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The Right Perspective in Business Education

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I. INTRODUCTION

The development of economic theories derived by mathematical exposition has been explosive in the past, but the interpretation of economic theories has remained extremely primitive for long time say for more than fifty years because, the assumption, which underlies the use of mathematics, has not been formerly scrutinized. Consequently, teachers of economic theories have misled their students in interpreting economic theories and business models. My concern in this paper is to put business education in the right perspective.

Thus, one of the purposes of this paper is to reintroduce a model[1], which I have developed previously, by which the validity of the interpretation of an economic theory, such as the marginal rate of substation in an indifference curve, can be tested. The major purpose of the paper is to apply the above model in interpreting the concept of economics, such as marginal rate of substitution, so that interpretation of an economic theory, thus teaching in business and economics can be put in right perspective.

II. INTERPRETATION OF THE MEANING OF MATHEMATICS

Mathematics has been used in the past in an economic theory without

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[1] See Paul Kim, "A Fundamental of Scientific Inquiry in Economics," http://scholarspace.jccc.edu/econpapers/6.

the development of a criterion that can test whether or not its usage is justifiable in developing an economic theory. In other words, mathematics has been used in the past in the development of an economic theory without establishment of a formal agreement about the way in which the mathematical equation is interpreted. Thus, in this paper, I will outline formally and establish the way in which an equation should be interpreted in economics. In other words, I will examine the way in which a mathematical equation is interpreted. For this purpose, I will present two types of the interpretation of an equation as shown below so that the validity of the substitution of an equation can be tested before we carry out the algebraic manipulation[2]:

(A): The algebraic definition of interpretational direction A, hereafter called the interpretational direction A or simply called (A).

(B) The algebraic definition of interpretational direction B, hereafter called the interpretational direction B or simply called (B).

Here is an example of an equation to explain the above (A) and (B):

$$dy/dx \ = \ 5 \qquad (1)$$

There are two elements in (1); one is mathematics and the other is interpretation. Mathematically, (1) indicates that two quantities on the left hand side of the equation and the right hand side of the equation are the same, thus they are universally true or the equality sign indicates the

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[2] For complete explanation of the two type of interpretation of an equation from the usage of language perspective, see Paul Kim "A Fundamental of Scientific Inquiry in Economics," htt://scholarspace.jccc.edu/econpapers/6 or Google. 9-14 .

universally true fact that the both sides are equal. However, when we interpret the meaning of dy/dx and 5 in (1), the term on the left hand side of the equation, which is a variable dy/dx, and the term on the right hand side of the equation which is a constant number 5, are not always the same. I will elaborate this point in detail by presenting two definitions of an interpretation of an equation mentioned above as (A) and (B).

An interpretation of an equation is defined as "the algebraic definition of interpretational direction A" to indicate that the meaning of a variable such as dy/dx in (1) is interpreted in terms of a constant number such as 5 in (1). On the other hand, an interpretation of an equation is defined as "the algebraic definition of interpretational direction B" to indicate that the meaning of a constant number such as 5 in (1) is interpreted in terms of a variable such as dy/dx in (1).

One of the important objectives of this article is to reveal that the above mentioned (A) and (B) are not the same[3]. Stated specifically, (A) is always acceptable or universally true, but (B) is not always acceptable or (B) is not universally true.

I will begin this by first explaining (A). The interpretation of a variable in an equation in terms of a constant number means that the

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[3] See for example, M. Parkin, *E. Microeconomics* 10th ed. (Addison Wesley), pp. 208. He treats that (A) and (B) are the same. Two statements are made: (1) The magnitude of the slope of indifference curve measure the marginal rate of substitution. (2) The magnitude of the slope of indifference curve is (called) the marginal rate of substation. The author assumes that (1) and (2) are the same. This paper has proven that this assumption is nor right. First (1) one is Interpretational Direction (A) and second (2) one is Interpretational Direction (B). (A) is acceptable but (B) is acceptable or not true statement. But the vast of majority of economists use (2) to define the marginal rate of substitution. See another example, R. G. Hubbard and A. P. O'Brien, *Microeconomics,* 5th ed. (Person), pp. 336. (The slope (is) tells us MRS.)   For an another example, See, W. Nicholson, *Intermediate Microeconomics*, 7th ed., pp. 52. (We call the absolute value of this slope the marginal rate of substitution.)

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meaning of a variable is interpreted or summarized by a constant number. For example, dy/dx in (1) means the amount of change in y resulting from an additional unit of change in x. This meaning can be summarized numerically in (1) as five units or expressed fully as the amount of change in y resulting from one additional units of change in x is equal to five units. (*Mathematically,* this interpretation or *summary* means that the meaning of a variable can be replaced by a constant number, or the former statement can be replaced by the latter statement in interpreting the equation. Although a constant number such as 5 in (1) does not have any specific meaning, it can be used to summarize the meaning of a variable or a function relationship.) Thus (A) is the right interpretation.

Next, I will scrutinize (B), which intends to interpret the meaning of a constant number in an equation in terms of a variable. The interpretation of a constant number in an equation in terms of a variable means that the meaning of a constant number can be summarized by a variable. For example, the meaning of a constant number such as 5 in (1) can be summarized by a variable such as dy/dx in (1). In other words, according to (B), a constant number such as 5 in (1) indicates that there is a functional relationship stated in a variable such as dy/dx in (1). Obviously, this interpretation of an equation, which is (B), is wrong since a constant number itself does not have any specific meaning.

For example, assume that dr/dt represents rate of the U.S. economic growth per year. When we write dr/dt = 3 %, we can interpret the U.S. economic growth rate can be summarized as 3 % or the U.S. economic growth rate is 3 %. This is the Interpretational Direction A and it is acceptable interpretation because the meaning of dr/dt is explained in terms of a constant number.

However, if we interpret the above equation by saying, "3 % is the U.S. economic growth rate," it is false or inconclusive interpretation. Because it is the Interpretational Direction B or 3% could be many other things beside the U.S. economic growth rate. In conclusion, (A) and (B) is not the same.

III. BUSINESS EDUCATION: ROLE AND LIMITATION OF MATHEMATICS

I have noted in this paper at the end of the section II that the interpretation direction (A) and the interpretational direction (B) are not the same. (A) is right interpretation and (B) is wrong interpretation. However, the vast majority of economists have assumed that they are the same, especially in teaching in economics and business education.

For example, Professor Parkin presents[4]:

(I) "The magnitude of the slope of indifference curve measures the marginal rate of substitution."

(II) "The magnitude of the slope of indifference curve is (called) the marginal rate of substation."

When Professor Parkin states that MRS can be measured by value of the slope of the indifference curve, his statement is true. However, he also says "The value of the slope of indifference curve is MRS," which is false. They are not the same, because the value of the slope of the indifference curve such as 5 can be mean anything, not only MRS and also many other things.

The Professor Parkin assumes that (I) and (II) are same. Note that (I)

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[4] Michael Parkin, *"Microeconomics,"* 10th edition, (Person), 208

is the interpretational direction of (A) and (II) is the interpretational direction of (B). As noted earlier (A) and (B) are not same. Thus (I) and (II) are not the same. (A) is right interpretation and (B) is wrong interpretation. So (I) is right interpretation but (II) is false interpretation.

Yet, the majority of economists have used (II) (which is wrong interpretation) in defining MRS. The use of the slope of an economic function such as an indifference curve to define the concept in economics such as MRS is a popular today. Unfortunately, most economists use the slope of the indifference curve to define MRS; this is obviously wrong.

For example, Professor Mankiw[5] specifically says, "The slope of an indifference curve is the marginal rate of substitution."

This paper has proven that this kind of defining MRS is wrong. But the vast majority of economists including Professor Mankiw use (II), which is (B) to define the marginal rate of substitution[6].

Therefor, MRS should not be defined using the slope an indifference curve but should be defined by logical reasoning. As noted earlier, the number such as 5 or the value of the slope of an indifference curve cannot give the meaning of the predicable relationship. We must first create the meaning of the MRS by intuitive ground (or empirical observations), and its

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[5] N. Gregory Mankiw, *"Microeconomics,"* 4th edition, (Thomson/South-Western.N.), 460.

[6] Here are some more examples: R. G. Hubbard and A. P. O'Brien. They state, "The slope (is) tells us MRS." *Microeconomics,* 5th ed. (Person), pp. 336. For an another example, W. Nicholson, "We call the absolute value of this slope the marginal rate of substitution." *Intermediate Microeconomics*, 7th ed., pp. 52. Finally, Professor Paul Krugman and Robin Wells also present, "the slope of the indifference curve (at any point) is (equal to minus) the marginal rate of substitution." They do not also see the difference between (I) and (II). See Paul Krugman and Robin Wells, *"Microeconomics,"* 2nd ed. (Worth), 283.

meaning can be summarized by the slope of an indifference curve such as 5. We will discuss this next.

IV. MARGINAL RATE OF SBUSTITUTION

In this section, I will demonstrate the right perspective of teaching the concept of marginal rate of substitution in the subject of an indifference curve. An indifference curve is the defined as the rate at which the amount of y is given up or sacrificed for one extra unit of x consumed in order to keep the consumer as happy as before. The most important concept or information about the indifference curve is the rate at which the amount of y is traded for x. So we made the term for this rate and called it the marginal rate of substitution (of x for y). MRS indicates or is defined the rate at which the amount of y which a consumer is wiling to give up or sacrifice in order to get one extra unit of x.

But the purpose of this section is to find another or more practical definition of MRS intuitively so that we will have a practical or application-oriented interpretation of MRS. For this purpose, we will show the computation of the value of MRS first below.

In order to compute the value of MRS, we look at two points on an indifference curve and estimate the ratio of two values on the indifference curve. For example, if the change in y is 20 (which is the amount of y given up) and the change in x is 4 (which is the amount of increase in x), then we form the ratio of two changes (20/4). This ratio (20/4) is often called the ratio of the slope of the line (or function). When we compute this ratio, its value becomes 5. Thus the value is 5, and it shows <u>per unit</u> information (one

extra unit of x) as stated in the following definition; if the value of MRS is 5, it means that the consumer is willing to give up 5 units of y in order to get <u>one</u> extra x.

This means that the consumer favors x compared with y or the consumer loves x so much compare with y. (Obviously, this is because the consumer has little x but y in abundance.) Specifically, the consumer is satisfied with x 5 times more than the y. In another words, MRS indicates how much the consumer is satisfied with x in comparison with y. Stated specifically, the consumer is satisfied with x 5 times as much as he or she is with y (if MRS = 5). This is the second definition of MRS. The first definition was the amount of y which a consumer is willing to give up (which was 5) in order to get one extra unit of x. So there two ways to define MRS. They both have the same meaning but say the same thing in two different ways. If we put the two definitions together, MRS is defined as the value of x (in relationship to y). For example, if MRS is 5, the consumer values x 5 times as much as he or she values y. This final definition of MRS (as the value of x) is simple and will be useful later in our search of equilibrium quantities of x and y when we compare the value of x with the cost (or the price) of x (as expressed as "Px/Py")[7].

Now as a note, the value MRS declines (like 5, 3, 2, and 1) as it moves down along the indifference curve. This is called "law of diminishing marginal utility," because as the consumer consumes more and more of x, the value of x declines (because the consumer has x in

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[7] If the value of x (MRS) is greater than the cost (the price) of x (noted as Px/Py), the consumer should increase the quantity of x consumed. On the other hand, if the former is less than the latter, the consumer should decrease the quantity of x consumed. Thus the condition of equilibrium is realized when the value of x become equal to the cost (or price) of x.

abundance).

In summary, MRS (of x for y) based on our intuition is this; <u>MRS simply indicates the value of x.</u> However, when we say the value of x, it can be interpreted intuitively in two different ways: (1) how much the consumer is willing to sacrifice y to get one x[8]; or (2) how much the consumer appreciates x[9] (in relationship to y). Both (1) and (2) present the same meaning but expressed differently how much we value of good x.

V. NOTE

Today, many concepts in economics and business are taught using the slope of the curve of a functional information such as MRS. This paper has demonstrated a right perspective or approach to the teaching of much of economics or business concepts so that teaching in business and economics course has the right perspective.

The right way to teach the concept of MRS, which I have demonstrated in this paper invites more intuitive thinking, not just relying on mechanical part of the concept based on the mathematics. Business education should more emphasize the cultivation of the intuitive thinking and inspiration of new ideas so that there would be more modern Adams Smiths in the future; rather than mathematicians as elite groups in business education class.

The reason why the interpretation of an economic theory remains in crude form was because they did not know the meaning of the use of mathematics until my theory of the interpretational direction of (A) and (B)

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[8] Its meaning can be summarized mathematically as change in y over change in x.
[9] Its meaning can be summarized mathematically as MUx/MUy.

appeared. In conclusion, my theory of the interpretational direction (A) and (B), not only destroy many of false economic theories developed, but also, more importantly, promote creative and intuitive thinking in interpreting economic theories.

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