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Author(s): John B. Egger

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Clarifying and Teaching Bohm-Bawerk's "Marginal Pairs"

John B. Egger

In history of economic thought courses, Eugen von Bohm-Bawerk (1851–1914) is usually introduced as one of the early Austrian economists who contributed to the theories of capital and interest. If time permits, however, key differences between the Austrian and neoclassical methods can easily be illustrated using Bohm-Bawerk's "marginal pairs" theory of price.¹ Bohm-Bawerk begins a horse trade with one potential buyer and one potential seller. He adds traders on one side of the market, then on the other, and finally proposes a general rule for the determinants of price. Because the valuations of the last successful buyer and seller² (one marginal pair) and of the first unsuccessful buyer and seller (another marginal pair) determine the range of feasible market-clearing prices, his analysis is commonly called *marginal pairs*.

Students often find Bohm-Bawerk's 20-page discussion to be clear, if a bit wordy, and more intuitive than the curves of neoclassical microeconomic theory. It is a convenient way to illustrate the good and bad aspects of a number of attributes of the Austrian school: a preference for working with discrete units of indivisible goods, verbal rather than symbolic mathematical reasoning, cause-and-effect analysis rather than mutual determination, and imperfect markets with limited numbers of traders. For counterpoint, George Stigler's (1966, 313) comments are useful:

Finally, particular numerical examples may raise theoretical difficulties which are essentially irrelevant or unimportant, and thus unnecessarily complicate the theory. Here Bohm-Bawerk provides an example: he established the clumsy and misleading theory of "marginal pairs" of buyers and sellers to circumvent difficulties arising out of his choice of indivisible commodities (horses) to illustrate the theory of values.

Contrasting Stigler's and Bohm-Bawerk's methods leads to a fascinating comparison of the research paradigms of the Austrian and the Chicago schools. Because many students lump these schools together, knowing only that they are both free market, the discussion can be particularly provocative and illuminating.

My purpose is not to survey and contribute to the vast literature on the differences between Austrian and neoclassical theories of markets. Those to whom the distinctions are unfamiliar but intriguing may enjoy some of the essays in the collections edited by Boettke (1994) and by Dolan (1976, especially the introduction), and Rothbard (1976).³

Just as a hint of the fun one can have, I like to rely on my students' experience with our intermediate price theory course, notorious for its graphs and mathe-

John B. Egger is an associate professor of economics at Towson University.

matics. Bohm-Bawerk's method follows that of the Austrian school's founder, Carl Menger, the first sentence of whose 1871 *Principles of Economics* (1981, 51) is "All things are subject to the law of cause and effect." Whatever the advantages of symbolic mathematics for describing equilibrium states, it is useless for establishing a cause-effect relationship and for understanding the process by which individuals *make* or *form* prices. Bohm-Bawerk's and later Austrians' preferences for verbal reasoning, therefore, is not simply a refusal to be dragged into the modern age but follows from fundamental beliefs about the purpose and nature of economics. Even average students find the contrast between Bohm-Bawerk's verbal discussion of the causal process by which individuals form a price and the intensively graphical and mathematical examination of equilibrium states dominating courses in microeconomic theory to be dramatic and intriguing, so it offers the teacher an excellent opportunity to explore differences between Austrian and neoclassical microeconomics as deeply as interest and time permit.

In practice, instructors and authors often pay little attention to Bohm-Bawerk's theory of price. Time is pressing in a general-coverage history of economic thought course, and despite its recent revival, some teachers are not interested in the Austrian school. Another reason is that Stigler is right: Bohm-Bawerk's conclusion is not clearly stated. To put it less charitably, because he claims generality, it is wrong. Scholars are properly suspicious of conclusions that seem dependent on involved numerical examples, and Bohm-Bawerk unintentionally illustrates the danger of reliance on examples by drawing an incorrect generalization. Because teachers have other claims on their time, a minor topic without apparent validity is a prime candidate for omission.

The marginal-pairs theory is worth a second look. Students like it, and it offers teachers a convenient introduction to provocative discussions of Austrian propositions. In this article, I clarify and correct Bohm-Bawerk's presentation and offer a student-friendly graphical exposition of it.

THE MARGINAL PAIRS

Each of Bohm-Bawerk's potential horsetraders has established a monetary valuation: a supply price and a demand price.⁴ The student should start at Bohm-Bawerk's one-buyer, one-seller beginning to appreciate his verbal style, but I will jump to his numerical example of "determination of price with two-sided competition" (Bohm-Bawerk 1959, 220, Table 1).

Bohm-Bawerk defines a *pair* as one buyer and one seller, selected according to their capacity for exchange. Upper-case letters in Table 1 (A or B) indicate buyer or seller; lower case indicate one of his pairs. The first pair, a, associates the most capable buyer (Aa, the individual with the highest demand price) with the most capable seller (Ba, the owner with the lowest supply price). The second pair, b, groups the second-most-capable buyer (Ab) and second-most-capable seller (Bb). Because the fifth pair (Ae/Be) exchanges but the sixth (Af/Bf) does not, Ae/Be constitute one of the *marginal pairs* and Af/Bf constitute the other marginal pair. As Bohm-Bawerk (1959, 225) put it:

TABLE 1
Bohm-Bawerk's Data

Willing buyer	Valuation of one horse (\$)	Willing seller	Valuation of his horse (\$)
Aa	300	Ba	100
Ab	280	Bb	110
Ac	260	Bc	150
Ad	240	Bd	170
Ae	220	Be	200
Af	210	Bf	215
Ag	200	Bg	250
Ah	180	Bh	260
Aj	170		
Ak	150		

Source: Bohm-Bawerk (1959, 220).

In the case of determination of price the motive of economic advantage of the participants imposes the requirement that the pairs of contracting parties having the greatest capacity for exchange shall consummate exchanges in descending order of such capacity. The progression must reach one last pair which thus becomes the "marginal pair."

In his example, bargaining will drive the price into the range between the valuations of Af and Bf: that is, it is determined by one (the unsuccessful) of his marginal pairs. He observes in a footnote (note 15, 434) that if the valuations of Af and Bf had been different (\$190 and \$230, respectively), then exchanges would have been consummated at a price between the valuations of Ae and Be, the successful marginal pair. His generalization is that the price must lie within a range, the borders of which are either the valuations of the successful marginal pair or the valuations of the unsuccessful marginal pair, whichever marginal pair establishes the smaller range. Again in his words:

The determination of the limit by two valuations must be interpreted to mean that that valuation will prevail which in each instance makes narrower the range within which the price must fall. (p. 224)

Where there is two-sided competition the market price will become established at a point within a range having an upper and a lower limit. The upper limit is determined by the valuation by the last buyer to come to terms and the valuation by that excluded willing seller who has the greatest capacity for exchange. The lower limit is determined by the valuation by the last seller among those to come to terms, and the valuation by that excluded willing buyer who has the greatest capacity for exchange. (p. 224)

Market price is established at a point within a range which is limited and determined by the valuations by the two marginal pairs. (p. 225)

The modern interpretation of the willing buyer's valuation is his or her demand price, and the willing seller's valuation is his or her supply price. Because the fifth-highest demand price (Ae's \$220) exceeds the fifth-lowest supply price (Be's \$200), and the sixth-highest demand price (Af's \$210) falls short of the sixth-lowest supply price (Bf's \$215), five (and not six) horses will be

exchanged. As Bohm-Bawerk's charming prose demonstrates, the range in which the price will appear can be analyzed verbally, but the modern student and teacher are likely to find the explicit construction of demand and supply curves helpful. I will develop that exposition after examining the presentation of Bohm-Bawerk's theory in textbooks.

THE MARGINAL PAIRS IN THE TEXTBOOKS

Some modern textbooks omit the marginal pairs.⁶ In the textbook that I use, *A History of Economic Theory and Method* (1990), Ekelund and Hebert discuss the theory, but the presentation is not very helpful.

Bohm-Bawerk put his finger on one of the determining factors in exchange value, the influence of *marginal pairs* of buyers and sellers in determining price. Successful buyer A_5 and seller B_5 , coupled with unsuccessful buyer A_6 and seller B_6 , are the main characters in price determination. One might phrase it in another (but a little more confusing) manner. It is the evaluations of the weakest of successful buyers (A_5) and the strongest of successful sellers (B_5) coupled with the evaluations of the strongest of unsuccessful buyers (A_6) and the weakest of unsuccessful sellers (B_6) that set the limits to exchange value. (p. 344)

Ekelund and Hebert have replaced one of Bohm-Bawerk's "and"s by the phrase "coupled with" and have used numbers rather than letters as subscripts to identify the marginal traders. Their Table 13-2 (p. 343) aligns potential buyers and sellers on either side of a horizontal line, with one double-ended arrow between the last successful buyer and the first unsuccessful seller and another arrow between the last successful seller and the first unsuccessful buyer, but this diagram is not explained.⁷

One textbook that comes close to a clear statement is the classic text of Haney (1949), who observes:

To cut a long story short, he [Bohm-Bawerk] concludes, with considerable amplification and refinement of his predecessors' teaching, that objective exchange value is determined somewhere between (1) an upper limit set by the valuations of the last, or least desirous, buyer included in the exchange and the most capable seller excluded, on the one hand, and (2) a lower limit established by the valuations of the least capable seller—the last seller—and the most desirous buyer included. In every case, it is the narrower of these double limitations that decides. (pp. 616–17)

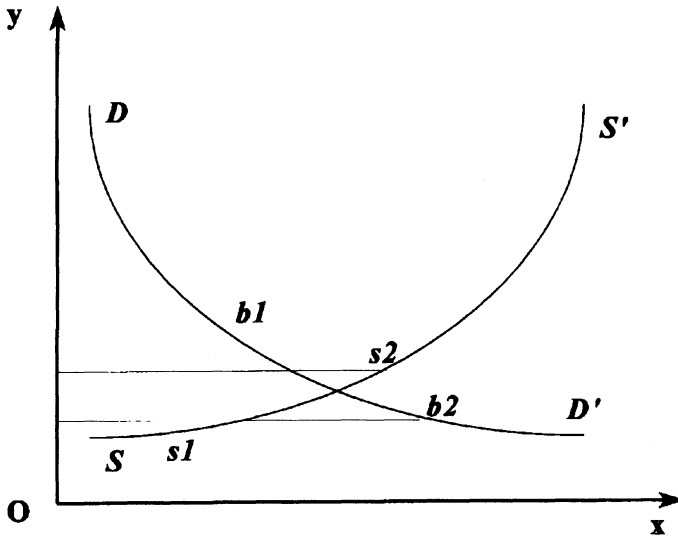
Haney illustrates his explanation with a supply-and-demand construction in which successive buyers' demand prices and sellers' supply prices are identified with superscripted b's and s's (Figure 1).

He concludes his explanation:

... if b^1 and s^1 = the last included buyer and seller respectively; then the maximum price will be set by the pair b^1 and s^2 , and the minimum by the pair s^1 and b^2 . In the diagram s^2 and b^2 are closer together than b^1 and s^1 ; and consequently they set the limits. (p. 617)

Haney correctly states Bohm-Bawerk's conclusion, but one must be aware that although Haney uses the word *pair* to identify b^1 and s^2 (and s^1 and b^2), these are not Bohm-Bawerk's *marginal pairs*. The pair of valuations that sets the upper limit to the feasible range of prices, Haney's b^1 and s^2 , comprises one member

FIGURE 1
How Haney Illustrates the Marginal Pairs



Source: Haney (1949, 617).

from one Bohm-Bawerk marginal pair (b^1/s^1), and another from the other (b^2/s^2). The Haney pair that determines the lower limit includes the remaining members of the two marginal pairs, b^2 and s^1 .

Haney's introduction of stylized supply and demand curves provides the means to a correct understanding and a straightforward way to teach Bohm-Bawerk's method.

CLARIFYING AND PRESENTING THE THEORY

My presentation of Bohm-Bawerk's theory follows Haney's lead in using supply and demand curves but retains the typically Austrian use of discrete units. Using numbers from the 1959 Huncke translation but reinterpreting "valuations" as demand and supply prices, I have constructed portions of the demand and supply curves for horses. With discrete curves like these, \$210 is the price the sixth most capable buyer is willing to pay, so the quantity demanded at exactly \$210 is six, while the sixth most capable seller is willing to accept \$215, so the quantity supplied at \$215 is six. For five to be demanded and supplied, then, the price must be permitted to equal neither \$210 nor \$215. Quantity supplied equals quantity demanded at five horses, and the price of each will lie above \$210 but below \$215 (Figure 2).

I focus on that relevant range of quantities and prices to understand Bohm-Bawerk's example better and I use his terminology to identify the buyers and sellers. In Bohm-Bawerk's example, the range of prices is between the valuations

of the first unsuccessful buyer (FUB) and the first unsuccessful seller (FUS): between \$210 and \$215. This is, indeed, one possible set of boundaries for the price range (FUB and FUS), but it is only one of four (Table 2).

Consider first the upper boundary. There are two possibilities for the valuation that sets it: that of the first unsuccessful seller (FUS) and that of the last successful buyer (LSB). The upper boundary will be the *lesser* of these two valuations. Figures 3a and 3b illustrate these possibilities, with other portions of the demand and supply curves—even the lower boundary of the price range—omitted. Bohm-Bawerk's example is Figure 3a; for Figure 3b, I have changed his LSB demand price from \$220 to \$213 (the important issue is that it is now less than \$215) and identified this hypothetical buyer as Ae'.

There are similarly two possibilities for the lower boundary, set by the *greater* of the valuations of the first unsuccessful buyer (FUB) and the last successful seller (LSS). Bohm-Bawerk's example is Figure 3c. For Figure 3d, I have raised the valuation of the LSS from \$200 to \$211 (the example requires only that it

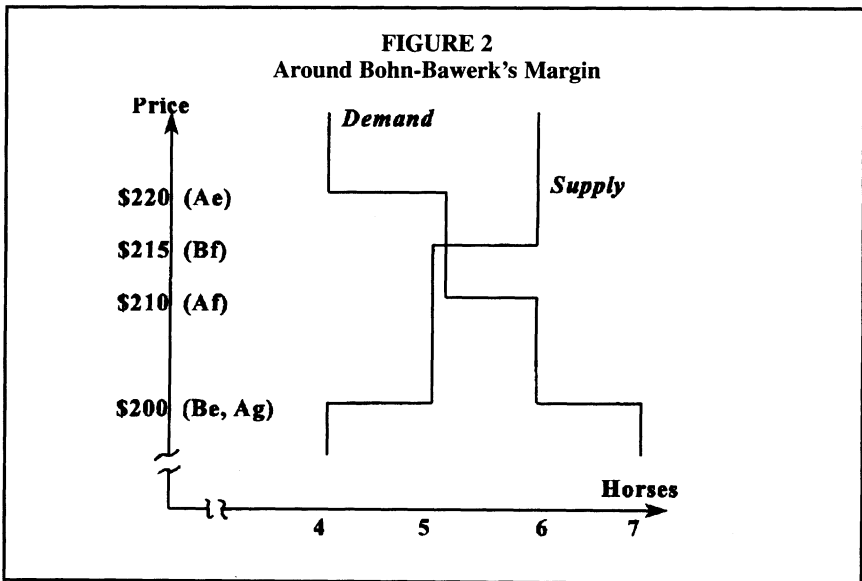


TABLE 2
The Traders Who Comprise the Marginal Pairs (e and f)

Buyer	Demand price	Identified as
Ae	\$220	Last successful buyer (LSB)
Af	\$210	First unsuccessful buyer (FUB)
Seller	Supply price	Identified as
Be	\$220	Last successful seller (LSS)
Bf	\$215	First unsuccessful seller (FUS)

Source: Bohm-Bawerk (1959, 220).

exceed \$210), identifying this hypothetical seller as Be' . The four possible outcomes may be identified by using the letters of the parts of Figure 3. Either A or B (Figure 3a or 3b) illustrates the upper end of the range; either C or D illustrates the lower end. The outcomes are summarized in Table 3.

If the first unsuccessful seller's supply price (\$215 for Bohm-Bawerk) is less than the last successful buyer's demand price (\$220), and the first unsuccessful buyer's demand price (\$210 here) exceeds the last successful seller's supply price (\$200), then Bohm-Bawerk's case applies. The upper and lower boundaries are set by the valuations of the unsuccessful marginal pair. Bohm-Bawerk's footnote (1959, 434, note 15) makes two hypothetical changes: it reduces FUB from \$210 to \$190, and it raises FUS from \$215 to \$230. These changes make the upper end of the price range LSB (\$220) and the lower LSS (\$200), so the range is determined by the valuations of the successful marginal pair.

This was Bohm-Bawerk's error that made his claim of generality false. For both limits of the feasible price range to be determined by either one marginal pair or the other, his footnote modification had to raise FUS above LSB and lower FUB below LSS. If he had made one change but not the other, he would have identified my AD and BC possibilities. But the feasible range would no

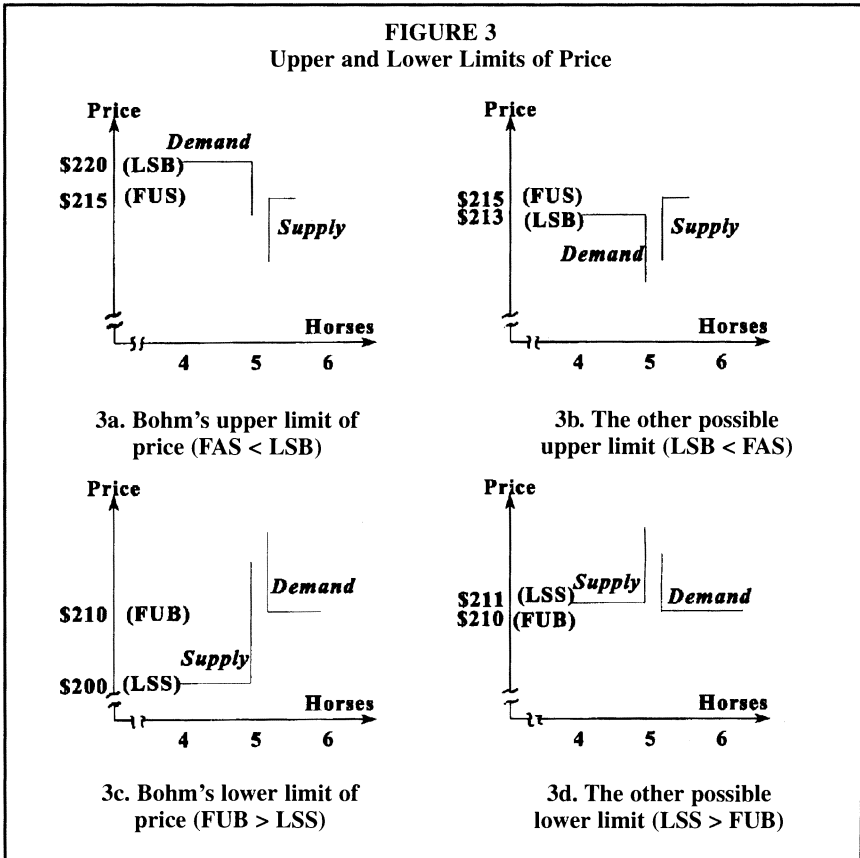


TABLE 3
Possibilities: Marginal Pairs . . . and Others

Figure 3 combination	Upper boundary	Lower boundary	
AC	FUS (Bf)	FUB (Af)	[Bohm's text; unsuccessful marginal pair]
AD	FUS (Bf)	LSS (Be')	
BC	LSB (Ae')	FUB (Af)	
BD	LSB (Ae')	LSS (Be')	[Bohm's note; successful marginal pair]

longer be determined by one of the marginal pairs: it would be determined by one valuation from one pair and one valuation from the other.

It is, indeed, the valuations of the marginal pairs that determine the range of feasible prices. But Bohm-Bawerk is wrong to claim that the range is either from LSS to LSB or from FUB to FUS, whichever range is smaller. The lower limit is either LSS or FUB (whichever is larger), and the upper limit is either LSB or FUS (whichever is smaller). A modest change in Bohm-Bawerk's exposition completes and clarifies this outcome.

Where there is two-sided competition the market price will become established at a point within a range having an upper and a lower limit. The upper limit is [determined by] *the smaller of* the valuation by the last buyer to come to terms and the valuation by that excluded willing seller who has the greatest capacity for exchange. The lower limit is [determined by] *the greater of* the valuation by the last seller among those to come to terms, and the valuation by that excluded willing buyer who has the greatest capacity for exchange. (1959, 224)

Bohm-Bawerk's original wording is bracketed; my suggested replacements are italicized. They provide the precision and completeness that were lacking in the original and missed by both of the modern presentations discussed here.

Neither Haney's (1949) nor Ekelund and Hebert's (1990) discussion is incorrect, but each is incomplete. Haney's "closer together," in particular, very nearly describes the correct conclusion. The two (of the four) valuations that are "closest together" must be the smaller of the two above-equilibrium prices and the greater of the two below-equilibrium prices.

CONCLUSIONS

A simple change in Bohm-Bawerk's wording clarifies, corrects, and completes his exposition. His imprecise "determined by" can be replaced by "the smaller of" (in the case of the upper limit) and by "the greater of" (in the case of the lower limit). Besides making his expression precise, this change illustrates that his example is but one of four possible outcomes. Unfortunately, it also reveals that Bohm-Bawerk's claim that the price range is determined by either one marginal pair or by the other is wrong. The use of discrete step-type demand and supply curves makes the teaching of this theory easy and clear.

Whether a concept or theoretical tool pays its own way in a course is always a matter for the teacher's judgment, and—no doubt—many will follow Stigler and the example of several current textbooks in omitting Bohm-Bawerk's marginal pairs theory of the determination of price. I have found that it nicely illustrates several characteristics of the Austrian school and that, presented as it is here, it is easy for my undergraduate students to grasp.

NOTES

1. *Positive Theory of Capital* (1889). Page references are to its publication as volume 2 of *Capital and Interest*, translated by George D. Huncke (1959). On the determination of price, see pp. 217–35.
2. "Last" means the successful buyer whose demand price is lowest and the successful seller whose supply price is highest.
3. For more on the differences between Stigler and the Austrians, see chapter 8 of Stigler (1941). An introduction to some of the controversy is found in Paque (1985). A readable and contemporary American use of the Austrian approach to price formation is in Rothbard (1993, 91–108). A vast literature exists on Austrian economics, including the refereed *The Review of Austrian Economics*; as the text emphasizes, however, this article is not intended to introduce this literature.
4. To be precise, demand prices would be slightly below and supply prices slightly above these monetary valuations.
5. The Smart translation (Bohm-Bawerk, 1930) uses British pounds as currency (p. 203) but is not significantly different.
6. Those omitting this topic include Landreth and Colander (1994) and Oser and Brue (1988).
7. Ekelund and Hebert (1990) identify those potential sellers with the lowest supply prices as "weak," probably because their monetary valuations are the lowest, but in Bohm-Bawerk's terms they are the *strongest* (or *most capable*) sellers.

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