

Harberger Triangles, Okun Gaps, and X-Efficiency:
The Rhetorical Application of Data Leibenstein's X-Efficiency

Introduction

In 1966, Harvard economist Harvey Leibenstein published an important article, questioning the prevailing assumption that competitive pressures are sufficient to guarantee efficient outcomes. Leibenstein offered examples of virtually identical firms producing differing results, which he took to be evidence that many firms do not operate optimally.

Leibenstein proposed that imperceptible factors explain what must be deviations from maximum efficiency. He attributed these instances of less-than-optimal performance to deficient motivation. He appealed to psychologists' research on the subject of work, but admitted they rarely offered hard numbers to back up their studies. Leibenstein acknowledged the limits of his own data:

... it is of importance to say something about the nature of the data. The empirical evidence does not present many unambiguous cases It is quite possible that the cases considered are entirely atypical ... and could not be duplicated in large segments of the economy. Some additional inputs or reallocations are sometimes involved. Also uncertainty elements and accidental variations play a role. Nevertheless, it seems that the magnitudes involved are so large that they suggest that the conjecture [about the limits of] allocative efficiency must be taken seriously. [Leibenstein 1966, p. 399]

In naming the phenomena he was describing, Leibenstein took his cue from a passage in Leo Tolstoy's War and Peace, which contained the observation, "Two armies may be identical in every observable respect, yet one army, in possession of an intangible 'X-factor,' will soundly defeat the other" (Part XIV, II).

Following Tolstoy's lead, Leibenstein introduced the concept of 'X-efficiency' into economic literature. X-efficiency created quite a stir, but, unlike Tolstoy, Leibenstein won more critics than admirers:

Between 1969 and 1980, the article was the third most frequently cited in the Social Science Citation Index. However, ... much of this citation derived from attempts to explain X-efficiency theory away: it was under almost constant attack from much of the mainstream of the profession over that same dozen years. [Perlman and Dean 1998, p. 141]

Leibenstein's most distinguished supporter was Herbert Simon, who devoted the final section of his Nobel Lecture to the subject, singling out Leibenstein along with Cyert and March (Simon 1979, pp. 50-89). Simon, however, was not committed to standard micro theory. Subsequent to Leibenstein's article, he had largely withdrawn from the discipline of economics, publishing only two articles in the American Economic Review and one in the Journal of Political Economy.

The subject of X-efficiency has continuing interest. On December 18, 2009, JSTOR registered 1351 references to X-efficiency, including 884 since 1980, suggesting a continuing interest in the subject.

Leibenstein's Challenge to Economic Theory

Why the ruckus? Leibenstein had not discovered anything new. Economists already knew that firms, shielded from competition, will not be efficient. As Adam Smith observed, "monopoly ... is a great enemy to good management" (Smith 1776, I.xi.b, p. 163).

Nor did they need Leibenstein to learn that management is not universally efficient. In 1881, Alfred Marshall suggested, "it seems best sometimes to reckon Organization apart as a distinct agent of production" (Marshall 1920, p. 139). Adriance, following Hobson and Davenport, suggested that when production involves more than a single individual, one cannot separate out the effect of cooperation from the marginal productivity of labor (Adriance 1914, p. 120).

The empirical support from specialized literature seems to offer strong confirmation of X-efficiency. One need only look at a textbook on industrial organization to read about a host of studies that document symptoms of X-inefficiency (see Scherer and Ross 1990, pp. 668-72).

Also, management seems to be able to ramp up efficiency in response to the shock of new competition (see Scherer and Ross 1990, p. 669). Borenstein and Farrell (2000) document the rash of cost-cutting announcements in the petroleum industry in the wake of the 1986 oil price crash. This timing was symptomatic of an industry where X-inefficiency had been endemic. On a more macroeconomic scale, Alex Field found evidence that the years of the Great Depression accelerated technological progress at a rate unmatched in US history. Presumably, a previous laxity in cost cutting played a role (Field 2003). Finally, the historical literature on large oligopolistic corporations provides

substantial detail about managerial slack -- US Steel was a favorite example. Even the business press routinely discusses such matters.

Why then should his article, describing a well-known phenomena raise a firestorm among economists? Unlike well-known examples of X-inefficiency, Leibenstein presented the phenomena as pervasive. If so, the principle assumption of profit maximization is invalid, undermining the relevance of mainstream microeconomic theory.

Leibenstein was an unlikely rebel. Perhaps because of an aversion to conflict, he resigned from Berkeley, repelled by the campus turmoil of the 1960s (Perlman and Dean 1998, pp. 133-34). In a later retrospective, he was almost apologetic for igniting the X-efficiency controversy. He recalled that when he put his "underutilized research assistants" to work, they discovered "a number of clear-cut, empirical examples of firms that appeared to be operating non-optimally" (Leibenstein 1988, p. xv). Because these findings "contradict[ed] standard micro theory ... I was forced by the data to reconsider my previously held positions" (Leibenstein 1988, p. xv).

Harberger's Triangles

Leibenstein's article appeared in the context of Arnold Harberger's influential, "Monopoly and Resource Allocation." Harberger challenged conventional economists even more provocatively than Leibenstein, beginning with the suggestion that he intended to upend conventional economic thinking about monopoly:

One of the first things we learn when we begin to study price theory is that the main effects of monopoly are to misallocate resources, to reduce aggregate welfare, and to redistribute income in favor of monopolists. In the light of this fact, it is a little curious that our empirical efforts at studying monopoly have so largely concentrated on other things. [Harberger 1954, p. 77]

Using tools that would be appropriate for an introductory economics class, Harberger produced a simple supply and demand diagram in which monopolistic power shifted the supply curve upward. Harberger went on to show that this move to a new supply curve had only a slight impact on total welfare, measured by the shaded triangular area. Using rough estimates of the slopes of the relevant lines, he estimated the dimensions of the welfare cost of monopoly.

His model suggested that markets are so efficient in allocating resources that any distortions created by monopoly were bound to be inconsequential -- less than 0.1 percent of the GNP (Harberger 1954, p. 83). In 1959,

Harberger returned to the same idea, suggesting that removing distortions in Chile's economy would create a relatively insignificant improvement in economic performance (Harberger 1959). Leibenstein discussed other, less influential studies, some of which estimated even smaller dead weight losses than Harberger (Leibenstein 1966, pp. 393-95).

Leibenstein put his finger on the crucial weakness of Harberger's method: "The basic assumption is that every firm purchases and utilizes all of its inputs 'efficiently'. Thus, Harberger's approach simply estimates the consequences of price and quantity distortions," ignoring Adam Smith's observation that monopoly is the great enemy of good management (Leibenstein 1966, p. 397).

Another assumption was crucial to diminishing the dimensions of the triangles. As Harberger explained:

I have not analyzed the redistributions of income that arise when monopoly is present I leave [questions about income distribution] to my more metaphysically inclined colleagues to decide.

[Harberger 1954, p. 87]

Over and above his surprising conclusion, one cannot help being struck by Harberger's ingenuity. Economists had used this kind of diagram for more than a century (see Hines 1999), but nobody before had ever tried to apply it empirically. Besides, the application of this diagram is a wonderful demonstration of the power of straightforward price theory to produce striking results.

More than a half century later, practically any economist will immediately understand the expression, Harberger triangle. The continued interest in Harberger's analysis is understandable. In addition to his brilliant empirical application of price theory, his argument that deviations from perfect competition are inconsequential meant that economists could feel free to use traditional price theory without having to bother with the complications of imperfect competition.

Triangular Discomfort

Not all economists were comfortable with Harberger's results, which raised serious policy questions. If antitrust regulations that lower prices would result in insignificant benefits, the same reasoning would suggest that regulations that raise prices also do little harm.

For example, Harberger himself estimated that according to his method, the corporate income tax had a

relatively trivial impact on economic welfare, even though it was still five times as great as the effect of monopolistic practices (see the discussion in Hines 1999, p. 179). If monopoly, or even the corporate tax rate, were not particularly destructive, would intrusive regulatory policies be equally inconsequential?

Future Nobel laureate Robert Mundell even worried that if distortions did so little damage, "someone inevitably will draw the conclusion that economics has ceased to be important!" (Mundell 1962, p. 622). Along this line, James Hines speculated that the literature on rent seeking might have been a delayed response to Harberger's article (Hines 1999, p. 183).

Harberger's display of applied price theory inadvertently lent support to future Nobel laureate James Tobin's 1977 effort to revive interest in Keynesian economics after some economists had declared Keynes dead. Tobin rekindled conservatives' unease about insignificant dimensions of Harberger's triangles by invoking Harberger to support Keynesian demand management. Not without a touch of provocation, Tobin wrote:

Any economics student can expatiate on the inequities, distortions, and allocation of inefficiencies of controls or guideposts or tax rewards and penalties. But just consider the alternative. The microeconomic distortions of incomes policies would be trivial compared to the macroeconomic costs of prolonged underemployment of labor and capital. It takes a heap of Harberger triangles to fill an Okun Gap. [Tobin 1977, p. 468]

The Battle Begins

George Stigler and Milton Friedman were very protective of price theory. They were particularly critical of the idea of monopolistic competition. They maintained that competitive forces necessarily produce efficient outcomes, except in the face of government interference. They had a long history of arguing that reports of monopolistic distortions were misinterpretations of the evidence.

As Claire Friedland, Stigler's close coworker, observed in a Journal of Political Economy Stigler memorial issue: "Much of his work centered on saving the damsel in distress, neoclassicism, from her attackers" (Friedland 1993, p. 780). Harold Demsetz's contribution to the memorial issue made a similar point:

Evidence of Stigler's attachment to neoclassical price theory is also given by that part of his work mainly

critical of the work of others. Price rigidity, administered price inflation, the theory of monopolistic competition, and X-efficiency were prominent targets, and each of them denied the efficacy of the neoclassical analytical framework. [Demsetz 1993, p. 800]

Stigler held nothing back in his efforts to protect price theory. Thomas Sowell, an admiring student of Stigler's, used his contribution to the Stigler memorial issue to liken his mentor's style of debate to a "Demolition Derby" (Sowell 1993, p. 787). Symbolic of his combative nature, Stigler captioned a picture of John Stuart Mill, describing him as "perhaps the fairest economist who ever lived: He treated other people's theories at least as respectfully as his own, a mistake no other economist has repeated" (Stigler 1987, p. 99). Stigler was no exception to this rule.

Besides his long-standing opposition to monopolistic competition, earlier Stigler had launched an epic debate about minimum wage laws. Richard Lester had found evidence that increasing minimum wages would not decrease employment (see Prasch 2007). Lester, who had extensive experience in industry after having recently served as chair of the Southern Textile Commission of the National War Labor Board, used government data, as well as surveys of industry leaders, to make his case, which was at odds with the assumptions of mainstream economic theory (Lester 1944).

The debate over the minimum wage is closely related to the question of X-efficiency. Many of the supporters of the minimum wage, especially the institutionalists, have argued that shocks to business, including higher wages, can force management to become more efficient. Richard Lester was writing within the tradition of this institutionalist school. In contrast, Stigler, following mainstream price theory, insisted that the inevitable result of a minimum wage would be higher prices and unemployment (Stigler 1946).

The idea that, absent strong competitive pressure, firms are unlikely to use their resources efficiently has faced stiff resistance at times, depending on the context; however, the notion that higher resource costs can shock firms to improve their performance has gone largely unchallenged (Porter and van der Linde 1995; Perelman 1999, ch. 7).

Applying the same logic to labor markets seems more objectionable, for reasons that parallel the defense against the theory of X-efficiency. Writing about the minimum wage, Stigler rejected the idea "that entrepreneurs may be shocked out of lethargy to adopt techniques which were previously profitable or to discover new techniques. This

"shock" theory is at present lacking in empirical evidence but not in popularity" (Stigler 1946, p. 359). Stigler contended that competition would have already made low-wage businesses efficient without the intervention of minimum wage laws. Of course, business would respond to increased minimum wages by substituting capital for labor as predicted by the existing production function. However, shock theory suggests that business would be motivated to develop superior production functions.

Unsuccessfully Rescuing the Damsel of Maximization

Leibenstein's threat to price theory did not escape the attention of the curmudgeonly Stigler, whose delayed response came in a caustically titled article, "The Xistence of X-Efficiency" (1976). Stigler felt compelled to attack because, "to assume that monopolists do not maximize profits ... is an abandonment of formal theory, and one which we shall naturally refuse to accept until we are given a better theory" (Stigler 1976).

Stigler insisted that X-inefficiency was only an illusion; that Leibenstein's evidence for differential productivities amounted to no more than a collection of anecdotes. Ultimately, the notion of an industry often depends upon an arbitrary system of classification. Firms, which seem to be in the same industry, may actually be producing different goods, such as different quality tomatoes or a product that requires less shipping because of an advantageous location. Cross product competition adds a further complication to an analysis of industrial organization. As a result, comparisons of the performances of individual firms or in terms of some industry standard are meaningless.

Stigler even went so far as to rebuke those who found evidence of X-inefficiency because such firms are probably producing non-marketed outputs, "including leisure and health" (Stigler 1976, p. 213). Stigler did not mean the leisure and health of the workers. Instead, he was referring to the wellbeing of employers, perhaps alluding to John R. Hicks's observation: "... the best of all monopoly profits is a quiet life" (Hicks 1935a, p. 8; 1935b, p. 265).

Stigler was undoubtedly correct that CEOs often take actions that trade off firm profitability for their own personal utility. For example, more recent research has shown that corporations underperform when their CEOs excel in golf and that spending on corporate jets is higher when CEOs belong to country clubs far from their headquarters (Perelman 2007, p. 9).

In terms of efficiency, however, the effects of actions that raise managerial utility at the expense of the firm do

not qualitatively differ from embezzlement. Certainly, diverting resources for personal use seems inconsistent with profit maximization -- the assumption that Stigler set out to rescue.

Stigler's reference to managerial utility raises another problem. Price theory is built around the idea that markets are efficient because prices provide accurate information about consumers' needs and the best way to provide for them. Subjectivity exists only in so far as it can be inferred by the revealed preferences reflected in transactions in the marketplace. For example, Dierdre McCloskey described Stigler reprimanding someone who strayed from this practice by "declaring loudly that all that mattered were the observable implications" (McCloskey 1994, p. 14).

Previous economists had been very careful about excluding questions of utility from the productive side of the economy. For example, when William Stanley Jevons strayed from this practice by suggesting that economists should consider the utility or disutility of work, he received harsh rebukes (see Perelman 2011, forthcoming). Frank Knight applauded the intentional neglect of what he called "sentimental" costs of work:

We have no concern with the pains or subjective sacrifices involved in production, since it is not at all in terms of such "costs" that the entrepreneur makes his calculations on the basis of which he decides whether to produce the good or on what scale. He takes account of sentimental costs only in so far as they influence the outlays he must make to secure the services necessary to production. That is, he is concerned only with the price measure of his costs. Their magnitude in some other aspect will not influence his decision. Pains and sentimental repugnancies are undoubtedly influences in limiting the supply of some sorts of services and raising their price, but in the aggregate they form a relatively unimportant element, and no one now contends that there is any tendency for the prices of productive services, still less of final goods, to bear any correspondence with these magnitudes. The relation between them is a separate inquiry, pertinent perhaps to an evaluation or criticism of the competitive economic order, hardly so to an explanation of its workings. [Knight 1921, p. 313]

Stigler, however, was willing to sacrifice a pawn -- the exclusion of workplace utility -- to save the queen of price theory. Yet, his ultimate critique may be less than the sum of its parts. It came down to the proposition that nobody can scientifically define an industry or even precisely compare two different firms unless everything -- the workforce,

the location, and equipment -- were absolutely identical.

Of course, Stigler could not disprove the existence of X-inefficiency, but he warned economists of the risks of following the path that Leibenstein's work suggested:

Unless one is prepared to take the mighty methodological leap into the unknown that a nonmaximizing theory requires, waste is not a useful economic concept. Waste is error within the framework of modern economic analysis, and it will not become a useful concept until we have a theory of error.

[Stigler 1976, p. 216]

Yet, Stigler promised to make the case that what Leibenstein called X-inefficiency "can usefully be assimilated into the traditional theory of allocative inefficiency" (Stigler 1976, p. 213). Was that a Freudian slip or did Stigler actually believe that such a theory existed? Or was he referring to the maximization of management's utility?

In the end, Stigler put the burden of proof onto Leibenstein, demanding that he come up with a theory that could predict deviations from productive efficiency. However, Leibenstein never pretended that he had produced a new scientific theory. His contribution was explicitly atheoretical. Instead, he offered a mass of evidence that called into question a basic assumption of an existing theory of near maximum efficiency. He used his "X" to indicate that complex motivational factors responsible for inefficiency defied reduction to a formal theory (Leibenstein 1978, p. 203).

Leibenstein criticized Stigler for turning his challenge around with what Leibenstein called a "tautological approach," which Stigler "defends ... on the ground that at the very least this approach leads to accurate predictions. However, Stigler himself does not indicate what these predictions are" (Leibenstein 1978, p. 210).

Ironically, Stigler seemed so focused on demolishing Leibenstein that he never bothered to use another line of defense for traditional price theory, which he had developed earlier. In 1939, he showed that flexibility needed to be taken into consideration in understanding efficiency (Stigler 1939). Without knowledge of the context, a static observation of a plant might give rise to a misleading interpretation of inefficiency. Small, high-cost plants may seem inefficient when they sit idle, but they may represent the least expensive method of meeting surges in demand.

Six years before Stigler's picked up the gauntlet of X-efficiency, Sidney Winter offered a Darwinian defense of

traditional price theory -- that static observations may find differing productivities, but that competitive forces are certain to weed out the inefficient (Winter 1971).

Tight Priors

Stigler's attack (possibly including its narrowness) was an example of what Melvin Reder described as a stubborn adherence to the "tight priors" of neoclassical economics -- a key feature of Chicago economics at the time (Reder 1982). Displacing tight priors to the satisfaction of their adherents is virtually impossible. A former Chicago faculty member recounted how people who used data that called into question the prevailing theory would "be met by choruses of 'I can't believe it' or 'It doesn't make sense'." Milton Friedman's own Money Workshop at Chicago in the late 1960s and the early 1970s was a case in point" (McCloskey 1985, p. 140). One of Stigler's own collaborators described this attitude toward empirical analysis:

... if someone holds a view it cannot be dislodged by any conceivable empirical data. Evidence from a data system doesn't convince them. These people have made their decisions already. They've become true believers and no amount of empirical evidence will ever convince them by definition. [Kindahl 1997]

A key part of this package of tight priors was the dogma that, because firms optimize, competitive forces, left to themselves, would ensure optimal outcomes. Following this logic, Stigler ruled out the possibility of acceptable evidence of X-inefficiency. He tautologically proposed that some intangible factor can always explain away any illusions of market imperfections. In this way, Stigler, who is commonly credited for the quip that data is not the plural of anecdote, could dismiss every observation purporting to be evidence of X-inefficiency as nothing more than a curious anecdote of no wider significance.

Who Are You Going to Believe, Me or Your Lying Eyes?

In contrast to Leibenstein, who claimed that the data made him modify his analysis, the approach of tight priors demands that the data conform to the theory. This rigid application of tight priors brings to mind Marx's (Groucho, not Karl) famous question.

Pushed to extremes, virtually any data can be thrown into question. For example, an article in the British

Medical Journal humorously questioned whether parachutes really helped the "gravitationally challenged," calling for a double blind study (Smith and Pell 2003).

In the case of X-inefficiency, this denial of the existence of differential inefficiencies seems to defy common sense. Even, Harberger, based on his long career as a development economist, lent strong support to Leibenstein's analysis, but without ever mentioning Leibenstein's work. In his presidential address to the American Economic Association on the subject of economic growth, he began, in effect, by downplaying the marginal perspective, which had been the centerpiece of his 1954 article:

Many, maybe even most, economists expected that increments of output would be explained by increments of inputs, but when we took our best shot we found that traditional inputs typically fell far short of explaining the observed output growth. [Harberger 1998a, p. 1]

Harberger then gave numerous examples of the sort of productive improvements that fall through the usual net of economic analysis -- many based on his experience in Latin America. In his most telling case, he wrote:

I recall going through a clothing plant in Central America, where the owner informed me of a 20-percent reduction in real costs, following upon his installation of background music that played as the seamstresses worked. [Harberger 1998a, p. 3]

Presumably, other firms had not yet discovered this technique for wringing out X-inefficiency. Elsewhere, Harberger observed that "bad growth experiences often sit side by side with good experiences in the same industry, as successfully innovating firms in that industry thrive and expand, while their less fortunate competitors are driven to the wall" (Harberger 1998b, p. 14).

Harberger clearly found that conventional economics is not particularly useful in finding the kind of music that might make the seamstresses work harder. Both Harberger and Leibenstein accepted the existence of intangibles that cannot be fitted into some abstract theory.

Similarly, in the world of team sports, people commonly speak of players' intangibles in a way that resembles the idea of X-efficiency. Despite unimpressive outward appearances and modest statistical records, some athletes have inexplicable intangibles that defy quantification.

The statistics-obsessed world of baseball offers an intriguing example. Shortly before Stigler's foray into X-efficiency appeared, Leo Durocher, a famed manager had been guiding the Chicago Cubs about 11 miles away from the University of Chicago. Durocher later explained to a reporter why Eddie Stankey was his favorite player: "He can't hit; he can't run; he can't field; he can't throw. He can't do a goddam thing, Frank, but beat you" (Durocher 1975, p. 13). Other players, who are outwardly very impressive, are described as poison, meaning that their effect on others is destructive.

Fleas, Rabbits, and Elephants

Today, most economists will accept the existence something akin to X-inefficiency as self-evident. This phenomena provides fodder for the growing field of behavioral economics.

The losses associated with X-inefficiency are enormous but they are impossible to measure. Jaroslav Vanek even pictured the respective dimensions of allocational-, Keynesian-, and X-inefficiencies as "fleas, rabbits and elephants" (Vanek 1989, p. 93). Elephants or not, Stigler's refusal to accept Leibenstein's idea of nonmaximizing behavior rings somewhat hollow today. Both business management and economists are still wrestling with the insights of Durocher and Leibenstein, trying to develop incentive schemes to squeeze X-inefficiencies out of organizations. The solution to the principal-agent problem, which has so far eluded economists, may be the equivalent of physicists' search for the Higgs boson, except that the odds favor the physicists succeeding first.

This episode also illustrates an unfortunate tendency in our discipline -- a tendency to attack rather than engage ideas that challenge our own. Readers are free to decide, however, if demolition derbies are the proper venue for a search for truth.

Summing Up

Ideological rigidity delayed recognition of Leibenstein's contribution until after he passed away. Rereading Leibenstein today, one can easily imagine that his words were a form of anticipatory plagiarism, ripped from some contemporary journal. Applying the language of modern behavioral economics, he wrote: "My contention is that X-inefficiency exists. It results from incomplete contracts, effort discretion, and nonmaximizing behavior, rather than lack of information or errors" (Leibenstein 1976, p. 203).

Certainly, Leibenstein's emphasis on motivation is in sync with much modern research, as is his reference to incomplete contracts. According to JSTOR, the expression, "incomplete contracts," first appeared in the economic literature with Williamson (1976). Leibenstein's use, coming in the same year, was the third. However, in his first paper a decade earlier, Leibenstein listed four causes of X-inefficiency. His first was that "contracts for labor are incomplete" (Leibenstein 1966, p. 407).

Although many, if not most discussions X-inefficiency focus on the failure to squeeze more from workers, less attention is directed toward the shortcomings of management. True, Alfred Marshall observed that business might not bother to maximize productivity until hard times come and "manufacturers are put on their mettle and exert themselves to the utmost to invent improved methods and to avail themselves of the improvements made by others" (Marshall 1888, p. 92). Unfortunately, few economists took note of this insight. Marshall's words appear in JSTOR only once, in a footnote and in an entirely different context, where John Dunlop was discussing the effect of employment on wages (Dunlop 1948, fn p. 362).

Ironically, Stigler came close to Marshall when he was alluding to what later became called expense preferencing in which management consciously diverts resources away from profit maximizing activities. However, Leibenstein seemed to shy away from such subjects, coming closest with the vague term "effort discretion."

The most important lesson one can take from Leibenstein comes from his initial response to Harberger's work. By just looking at the price distortions of monopoly, one loses sight of the productive side of the economy (see Perelman 2011). More generally, closer attention to the productive side of the economy will greatly enrich economists' understanding of the real world. Earlier work in that area might even have helped to alert economists to the impending crisis that began in 2007.

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