Did Pareto discover income and substitution effects? On an interpretation suggested by Hutchison

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Abstract

Terence Hutchison (1953) has argued that in his Manual of Political Economy Vilfredo Pareto provided a verbal, non−mathematical description of income and substitution effects. Hutchison's claim on Pareto's behalf is important since it would move the date of the discovery of the concept (if not the mathematical proof) of separate income and substitution effects back from 1915 to the 1906 publication of the original Italian language version of the Manual, and would reassign priority for the discovery from Slutsky to Pareto. This note reexamines this claim of Hutchison's, and shows that in fact it is mistaken. Pareto did not actually discuss income and substitution effects as they are now understood. Rather, in the passage which Hutchison cites, Pareto was discussing the impact of a change in income, not prices, on quantities demand.

I. Introduction

It is generally understood that in addition to his many other accomplishments as an economist, statistician, and sociologist, Vilfredo Pareto made several fundamental contributions to the theoretical study of utility and consumer demand. As numerous authors have noted, he argued (somewhat inconsistently) for an ordinal approach to utility functions and pioneered the comparative statics analysis of demand later completed by E.E. Slutsky (1915), John Hicks and R.G.D. Allen (1934), and others. E. D'Albergo (1949), George Stigler (1950), John Chipman (1976), Renato Cirillo (1979), Peter C. Dooley (1983), Jurg Niehans (1990), and Christian Weber (1999a, b) have all discussed the relationship between the comparative statics analysis first employed by Pareto (1892-1893, Parts III and V, 1909) and the complete analysis later provided by Slutsky and others.

This rather sizeable secondary literature on Pareto's contribution to the comparative statics of consumer demand clearly indicates that the major difference between the analyses of Pareto and Slutsky is that although Pareto did pioneer the mathematical methods later used by Slutsky, Pareto never separated out the income and substitution effects of a change in price.[1] In fact, he neglected the mathematical study of income effects almost entirely. Because he did not derive the income and substitution effects, he was also unable to derive the Slutsky equation. Thus, he was never able to explain exactly when and why demand curves will slope downward, or to show that compensated cross price effects must be symmetric. These important contributions, which lie at the heart of the modern theory of demand, had to wait for Slutsky (1915).

In the context of this secondary literature, it is surprising to see Terence Hutchison (1953) argue that in his *Manual of Political Economy* Pareto did in fact provide a non-mathematical, verbal description of income and substitution effects. Hutchison's claim on Pareto's behalf is important since it would move the date of the discovery of the concept (if not the mathematical proof) of separate income and substitution effects back from 1915 to the 1906 publication of the original Italian language version of the *Manual*, and would reassign priority for the discovery from Slutsky to Pareto.[2]

This note reexamines this claim of Hutchison's, and shows that in fact it is mistaken. Pareto did not actually discuss income and substitution effects as they are now understood. Rather, in the passage which Hutchison cites, Pareto was discussing the impact of a change in income, not prices, on quantities demand.

II. Hutchison on Pareto and Income and Substitution Effects

This section considers the merits of Hutchison's claim on Pareto's behalf. Quoting from Pareto's *Manual*, Hutchison (1953, p. 221) writes:

> Pareto also develops the distinction between income and substitution effects: 'In passing from a certain combination of goods A, B, and C, ... to another A^1, B^1, and C^1, we may divide the operation into two: first we preserve intact the proportions of the combination and increase (or decrease) all the quantities in the same proportion; secondly, we change the proportions and so arrive definitively at the combination A^1, B^1, & c' (*Manuel*, p. 283).[3]

However, Hutchison's claim that Pareto had discovered the idea of separate income and substitution effects is in error, as an examination of the context in which the quoted passage appear quickly reveals. The passage which Hutchison quotes appears in a longer section at the very end of Chapter IV of the *Manual* in which Pareto is discussing indifference curves. Having discussed the two good case using graphs, Pareto proceeds to the case of more than two goods. The passage from the 1971 English translation of the *Manual* reads as follows:

> The case in which we have many goods is very complex; hence it is useful to have available several means for simplifying it. In order to move from a certain combination of goods A, B, and C, ... to another A', B', and C', ... we can divide the operation in two: 1st We keep the proportions in the combination intact and increase (or decrease) all the quantities proportionally; 2nd we change the proportions, and thus finally arrive at the combination A', B', ... For example, let us assume an individual who has 1,200 francs annual income; this income increases to 2,400. The allocation will be as follows:

Expenditure for	First real situation		Intermediate theoretical situation		Second real situation	
	francs	% of income	francs	% of income	francs	% of income
Food	720	60	1,440	60	1,200	50
Housing	360	30	720	30	600	25
Clothing	120	10	240	10	600	25
Income	1,200	100	2,400	100	2,400	100

> It should be noted that the first operation is much more important than the second, especially for increases in income which are not very substantial. When income increases, it is true that the proportions spent on the large categories, food, housing, clothing, amusement, change, but that is a secondary phenomenon compared to the principle phenomenon, which is the increase in all these expenditures. (Pareto, 1971, pp. 207-208)

Nowhere in this passage does Pareto ever mention a change in the price of any good of the goods under consideration. Instead, he is concerned throughout with changes in income only. Thus, Pareto's two stage movement from bundle A, B, C ... to bundle A', B', and C' ... is not analogous to

the modern distinction between the income and substitution effects of a change in price. Rather, it suggests thinking of the income effect itself as being composed of two parts: In one of these, all quantities demanded change in the same proportion as the change in income, so that income expansion curves and Engel curves are rays through the origin. In the second, the fraction of income assigned to each good is permitted to change, so that the income expansion curves and Engel curves need not be linear and need not pass through the origin. Pareto clearly believed that the first of these changes dominated the ultimate impact of a change in income on quantities demanded.

In effect, Pareto is arguing here that:

1) Utility functions need not be homothetic,[4] and indeed that homothetic utility functions imply behavior (constant proportions of income spend on all goods regardless of the level of income) not observed empirically.

2) However, the assumption that utility is homothetic is in many cases a reasonably close approximation to reality, especially for sufficiently small changes in income, since "the first operation (changing demands for all goods by the same proportion as the change in income) is much more important than the second, especially for increases in income which are not very substantial."

III. Conclusion

Pareto has a great many accomplishments to his credit, but the discovery of the separate income and substitution effects of a change in price is not among them, Hutchison's claim to the contrary notwithstanding. The point of this paper has been to show that a more careful reading of Pareto's *Manual* clearly shows that priority for the discovery of the income and substitution effects of a change in price still rightfully goes to Slutsky.

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NOTES

1. See, e.g., Dooley (1983), Niehans (1990), and Weber (1999b).

2. Since Pareto's discussion is entirely verbal, even if Hutchison were correct, priority for the mathematical development of the income and substitution effects would still go to Slutsky.

3. The page reference refers to the 1909 French translation of the *Manual*. The quoted passage appears in a slightly different translation on pp. 207-208 of the 1971 English translation.

4. For a homothetic utility function, the slope of an indifference curve depends only on the ratio of the goods consumed. Thus, the income expansion paths in the indifference map and the Engel curves in income-quantity space are rays through the origin. This implies that with all prices fixed, the proportion of income spent on each good must be constant. For a discussion of homothetic functions, see Chiang (1984, Sec. 12.7). The reader should note that Pareto himself never used the word homothetic.