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BOOK REVIEW

Revisiting the geometry of the demand and supply functions **by Saidou Baba Oumar, 2021, Generis Publishing, 55 Pages. ISBN: 9798590826094**

The economic thought is plural, but at each time a central corpus emerges and brings together the beliefs of researchers and academics who have the same convictions on the most fundamental concepts. Economists play an important role in determining the concepts which are relayed to future generations. A first synthesis called the "neoclassical" had started taking shape with Alfred Marshall in 1890. In addition, Benjamin Disraeli, British Prime Minister in the late nineteenth century, is reputed to have said that *there are three kinds of lies: lies, damned lies, and statistics. One of the most powerful ways of conveying statistical information is in the form of a picture: a graph. Thus graphs too, like statistics, can tell lies. But the right graph does not lie. Indeed, it reveals data and helps its viewer to see and think about relationships that would otherwise be obscure*. Graphs are surprisingly modern invention. The first graphs appeared in the late eighteen century, long after the discovery of mathematical sophisticated ideas such as logarithms and calculus. But today, especially in the era of personal computer and video display, graphs have become almost more important than words. The ability to make use of graphs is as important as the ability to read and write. How do economists use graphs? What are the different types of graphs that economists use? What are the main pitfalls that can result in a graph that lie? Here is a series of questions that could have caught the attention of Oumar. But instead he became interested in the unique style of graphically explaining the demand and supply functions – two key concepts in the Marshallian analysis – on a two-dimensional Cartesian plane diagram where the variable price is always plotted on the Y-axis (vertical line) and the variable quantity demanded or supplied is plotted on the X-axis (horizontal line).

The book is comprised of well-organised seven chapters; from the introduction to conclusion. It is made up of 55 pages and attempts to revisit the geometry of the demand and supply functions in economic analysis, taking mathematical requirements into account. In other words, the book revisits the Marshallian graphical framework of presenting the demand and supply functions based on the scientific requirements of logic, rigour, consistency and objectivity. Specifically, the author intends to:

- Prove the validity of the laws of demand and supply with regard to the two mathematical forms of defining the demand and supply functions of a good;
- Examine the procedure for measuring the elasticity concept;

- Explore the computation of the surplus concept;
- Discuss the geometry of other economic analyses and;
- Recommend the appropriate ways of using mathematics in economic analyses.

Chapter one is the introduction. It presents the genesis and the evolution of two key concepts over time: the concepts of demand and supply. Also, it explores the theoretical foundations of the inquiry, specifies the objectives to achieve and explains the methodology adopted to realise the set aims of the book. The author explains that if the use of the concepts of demand and supply dates back to the 14th century with ibn Taimiyah, it is Davenant (1699) who disseminated an explanation of the relationship between the price and harvested quantity of corn in England, and Locked (1691) introduced an unambiguous description of the relationship between the variables involved in the concepts, claiming that the rise or fall in the price of any commodity depends on the size of the market and its quantity readily available for the market. However, it is Mill (1767) who first mentioned explicitly the phrase "demand and supply" in economic discussions. The first mathematical model of demand and supply is due to Cournot (1838) while the graphical representation of demand and supply is credited to Jenkin (1870) and its expansion and publicity is owed to Marshall (1890). Starting from a general equation of a function and ceteris paribus, the author uses the case study of the demand for and supply of a good or service in a competitive market to formulate:

- The standard mathematical form or model of the demand and supply functions of a good;
- The causal mathematical model or form of the demand and supply functions of a good.

He observes that all the economists before Marshall complied with the mathematical provision of geometry that consists in plotting the dependent variable (Q) of the standard mathematical model of the demand and supply functions of a good on the vertical axis and the independent variable (P) on the horizontal axis. Furthermore, he points out that Marshall (1890) interchanged the positions of these variables on the axes. This change of the positions of Q and P called the attention of Oumar. He then raised a series of questions such as: Why the interchange of the positions of Q and P on the Y and X axes? Is this pattern of transposing the axes of the variables common to all graphical analyses and representations of real world phenomena? Are there sufficient arguments to motivate the new graphical representation of Marshall? Considering this series of questions, Oumar through the book attempts to revisit the geometry of the demand and supply functions in economic analysis as conceived by Marshall. The methodology used is the analytical approach of data analysis. The validity of the laws of demand and supply functions (standard and causal models) is done through simple numerical examples and graphical representations.

Chapter two is devoted to the examination of the relationship between the variables of the demand and supply functions. The author explains his arguments by presenting four scenarios. Two scenarios are used for each model (standard model and causal model). The first two

scenarios focus on the verification of the laws of demand and supply with the standard model, while the last two scenarios verify the same laws but with the causal model. These scenarios consist in using arbitrary values of P and Q and substituting them into the different equations previously specified to generate the various values of Q_d and Q_s (P_d and P_s) in four different tables. In Scenario 1, the results obtained comply with the requirements of the laws of demand and supply which are stated as follows:

The law of demand states: *other things being equal, the higher the price of a good, the lower is the quantity demanded.*

The law of supply states: *other things being equal, the higher the price of a good, the greater is the quantity supplied.*

These results are confirmed by the graphical representation. In Scenario 2, the results show that the law of demand and supply are confirmed algebraically. However, the author observes that the graphical representation of the causal model of the demand and supply functions discarded the values of Q ranging from 0 to 19 due to the negative price values affecting the supply function (P_s). Therefore, this contradicts the requirements of the law of supply in economic theory. The same contradiction is observed in Scenario 3: the verification of the laws of demand and supply with the causal model. The results of the last scenario are similar to those of the first scenario. Based on all these verifications, Oumar finally concludes that the standard model is more responsive to mathematical treatments than the causal model.

Chapter three investigates the concept of elasticity. Almost all the different types of elasticity are reviewed here. Chapter four explores the meaning of consumer surplus and producer surplus and shows how these measures are calculated based on Marshall (1890)'s reasoning. Chapter five proposes an alternative way of computing the consumer surplus and the producer surplus using the standard model of plotting the dependent variable on the vertical axis and the independent variable on the horizontal axis. The empirical verification with arbitrary data confirms the empirical results obtained with the Marshallian approach in chapter four.

Chapter six is devoted to the geometrical analysis of other economic (micro and macro) phenomena. Both algebraic analyses and graphical representations (where the dependent variables are plotted on the vertical axis and the independent variables on the horizontal axis) are used. Chapter seven concludes the book with remarks and important suggestions.

By way of conclusion, the information contained in this book is very instructive and useful for students and academics. Also, the simplicity of the language, examples and graphical illustrations used in the book make it a useful tool in economics for nonprofessional economists or general public. Moreover, the way the book is written encourages the reader to finish it at a stretch. The other major contributions of the book are found in chapters three and five where the author challenges Marshall's graphical representation of the demand and supply functions and where he proposes an alternative way of calculating surplus, respectively. Finally, the book paves the way for more debates and publications to researchers and academics. However, the first limitation of the book is that it has a few mistakes in particular on the following pages:

15, 18, 28, 38, and 45. As a matter of fact, on page 15, the omission of Q = 41 in Table 2 has caused a one period gap in the calculated values of P_d and P_s. The same problem is encountered in Table 3 on page 18. On page 28, in the last paragraph, line 7, it should be written "…from the transaction is 300…" and not "….200…". On page 38 and specifically in Table 6, the last figure in the column of "output" should be "9" instead of "11". On page 45, Table 9, the wrong figures imputed in the column of TVC has negatively affected all the subsequent columns integrating that variable in their calculations. Also, taking into consideration the mathematical rigour which is very dear to the author, it is worth mentioning here that the rounding up of figures in this table has not been done properly. For instance, the fifth and sixth figures in column "AFC" should be 1.67 and 1.54 and not 1.66 and 1.53 respectively. The second limitation is the incompleteness of the analysis. It would have been desirable for the author to carry out a complete analysis in the domains of the different functions under study than doing it in specific intervals of these domains. And drawing a conclusion from a partial or incomplete analysis could be misleading, hence the necessity to complete the analysis of Oumar. The four scenarios of the author are reproduced here but with different series of arbitrary values. In scenarios 1 and 4, a series of arbitrary values of "P" is used with $P \in [25,+\infty[$ while in scenarios 2 and 3, another arbitrary series of values of "Q" is used where $Q \in [50,+\infty[$. This is done because it is obvious that the series of values used by the author can go up the lower limits of these new series of values without any change in his conclusions. Following the procedure of the author, the following tables are obtained:

Table 1: Quantity-price schedules of demand for and supply of a good in a free market for scenario 1

P	25	26	27	28	29	.	.	.
Q_d	0	-2	-4	-6	-8	.	.	.
Q_s	95	98	101	104	107	.	.	.

Table 2: Price-quantity schedules of demand for and supply of a good in a free market for scenario 2

Q	50	51	52	53	54	.	.	.
P_d	0	-0.5	-1	-1.5	-2	.	.	.
P_s	10	10.33	10.67	11	11.33	.	.	.

Table 3: Price-quantity schedules of demand for and supply of a good in a free market for scenario 3

Q	50	51	52	53	54	.	.	.
P_d	0	-0.5	-1	-1.5	-2	.	.	.
P_s	10	10.33	10.67	11	11.33	.	.	.

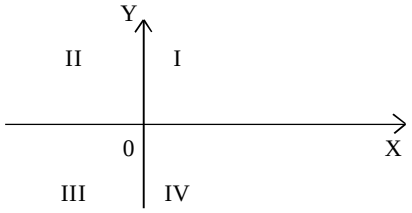
Table 4: Quantity-price schedules of demand for and supply of a good in a free market for scenario 4

P	25	26	27	28	29	.	.	.
Q_d	0	-2	-4	-6	-8	.	.	.
Q_s	95	98	101	104	107	.	.	.

Each table here is the extension of the author's table and is attached to the corresponding graph of the author. In other words, Table i here completes Table i of the author and is attached to Figure i of the author. For the four scenarios, the laws of demand and supply are verified for the two forms of model: the standard and the causal models. This observation is similar to that of Oumar. But contrary to the latter, it is observed now that the standard model is no more responsive to mathematical treatments than the causal model. On the contrary, the causal model seems to be more responsive than the standard model. In fact, in all the four scenarios, Q_d and P_d exhibit negative values which are discarded in the graphical illustrations while Q_s and P_s exhibit positive values. Since all the computed values of the dependent variable obtained from selected interval values of the explanatory variable of the two functions are not retained for graphical representations of the models, the same conclusion should then be applied to the standard model as well as the causal model.

In summary, an extension of the algebraic analysis of Oumar shows that: in scenarios 1 and 4 if we consider values of P greater than or equal to 26, the quantity demanded would be negative while the quantity supplied would be positive. Should we then conclude that the law of demand is partially fulfilled with the standard form of describing the demand and supply functions? Or should we infer that this contradicts the requirements of the law of demand in economic theory? Also, in scenarios 2 and 3 in the book, the author has only focused on the negative values of P_s while P_d equally has negative values as from Q greater than 50. Why is he not concerned with these negative values of P_d? Why did he not insist on the explanation of the withdrawal of the negative values in the graphical representations?

The Cartesian plane diagram has four quadrants as illustrated below:



In quadrant I, X > 0 and Y > 0

In quadrant II, X < 0 and Y > 0

In quadrant III, X < 0 and Y < 0

In quadrant IV, X > 0 and Y < 0

And of course, it is only quadrant I (where X > 0 and Y > 0) that is taken into consideration in the geometrical analysis in the book and this is due to the nature of the variables. Actually, the variables quantity (Q) and price (P) can never be negative. And as such, the underlying assumption of the laws of demand and supply is that their graphical representations should be

restricted to quadrant I. This justifies why it is normal to discard the values of Q ranging from 0 to 19 and all the other negative values in the graphical illustrations of the demand and supply function in scenarios 2 and 3. Therefore, it is too biased to conclude that only the requirements of the law of supply in economic theory are contradicted.

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