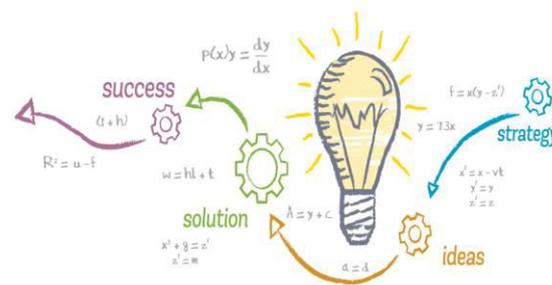
- January 2019: AMP identified 1,000 small firms in the two selected states to participate in an information session to present the *AMP* program and discuss its potential benefits for business performance. *AMP* sent invitations to these 1,000 firms requesting them to send a representative to attend the information session

- February to March 2019: After the information sessions, firms were given one month to decide whether they would like to participate in the program. At the end of the one-month period, 403 firms decided to participate in the *AMP* program while 597 units did not.

- March to July 2019: Participant firms have received a detailed diagnostic of their management practices and five months of free one-on-one consulting support in order to update their management practices. Participant firms agreed to share information on financial indicators, such as revenues, costs and profits. After five months of intervention, firms were given the opportunity to apply to a government fund for further investments.

- October 2019: A survey company collected information, including several performance indicators, from all 1,000 firms that were invited to participate.

*Question 1 for discussion: What is the **one** basic question that your impact evaluation should be able to answer?*
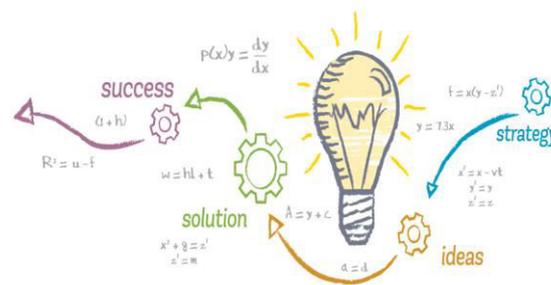
Method 1 – **Impact estimates using simple difference between firms that participated in the program versus firms that did not.**

Assume that the 403 firms that participated in the *AMP* program constitute the 'treatment' group and the remaining 597 units (i.e. those units that attended the meeting but did not choose to participate in the *AMP* program) represent the 'comparison' group.

Table 1 below compares the average value of profits in the 'treatment' 'comparison' groups in Atlantis Dollars (AD).

Table 1: Average value of profits in October 2019 (in AD $1,000)

	Profit per unit Treatment group	Profit per unit Comparison group	Estimated impact
Method 1: Simple difference	235.5	147.9	87.6*

statistically significant at the 5% level
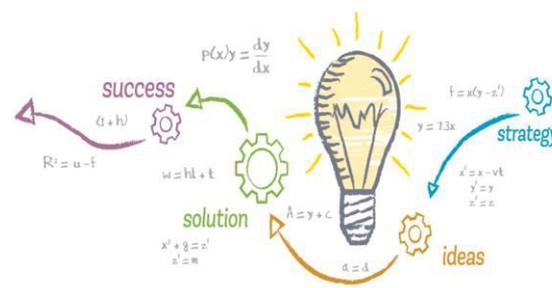
Question 2 for discussion – Do you think this method can give you a precise idea of the actual impact of the AMP program on profits? Why or why not?

Is it possible that the firms that chose to be in the program are different from those that did not? If so, in which ways?

To address the differences in firm characteristics, we match firms in the treatment and comparison groups with similar probabilities of participating in the program based on observable characteristics (propensity scores) and estimate the impact of the difference between key indicators only on the matched sample of firms. Notice that the sample size in the matched sample is smaller since the analysis is run only for the firms with similar probabilities of participating in the program.

Table 2: Characteristics of treatment and control groups using Simple Difference and Propensity Score Matching Methods

	Method 1: Simple Difference			Method 2: Propensity Score Matching		
	Treatment group	Comparison group	Difference	Treatment group	Comparison group	Differenc
Firm Age (in years)	21	14	7*	18	16	2
Revenue (AD $1,000)	235.5	147.9	87.6*	215.2	174.9	40.3*
Number of Employees	220	170	50*	200	190	10
Number of different products	3.9	4.1	-0.2	3.7	3.8	-0.1
Hierarchical levels at the firm	4.4	2.2	2.2*	3.6	2.8	0.8
Productivity (in logs)	2.90	2.30	0.6*	2.60	2.45	0.2*
Inventory (1,000 kg)	61.1	53.3	7.8*	58.2	54.7	3.5
Size of sample	403	597		312	337	

Note: * indicates statistically significant at the 5% level

Table 3. Average value of profits in October 2019using Propensity Score Matching (in AD $1,000)

	Profit per unit Treatment group	Profit per unit Comparison group	Estimated impact
Profits (AD $1,000)	215.2	154.9	60.3*

*statistically significant at the 5% level
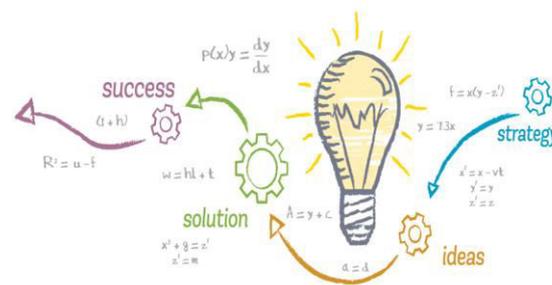
Question 3 for discussion – Looking at Table 2, what do you notice on the observable characteristics between the treatment and comparison groups when you switch from using Method 1 to Method 2? Why do you think that is?

Question 4 for discussion – Why do you think that the estimated impact on profits using Method 2 is smaller than the impact estimated using Method 1?

The DID method estimate the program impact by using a double difference comparison, allowing also to control for unobservable differences that are fixed over time between the treatment (T) and comparison (C) firms as shown below:

$$DD = (T_{2019} - T_{2018}) - (C_{2019} - C_{2018}).$$

Table 4 includes information on profits for the two years prior to the implementation of the *AMP* program (2017 and 2018), as well as profits in the year of implementation of the *AMP* (2019).

Table 4: Average value of profits from 2017 to 2019 (in AD $1,000)

	Profit per unit Treatment group	**Profit per unit Comparison group**	**Difference**
Profits in October 2019	235.5	147.9	87.6
Profits in October 2018	211.2	179.6	31.6
Profits in October 2017	200.8	130.7	70.1
Difference between profits in 2019 and those in 2018	24.3 (235.5 - 211.2)	-31.7 (147.9 - 179.6)	**56*** (24.3 – (-31.7)) =(235.5-211.2)- (147.9 179.6) =(Difference-in-Difference)

statistically significant at the 5% level

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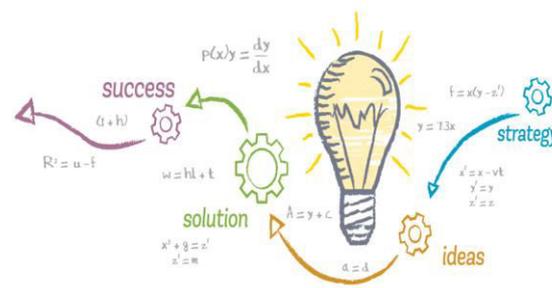
*Question 5 for discussion* – How could you use the data on profits from previous years to improve your analysis? Based on the information in Table 4, what would be your new estimate of the impact of the program on profits?

Question 6 for discussion – Compare your new estimate to the estimates you obtained with Methods 1 and 2. Is the estimated impact lower or higher? Why do you think this is?
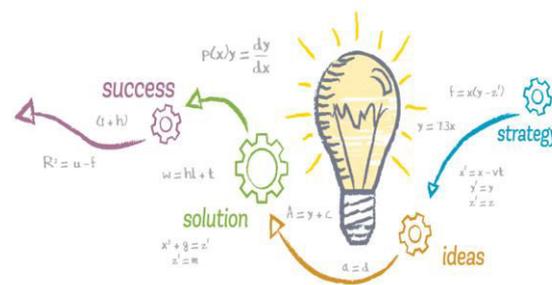
Question 7 for discussion – Do you think the impact estimated with Method 3 represent the true causal effect of the program on profits? Why or why not?

Question 8 for discussion – Using the data described above, can you come up with more convincing methods for estimating the impact of the program? What kind of information would be helpful?

Now suppose the Ministry decided to randomly assign firms to participate in the pilot *AMP* program. Around 2,000 firms were interested in participating and the *AMP* team choose randomly 1,000 units out of this group to receive the treatment. Because of the randomization, the 1,000 treatment firms will be very similar in both observed and unobserved characteristics to the 1,000 other firms (the 'control' group).

Table 5 compares the 'treatment' group and the 'control' group on the basis of observable characteristics.

Table 5: Characteristics of treatment and control groups (in AD $1,000)

	'Treatment' group	'Control' group	Difference
Average value of profits in October 2017	220.2	219.9	0.3
Average value of profits in October 2018	245.4	244.2	1.2
Firm Age (in years)	19	18	1
Revenue (AD $ 1,000)	200	195	5
Number of Employees	221	218	3
Number of different products	4	4	0
Hierarchical levels	3.9	4	-0.1
Productivity (logs)	2.85	2.95	-0.1
Inventory (1,000 kg)	62.2	62.4	-0.2
Sample size	1000	1000	

statistically significant at the 5% level

Table 6: Average value of profits in October 2019 (in AD $1,000)

	Treatment group	Control group	Impact estimate
Method 4: Random Simple difference	210.7	170.1	30.6*

*statistically significant at the 5% level
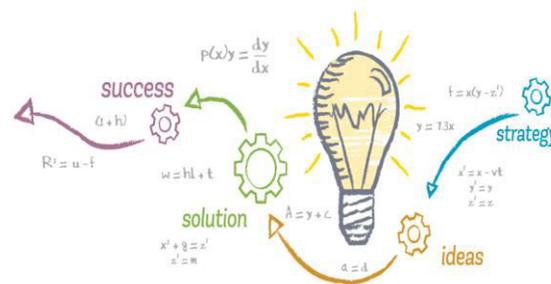
Question 9 for discussion – Notice that the two groups seem very similar in Table 5. Is this what you were expecting? Why or why not? How does this compare to the characteristics of the two groups used in Methods 1 and 2?

Question 10 for discussion – Based on the results above, would you recommend the program as a way of increasing profits for large firms?

Question 11 for discussion – Notice that the impact estimate in Table 6 is lower than those obtained under the preceding methods. What might explain this difference in the results?

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Table 7 – Summary of estimated impacts of *AMP*

Method	Estimated impact
Method 1: Simple difference	87.6*
Method 2: Propensity score matching	60.3*
Method 3: Difference-in-Difference based on panel data	56.0*
Method 4: Randomized experiment	30.6*

Statistically significant at the 5% level

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