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Sir Robert Giffen and the Great Potato Famine: A Discussion of the Role of a Legend in Neoclassical Economics

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and
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It is widely believed that British economist Sir Robert Giffen observed Irish peasants consuming increasing quantities of potatoes as potato prices rose during the mid-nineteenth century famine. The conventional explanation for this purported behavior assumes that potatoes were strongly inferior goods and constituted a large portion of the typical Irish consumer's budget; consequently, the demand curve for them was upward-sloping. The historical evidence, however, appears to contradict this view. Indeed, the very nature of a famine implies that this behavior could not have been characteristic of the populace as a whole. There is no way to buy more potatoes when there are fewer potatoes. Thus, the Giffen legend concerning the great potato famine appears at best to be a misinterpretation of some observed but misunderstood phenomenon, and at worst a kind of hoax.

The purpose of this paper is to examine the perpetuation of the prevailing theory despite its historical inaccuracy. We briefly review the controversy surrounding the Giffen legend and examine the paradigmatic value of the existing legend. Some concluding remarks are given at the end of the paper.

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The Giffen Controversy

Between 1845 and 1849, Ireland experienced what is commonly referred to as the great famine: a blight that destroyed enormous portions of the potato crop. In 1848 alone, for example, the blight reduced the yield per acre by nearly 50 percent, from 7.2 tons to 3.9, while in other years the blight destroyed virtually the entire crop [Mitchell and Dean 1962]. By all accounts, potatoes were a staple of the Irish peasants' diet, and the ensuing starvation was a direct consequence of the potato blight.

Aside from the tragic nature of this history, there is nothing remarkable about these events. Rather, it is the behavior of the peasants during this time that is of interest. According to popular economic lore, the blight created a supply shock, which raised the price of potatoes, inducing both income and substitution effects among consumers. Potatoes are said to have been income-inferior goods, so the income effect of the price rise encouraged an increase, rather than a decrease, in the consumption of potatoes. Indeed, as the story goes, the income effect so dominated the substitution effect that Sir Robert Giffen observed peasants actually consuming *greater* quantities of potatoes as their price rose, thus exhibiting a positively sloped demand curve. A popular presentation of the story is given in the principles text by Paul Samuelson:

... When the 1845 Irish famine greatly raised the price of potatoes, families who consumed a lot of potatoes merely because they were too poor to consume much meat might have ended up consuming *more* rather than less of the high-P[rice] potatoes. Why? Because now they had to spend so much on potatoes, the necessary of life, as to make it quite impossible to afford any meat at all and hence were forced to become even more dependent than before on potatoes. In brief, the substitution-effect was here overcome by the perverse income-effect applicable to a peculiar "inferior" good such as the potato, which tends to *decrease* in the poor man's budget when incomes *rise*. This *curiosum* is attributed to Sir Francis [sic] Giffen, a Victorian economist [Samuelson 1964, 432n].

In a later edition, Samuelson and Nordhaus are somewhat less cautious in their presentation and more clearly identify the alleged source of the story:

What happened when the 1845 Irish famine greatly raised the price of potatoes? ... After the potato blight, potato prices rose so sharply that the family's real income actually fell. As a result, they ended up consuming more rather than less of the high-P[rice] potatoes!

. . . This curiosum is attributed to Sir Robert Giffen, a Victorian economist [Samuelson and Nordhaus 1985, 416].

The Giffen story, however, has been under attack by scholars for nearly half a century. As the late George Stigler [1947] pointed out, Giffen never published any such findings, so that it is questionable whether he actually observed such behavior. Indeed, having been born in 1837, Giffen would have been a mere child in England at the time of the famine in Ireland. This makes it highly doubtful that he directly observed the Irish peasants during the 1845-49 period and more doubtful still that he would have correctly interpreted any such observed behavior. It was not until 50 years later, in 1895, that the Giffen story appeared in the third edition of Alfred Marshall's *Principles of Economics*. Marshall himself, born in 1842, was a toddler of three years at the outbreak of the famine and could no more have observed the behavior of the Irish during this time than could Giffen. And while it is conceivable that a mature Robert Giffen reported his childhood observations to a mature Alfred Marshall in the 1890s, at best the report emerged after a half century of gestation. In any case, Marshall's version of the Giffen paradox refers to bread, rather than to potatoes: ". . . as Mr. Giffen has pointed out, a rise in the price of bread makes so large a drain on the resources of the poorer labouring families and raises so much the marginal utility of money to them, that they are forced to curtail their consumption of meat and the more expensive farinaceous foods; and, bread being still the cheapest food which they can get and will take, they consume more, and not less of it" [Marshall 1895, 132]. Some years later, in the *Memorandum on Fiscal Policy of International Trade*, Marshall makes it clear that the observation refers to the consumption of wheaten goods in England in the latter half of the nineteenth century [Stigler 1947, 152]. Marshall's subsequent correspondence with Francis Edgeworth discussing Giffen phenomena confirms this interpretation [Stigler 1947, 152-3]. Thus, Marshall's description is not a valid antecedent for Samuelson's version of the Giffen paradox. Moreover, it appears that both accounts are historically inaccurate.

The evidence for historical observation of either version of the Giffen case is extraordinarily meager. Marshall's reference to Giffen's observation concerning English bread consumption and later discussions of the Irish case, also attributed to Giffen, constitute the only evidence of any such events. Discussions of the bread consumption case invariably cite Marshall's textbook account if any citation is given at all. Curiously, treatments of the Irish case generally contain no citation. In addition to unsuccessfully attempting to trace the origins of Marshall's attribution to Giffen, Stigler [1947] also takes up the question of whether the Giffen

phenomena can be found in the data on English wheat markets in the relevant years of the nineteenth century. Stigler finds no empirical evidence of Giffen behavior in the numbers. Stigler's conclusions have not subsequently been challenged [but see Prest 1949 and Stigler 1949].

In one of the few historical analyses of the Irish potato paradox, Dwyer and Lindsay [1984] argue convincingly that the supposed behavior in fact could not have occurred. Certainly, an upward-sloping demand curve for potatoes could not have been a neoclassical market phenomenon. If the demand curve were positively sloped but flatter than the supply curve, the market would have been unstable: any infinitesimal movement of price above equilibrium would have created excess demand and caused the price to rise further, diverging from equilibrium. That is, under the perverse behavioral assumptions of the Giffen legend, should producers have (perhaps inadvertently) set an asking price for potatoes above the market-clearing level, consumers would have curtailed their purchases of more expensive foods and gone to the market seeking more potatoes, thereby creating a shortage and bidding up the price indefinitely. Alternatively, any slight reduction in price below equilibrium would have sent the price spiraling downward. Moreover, any inward shift of the supply curve occasioned by the blight would have reduced the price and quantity of potatoes. But a price reduction under these circumstances not only contradicts the historical evidence, it runs counter to the legend itself. Had the price fallen, it would not have been possible to observe the response of consumers to a price increase.

Conversely, if the market demand curve were positively sloped and steeper than the supply curve, an inward shift of supply would have raised the price and the quantity consumed. But this result is blatantly preposterous as well as historically inaccurate: the output of potatoes could not have risen during the crop blight. Indeed, had the market conditions been such, potato farmers could have sold more potatoes at higher prices by artificially restricting the supply even in the absence of a blight.

The impossibility of a Giffen market, of course, does not preclude the possibility of Giffen behavior by a minority of individuals or families. In the neoclassical paradigm, the market demand curve is simply the horizontal summation of all the individual demand curves for a particular product. Technically, it would be possible for the market demand curve to slope downward (i.e., for the quantity demanded in the market to be a negative function of price) despite the existence of a few positively sloped individual demand curves. Under such circumstances, with a positively sloped market supply curve and a negatively sloped market demand curve, an inward shift of supply caused by blight would have raised the

equilibrium price of potatoes. The price increase could have caused those consumers for whom potatoes were strongly inferior (those with positively sloped demand curves) to buy more. But inferiority in the neoclassical paradigm implies that the income elasticity of a good is negative, and dominant inferiority (the Giffen condition) implies a very negative income elasticity. As Dwyer and Lindsay [1984] point out, however, for peasants at the brink of starvation, the income elasticity of any foodstuffs, particularly nutritious items, must be quite positive.

It is therefore of interest to consider the possibility of observing Giffen behavior—families consuming more potatoes as the price rises—in the absence of income-inferiority. If potatoes were not income-inferior goods, how is it that people might have been observed consuming more potatoes as the price increased?

Perhaps the simplest explanation is that they exhibited hoarding behavior. Under the threat of mass starvation, it is not at all unreasonable to expect individuals to hoard foodstuffs that can be stored relatively easily. A second possibility has been mentioned by Dwyer and Lindsay [1984] and more recently by Berg [1987]. Since most of the Irish peasants were engaged in agriculture, there was a sizeable portion of the population that both produced and consumed potatoes. This establishes the possibility that it was the behavior of net producers in the event of a price increase that might have produced Giffen-like effects. The third possibility is that the Giffen outcome resulted from a shifting demand curve for a potato substitute rather than a movement along a stationary demand curve for potatoes. Certainly, Marshall's reference to bread might suggest the role of a substitute good, since the blight damaged only the potato crop.

In each of these hypothetical cases, the result holds for normal goods, so that the Giffen outcome is achieved without reference to the Giffen assumptions of income-inferiority and negative income effects. Of course, each of these possible explanations of Giffen phenomena are speculative, but no more so than the prevailing theory, and they are certainly more historically plausible. It thus becomes necessary to inquire why, in the absence of empirical evidence and with more reasonable explanations easily at hand, the less reasonable assumption of strong income-inferiority is retained as part of the received economic doctrine.

The Paradigmatic Significance of the Giffen Legend

The earliest recorded version of the "Giffen paradox" predated Marshall's account and even Giffen himself. It has been attributed to the economist Simon Gray in a volume published in 1815.¹ Nevertheless,

Marshall's account of Giffen phenomena published in 1895 in his widely read text is the key event in what is an essentially legendary process. This is so in two respects. First, the attribution to Giffen, despite Giffen's failure to commit the story to writing suggests an oral transmission to Marshall either directly from Giffen or through one or more intermediaries. Second, all of the subsequent retellings of the story appear with reference to Marshall's account or with no reference. Nowhere is there any attempt to ground the story in empirical evidence. More modern discussions have resembled legends in still another sense. The story has been altered and embellished in the retelling. This appears to be the process that resulted in Giffen's recounted observation of the Irish potato famine.

The earliest example of the *Irish* Giffen story is the one cited above from the 1964 edition of Samuelson's famous textbook. No source is given, and the story is repeated in each subsequent edition until the newly published 14th edition, from which it has disappeared without comment. Besides textbook accounts, to which we will return in a moment, a moderate amount of discussion of the Giffen phenomena has taken place in the journal literature. These articles, with the exception of Dwyer and Lindsay cited earlier, consist of abstract elaborations of demand theory [see Dougan 1982; Silverberg and Walker 1984; Berg 1987; Kipsey and Rosenbluth 1971; De Alessi 1968; Welty 1971; Gilley and Karels 1991] or discussion of the role of the paradox in Marshall's thought or neoclassical economics more generally [see Gramm 1970; Boland 1977; Lloyd 1965, 1969; Welty 1969]. Nowhere is there an attempt to establish the actual historical existence of Giffen markets.

Stated bluntly, there is no reason to believe that Samuelson's Irish famine story is anything other than myth. This myth, however, was apparently not the creation of any one individual. The account given by Samuelson has several elements in common with Marshall's. These include the involvement of Giffen and nineteenth century events on the British isles. There is some evidence that potatoes (without specific reference to Ireland) had been sometimes cited along with bread and rice as possible examples of Giffen goods (as in Gray). The innovation in the Samuelson account had been to put these already legendary elements together with the Irish potato famine (in addition to apparently conflating Sir Robert Giffen and Sir Francis Drake). In so doing, this account created another and apparently more compelling real-world example of the Giffen paradox. Whether the legendary innovations that located the Giffen phenomena within the context of the Irish potato famine originated with Samuelson himself or earlier in an oral tradition is unclear.² In any event,

as Dwyer and Lindsay [1984] point out, such an account can have had little to do with actual events.

Following Samuelson's publication, the legend of Giffen and the potato famine takes on new life. It is widely recounted in texts even though unsupported in the general literature. Dwyer and Lindsay characterize the Irish famine story as being "increasingly" cited and go so far as to identify it as an emerging "fallacious consensus" [Dwyer and Lindsay 1984, 188]. As examples they cite Browning and Browning [1983], Leftwich [1982], McCloskey [1982], Kohler [1982], and Nicholson [1978]. A somewhat informal survey of the textbook literature uncovers further examples of the Irish story [Koch 1979; Ferguson and Maurice 1974; Heilbroner and Thurow 1975; Hirshleifer 1980; Truett and Truett 1982; Ferguson 1972; Stigum and Stigum 1968].

A rather embarrassing example can be found in Lipsey and Steiner's [1977] text. Lipsey's British text, *An Introduction to Positive Economics*, first published in 1963, recounts Marshall's bread story, attributing it to Sir Robert Giffen. In the American text published three years later with Peter Steiner, under the fortunately less empirically smug title of *Economics*, the Irish potato story is attributed to Sir Francis Giffen and identified as "the famous case," a mere two years after Samuelson first published it. Both Ferguson [1972] and Heilbroner and Thurow [1975] refer to the case as "classic."

Why should so many texts consistently repeat a story that is unsupported in the literature, implausible on the face of it, and more easily explained in other ways even if true? The Lipsey and Steiner example cited above certainly suggests one possible explanation. The repetition of the mistake about Giffen's given name would seem to indicate that the example was cadged directly from Samuelson's text. In an article in *The Sciences*, Diane B. Paul refers to this practice as "cribbing" [Paul 1987, 27]. She argues that this activity is not so much due to simple plagiarism on the part of textbook writers as an increasing attention to the bottom line by both textbook publishers and writers. She dates this to the expanding market for college texts in the 1960s and 1970s. The recent decline in the market has only increased competition among the expanded number of publishers. In these circumstances, there is strong temptation to rely on the imitation of established and successful texts. Publishers will also frequently use market surveys. She summarizes the results of this practice by quoting from a decision that ruled against a charge of plagiarism brought by the publishers of Campbell R. McConnell's *Economics: Principles, Problems and Policies*:

Economics professors, who shape the market, desire texts to which their own class notes can be adapted. Their notes, in turn, are the products of long familiarity with what might be described as "Samuelson methodology." These professors are presumptively unwilling to effect a reorganization of their own notes merely to satisfy the whim of a new textbook writer [1987, 29].

Thus, it is not surprising to find an example quoted in Samuelson's immensely successful textbook repeated often nearly verbatim in subsequently written texts. Paul concludes:

Today's textbooks are thicker, slicker, more elaborate, and more expensive than they used to be. They are also more alike. Indeed, many are virtual clones, both stylistic and substantive, of a market leader [1987, 27].

Paul's article is cited by the noted paleontologist and historian of science Stephen Jay Gould in his essay "The Creeping Fox Terrier Clone" [Gould 1991]. In this essay, Gould traces the repetition of a description of *hyracotherium*, the earliest ancestor of the modern horse, as being about the size of a fox terrier. He justifies his method in the following paragraph.

I present an example that may seem tiny and peripheral in import. Nevertheless, and perhaps paradoxically, such cases provide our best evidence for thoughtless copying. When a truly important and well-known fact graces several texts in the same form, we cannot know whether it has been copied from previous sources or independently extracted from any expert's general knowledge. But when a quirky little senseless item attains the frequency of the proverbial bad penny, copying from text to text is the only reasonable interpretation. There is no other source. My method is no different from the standard technique of bibliographic scholars, who establish lineages of text by tracing errors (particularly for documents spread by copyists before the invention of printing) [Gould 1991, 158].

The parallels with our story of Sir Giffen and the Irish potato are obvious. Had Giffen actually made his fabled observations during the potato famine, it would not be surprising that this single exception to the law of demand should be so widely cited. The fact that the story is apocryphal at best is what makes its repetition curious. Gould condemns this sort of activity harshly as "the thoughtless, senseless, and often false copying of phrase, anecdote, style of argument and sequence of topics that per-

petuates itself by degraded repetition from text to text and thereby loses its anchor in nature" [1991, 158]. Gould concludes his essay by pointing out that the best estimates of the size of hyracotherium make it out to be about 55 pounds. Hyracotherium was no more fox terrier-sized than the Irish increased their consumption of potatoes in the face of blight and rising prices.

While copying motivated by thoughtlessness and greed plays a role in the reproduction of the Giffen story, we would like to propose a somewhat more charitable explanation of the repetition of the Giffen legend. Thomas Kuhn in *The Structure of Scientific Revolutions* [1970] devotes considerable energy to examining the role of textbooks in establishing the existence of an ongoing scientific paradigm.

In this essay, "normal science" means research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice. Today such achievements are recounted, though seldom in their original form, by scientific textbooks, elementary and advanced. These textbooks expound the body of accepted theory, illustrate many or all of its successful applications, and compare these applications with exemplary observations and experiments [Kuhn 1970, 10].

In this context, the Giffen legend constitutes an exemplary observation. It illustrates important aspects of demand theory. Because of its exemplary character, it is expected that the legend should be repeated frequently in the context of textbook presentations of neoclassical economic theory. The fact that no such observation ever took place is to a large extent beside the point. Kuhn points out that "the applications given in texts are not there as evidence but because learning them is part of learning the paradigm at the base of current practice" [1970, 80]. The legend's value in learning the paradigm is not dependent on its veracity, though widespread knowledge of its lack of empirical content can and probably will undermine its usefulness.

What role does the Giffen legend play in neoclassical demand theory? At its simplest level, the legend and its subsequent explication illustrate the fundamental distinction between the substitution and income effects and the distinction between normal goods and inferior goods in assessing the impact of the income effect.

The legend also has a more profound meaning in its role as establishing the "scientific" character of the neoclassical paradigm. In this regard, its role is contradictory and ambiguous though nonetheless important. The neoclassical paradigm has adopted falsificationism as its main

method of empirical test, something to which it has held on tenaciously despite the philosophical onslaught against this principle in recent decades [see McCloskey 1983]. If falsification is to be adopted as an empirical method, the theory must be potentially falsifiable. There must be some potential observation that would be inconsistent with the underlying theory. Utility theory, however, accepts tastes and preferences as individual and given outside of the model. Utility maximization is purported to impartially explain the behavior of the voluptuary and the ascetic, the altruist and the criminal. Thus, it is impossible to refute the validity of utility maximization *per se*.

One of the results of utility theory, however, is the "law of demand," which asserts that the quantity demanded of a good declines as its price rises. Unlike utility theory in general, the law of demand is a concrete prediction about behavior; it is therefore potentially falsifiable. Of course, the only possible counter observation to the law of demand is the upward sloping demand curve. The Giffen legend is used to concretely raise this possibility and thus serves to establish the falsifiability and therefore the reputed scientific character of neoclassical theory [see Boland 1977; De Alessi 1968; Welty 1971].

The tension arises because the Giffen legend, in establishing falsifiability, threatens to carry out that falsification by denying the law of demand. As soon as the Giffen legend is offered to establish falsifiability, it is transformed into an anomaly to be explained. The explanation is found immediately through the operation of the negative income effect. The Giffen paradox thus becomes an anomaly explained. By explaining its major potential anomaly, the neoclassical paradigm is strengthened. Thus, neoclassical economics sacrifices the universality of the law of demand to preserve the larger intellectual construct, utility maximization theory. Meanwhile, the tautological character of utility maximization has been obscured by seemingly raising the possibility of the scientific falsifiability of the neoclassical paradigm. The Giffen legend therefore serves to both establish and deny the falsifiability of neoclassical theory. Paradoxically, it can serve and indeed has served both functions despite their incommensurability.

In either or both functions, the Giffen story has been integrated into the neoclassical paradigm. Its repetition need not be regarded necessarily as evidence of greed or indolence. On the contrary, the retelling of the story may be a necessary part of educating economics students in the essential lore of the profession. Gould's *hyracotherium* as the evolutionary ancestor of the horse is perhaps another instance of the repetition of an exemplary application, in this case, of evolutionary theory.

The utility of the Giffen legend is evidenced by various attempts to rescue the story from its crumbling empirical foundations. The most simple strategy is to acknowledge the apparent apocryphal character of the story while recounting it anyway. A much more elaborate strategy involves doing animal studies. One such study induced hungry animals to consume more of an unpleasant food alternative when its "price" rose because their "income" was too low to provide sustenance otherwise [see Silverberg et al. 1987].

Battalio et al. [1991] set out to confirm Silverberg et al.'s study by reproducing a similar economic environment in their laboratory. They motivate their study by observing that "in constructing such an environment within the bounds set by legal and ethical considerations and our limited research budget, we have used rats as individuals" [Battalio et al. 1991, 961]. They obtain similar results by depriving rats of liquid sustenance. They conclude in part: "We believe that the results of this experiment are important, not because they suggest that Giffen goods are likely to be observed in aggregate market demand, but because of their ability to test between competing representations of consumer behavior and to validate the counterintuitive prediction of the Slutsky-Hicks theory regarding the existence of Giffen phenomena" [Battalio et al. 1991, 969].

Such attempts are not only a testimony to the enduring legacy of the Giffen legend. More generally, they reflect a greater preference for finding or contriving data to verify theories rather than rejecting theories for which there exists no supporting evidence.

Conclusion

Two distinct versions of the "Giffen legend" have appeared in the economic literature, each propounded by the leading economic theorist of his day. Alfred Marshall asserted, apparently without evidence, that bread was a Giffen good among the late-nineteenth century English. Paul Samuelson later asserted, even more implausibly, that potatoes constituted a Giffen good to the mid-nineteenth century Irish. Both authors' stories rely on the dominance of negative income effects over substitution effects and thus attribute to food the peculiar characteristic of strong income-inferiority. The present paper suggests, however, that a simultaneous increase in the price of food and its consumption can be readily explained without reference to such features. The epistemological value of the story therefore lay not in its superior ability to explain any observed phenomena. Rather, the Giffen legend strengthened utility theory by implying falsifiability while simultaneously making empirical refutation

more difficult. Even the most seemingly perverse behavior—the possibility of an upward-sloping demand curve—could be explained away by invoking income and substitution effects. Thus, there are specific philosophical reasons for the perpetuation of a somewhat fanciful legend within the relentlessly positivist story of neoclassical economics.

Notes

1. Simon Gray published *The Happiness of States* in 1815. In it, he made the following argument:

To raise the price of corn in any great degree, tends directly to increase the general consumption of that necessary. There is no paradox here. . . . As the surplus of their income, in these times of real or pretended scarcity, after buying the usual quantity of bread, will not procure anything like the usual quantity of meat and other articles, [the working classes] must, therefore, lay it out on more bread and potatoes. . . . By raising the price of bread corn, thus, far from making people live less on that necessary, . . . we force them to live more on it; and beyond a certain price, almost entirely [Gray in Masuda and Newman 1981, 1012, 1013].
2. This possibility is suggested by the personal recollections of an anonymous reviewer.

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