

Teaching Introductory Economics: Application of the Cost-Benefit Principle to the Optimal Allocation of Resources

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Abstract: The current way of teaching Introductory Economics in many universities in different parts of the world does the emphasis on technique. As you flip through the pages of the classic textbooks written by G. Mankiv, P. Krugman, R. Lipsey, M. Parkin you will see graphs or mathematical formulas practically on every page. At the end of such a course the students learn how to calculate equilibrium prices and quantities, different types of elasticities and multipliers, how to draw indifference curves. But they have no idea how to apply any of these tools to real world problems.

Key words: economic education; teaching introductory economics; undergraduate curriculum; cost-benefit principle; optimal allocation of resources

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1. Application of the Cost-Benefit Principle to the Optimal Allocation of Resources: General Algorithm

One of the most fundamental concepts that many of us want our beginning students to master is the cost-benefit principle. Perhaps, only few who teach Introductory Economics would disagree that the cost-benefit principle is the pillar of Microeconomics. But, surprisingly, the classic textbooks do not discuss this fundamental concept at all. As far as my teaching experience goes, the only textbook that dedicates the whole chapter to the cost-benefit principle is Frank/Bernanke's "Principle of Microeconomics". I have been using this textbook for many years and I really appreciated the way how this concept was presented to the students.

Due to my personal persuasion about the value of the cost-benefit principle to the beginning economics students I have made a genuine contribution to the methodology of teaching it. I was able to design a general algorithm of how to apply the cost-benefit principle to the problem of optimal allocation of resources. Typically, I use this algorithm in two chapters of my Introductory Economics course — "Basics of the Cost-Benefit principle" and "Demand: The Benefit Side of the Market". Let me invite you to my Introductory Economics class and share with you that stuff.

First of all, students are introduced to the general idea behind the algorithm. It consists of the following steps: **Step 1**. Pick up RANDOMLY any allocation A.

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Step 2. Look forward to another allocation B reallocating your resources just a little bit.

Step 3. Standing on allocation A ask yourself a question: "Should I move from A to B?"

To answer the question you have to compare two things: Additional Benefits from "Moving from A to B" with Additional Costs of "Moving from A to B".

Step 4. Let us assume that the Additional Benefits from "Moving from A to B" is bigger than Additional Costs of "Moving from A to B". In this case the cost — benefit principle advises you to move from A to B.

Now you are standing on allocation B and you look forward to another allocation C reallocating your resources in the same direction as you did in step 2.

Step 5. Standing on allocation B ask yourself a question: "Should I move from B to C?"

To answer the question you have to compare two things: Additional Benefits from "Moving from B to C" with Additional Costs of "Moving from B to C".

Step 6. Let us assume that the Additional Benefits from "Moving from B to C" is bigger than Additional Costs of "Moving from B to C". In this case the cost — benefit principle advises you to move from B to C.

And so on..... If moving from allocation X to allocation Y you find out that Additional Benefits from "Moving from X to Y" is less than Additional Costs of "Moving from A to B" Then you have arrived at the optimal allocation which is X.

Let us demonstrate how this algorithm works solving the following two problems.

2. Application of the General Algorithm (Problem 1)

"Seth owns a company that employs homeless people to sell flowers each Saturday evening between 10 p.m. and midnight on the downtown street corners of Centerville and Outerville. If Seth has 6 sellers how she should allocate them to get the maximum total revenue?"

Table 1 presents information about total revenue earned by the sellers located in two different locations. For example, if Seth allocates four sellers at Centerville they will generate \$90 of total revenue to her. But if Seth allocates four sellers at Outerville they will generate only \$80 of total revenue.

Number of sellers	Total revenue in Centerville	Total revenue in Outerville
0	\$0	\$0
1	\$30	\$50
2	\$55	\$65
3	\$75	\$75
4	\$90	\$80
5	\$100	\$85
6	\$100	\$85

 Table 1
 Total Revenue in Centerville and Outerville

Source: Own data

Now we are going to apply the general algorithm specified above to this specific problem:

Step 1. Pick up RANDOMLY any allocation A:

Assume that Seth is thinking to send 1 person to Centerville and 5 persons to Outerville.

Thus, allocation A: 1 at Centerville & 5 at Outerville.

Step 2. Look forward to another allocation B reallocating your resources just a little bit:

Now, Seth is thinking to reallocate 1 person from Outerville and place it to Centerville.

Thus, allocation B: 2 at Centerville & 4 at Outerville.

Step 3. Standing on allocation A Seth is asking herself a question: "**Should I move from A to B**?" To answer the question Seth has to compare two things: Additional Benefits from "Moving from A to B" with Additional Costs of "Moving from A to B". Additional Benefits from "Moving from A to B" are associated with extra (additional) person at Centerville which will bring Seth an Additional Revenue. Therefore, Additional Benefits from "Moving from A to B" = Total Benefits at Centerville (from two persons) — Total Benefits at Centerville (from one person) = \$55-\$30 = \$25. That extra (additional) person moved from Outerville to Centerville will bring Seth extra \$25 in revenue. But when Seth reallocates one person from Outerville to Centerville she loses revenue associated with that person at Outerville — she has 4 persons at Outerville instead of 5. Therefore, Additional Costs of "Moving from A to B" are associated with the Loss of Revenue at Outerville:

Additional Costs of "Moving from A to B" = Total Benefits from 5 persons at Outerville minus Total Benefits from 4 persons at Outerville = \$85 - \$80 = \$5

Step 4. As we see, Additional Benefits from "Moving from A to B" = \$25 are bigger than Additional Costs of "Moving from A to B" = \$5. Thus, the cost-benefit principle advises Seth to move from A to B.

Now Seth is standing on allocation B (2 at Centerville & 4 at Outerville) and she is looking at **allocation** C (3 at Centerville & 3 at Outerville)

Step 5. Seth is asking herself a question: "Should I move from B to C?"

To answer the question Seth has to compare two things: Additional Benefits from "Moving from B to C" with Additional Costs of "Moving from B to C". Additional Benefits from "Moving from B to C" are associated with extra (additional) person at Centerville which will bring Seth an Additional Revenue. Therefore, Additional Benefits from "Moving from B to C" = Total Benefits at Centerville from three persons minus Total Benefits at Centerville from two persons = \$75-\$55 = \$20. That extra person moved from Outerville to Centerville will bring Seth extra \$20 in revenue. But when Seth reallocates one person from Outerville to Centerville she loses revenue associated with that person at Outerville-she has 3 persons at Outerville instead of 4. Therefore, Additional Costs of "Moving from B to C" are associated with the Loss of Revenue at Outerville: Additional Costs of "Moving from B to C" = Total Benefits from 4 persons at Outerville minus Total Benefits from 3 persons at Outerville = \$80-\$75 = \$5

Step 6. As we see, Additional Benefits from "Moving from B to C" = \$25 are bigger than Additional Costs of "Moving from B to C" = 5. Thus, the cost-benefit principle advises Seth to move from B to C.

Now Seth is standing on allocation C (3 at Centerville & 3 at Outerville) and she is looking at **allocation D** (4 at Centerville & 2 at Outerville)

Step 7. Seth is asking herself a question: "Should I move from C to D?"

To answer the question Seth has to compare two things: Additional Benefits from "Moving from C to D" with Additional Costs of "Moving from C to D". Additional Benefits from "Moving from C to D" are associated with extra (additional) person at Centerville which will bring Seth an Additional Revenue. Therefore, Additional Benefits from "Moving from C to D" equal to the difference between Total Benefits at Centerville from four persons and Total Benefits at Centerville from three persons: 90-75 = 15. That extra (additional) person moved from Outerville to Centerville will bring Seth extra 15 in revenue. But when Seth reallocates one person from Outerville to Centerville she loses revenue associated with that person at Outerville — she has 2 persons at Outerville instead of 3. Therefore, Additional Costs of "Moving from C to D" are associated with the Loss of

Revenue at Outerville: Additional Costs of "Moving from C to D" = Total Benefits from 3 persons at Outerville — Total Benefits from 2 persons at Outerville = \$75-\$65 = \$10

Step 8. As we see, Additional Benefits from "Moving from C to D" = \$15 are bigger than Additional Costs of "Moving from C to D" = 10. Thus, the cost — benefit principle advises Seth to move from C to D.

Now Seth is standing on allocation D (4 at Centerville & 2 at Outerville) and she is looking at **allocation E** (5 at Centerville & 1 at Outerville)

Step 9. Seth is asking herself a question: "Should I move from D to E?"

To answer the question Seth has to compare two things: Additional Benefits from "Moving from D to E" with Additional Costs of "Moving from D to E". Additional Benefits from "Moving from D to E" are associated with extra (additional) person at Centerville which will bring Seth an Additional Revenue. Therefore, Additional Benefits from "Moving from D to E" = Total Benefits at Centerville from five persons — Total Benefits at Centerville from four persons = \$100 - \$90 = \$10. That extra person moved from Outerville to Centerville will bring Seth extra \$10 in revenue. But when Seth reallocates one person from Outerville to Centerville she loses revenue associated with that person at Outerville — she has 1 person at Outerville instead of 2. Therefore, Additional Costs of "Moving from D to E" are associated with the Loss of Revenue at Outerville: Additional Costs of "Moving from D to E" = Total Benefits from two persons at Outerville — Total Benefits from one person at Outerville = \$65-\$50 = \$15

Step 10. As we see, Additional Benefits from "Moving from D to E" = \$10 are less than Additional Costs of "Moving from D to E" = 15. Thus, the cost — benefit principle advises Seth not to move from D to E.

Therefore, **the optimal allocation is D (4 at Centerville & 2 at Outerville)**. If Seth allocates four persons at Centerville and two persons at Outerville she will maximize her total revenue.

3. Application of the General Algorithm (Problem 2)

Now let us apply the above algorithm in the context of the chapter "Demand: The Benefit Side of the Market" — to the **utility maximization process**.

Assume that you have in your pocket \$10 and you want to allocate these \$10 between two types of ice-cream — vanilla and sundaes — to get maximum utility. You pay \$1 for one cone of vanilla and \$1 for one cone of sundaes. The Table 2 presents total utility you get from consumption of different amount of cones of vanilla and sundaes.

Step1. Pick up randomly any bundle A that exhausts consumer's income:

Let us split \$10 between two types of ice-cream — choose bundle A [5v, 5s]

Step 2. Calculate marginal utility per dollar (MU/P) for each good in the bundle A.

When we calculate (MU/P) for a good in a bundle we pay attention to the last unit of the good in the bundle. In our case, (MU/P) vanilla = (75 - 68) utils/\$1 = 7 utils/per dollar. (MU/P) sundaes = (130 - 120) utils/\$1 = 10 utils/per dollar

We see that (MU/P) sundaes > (MU/P) vanilla. It means that to move from initial bundle A to an optimal bundle you need to re-allocate your income towards **more sundaes.** Having compared (MU/P) between two goods in the bundle A, we were able to determine the general **direction** of re-allocation of our income to arrive at the optimal bundle:

Sundaes \uparrow is the path to the optimal bundle

Vanilla cones (per week)	Utils (per week)	Sundaes cones (per week)	Utils (per week)
0	0	0	0
1	36	1	50
2	50	2	80
3	60	3	105
4	68	4	120
5	75	5	130
6	80	6	138
7	84	7	144
8	82	8	148
9	81	9	150
10	80	10	151

Table 2 Total Utility

Source: Own data

Step 3. Once you have determined the direction of re-allocation of your income, you follow this direction and pick up the next affordable bundle B that contains more of sundaes: B [4v, 6s]

Step 4. You apply the cost-benefit principle to the action "Move from bundle A to bundle B". Marginal (additional) benefits of the action will be associated with the additional utility you would get from the additional amount of sundaes (move from 5 to 6 sundaes).

Marginal Benefits = (138 - 130) = 8 utils

Marginal (additional) costs of the action will be associated with the additional utility you would lose due to the decrease in the consumption of vanilla (move from 5 to 4).

Marginal Costs = (75 - 68) = 7 utils

Step 5. As you see, Marginal Benefits > Marginal Costs. In this case the cost –benefit principle suggests to you to move from bundle A to bundle B.

Step 6. Now, having moved to bundle B you pick up next affordable bundle C that contains more sundaes: C [3v, 7s]

Step 7. You apply the cost-benefit principle to the action "Move from bundle B to bundle C". Marginal (additional) benefits of the action will be associated with the additional utility you would get from the additional amount of sundaes (move from 6 to 7 sundaes).

Marginal Benefits = (144 - 138) = 6 utils

Marginal (additional) costs of the action will be associated with the additional utility you would lose due to the decrease in the consumption of vanilla (move from 4 to 3).

Marginal Costs = (68 - 60) utils = 8 utils

Step 8. Marginal Benefits < Marginal Costs. In this case the cost-benefit principle advises you: "Do not move from bundle B to bundle C. Stay at bundle B."

Bundle B is the optimal bundle — it gives you maximum utility for your \$10.

4. Conclusion

Although two problems above are artificially created and the algorithm to solve them can't be applied directly to real — life issues of optimal allocation of resources but students, nevertheless, will greatly benefit from

solving them. How? They will get used to look at the real world problems through the glasses of "opportunity costs and the cost-benefit principle". This is the major benefit they should expect from studying and learning the principles of Introductory Economics. It is my deep persuasion that our role as economic educators is to help beginning students to form their economic way of thinking. As John Maynard Keynes said in his famous General Theory of Employment, Interest and Money: "The theory of economics does not furnish a body of settled conclusions immediately applicable to policy. It is a method, rather than a doctrine. An apparatus of the mind, a technique of thinking, which helps its possessors to draw correct conclusions."

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