

Retrospectives

X-Efficiency

Michael Perelman

This feature addresses the history of economic terms and ideas. The hope is to deepen the workaday dialogue of economists, while perhaps also casting new light on ongoing questions. If you have suggestions for future topics or authors, please write to Joseph Persky of the University of Illinois at Chicago at jpersky@uic.edu.

Introduction

In 1966, Harvey Leibenstein published an intriguing article called “Allocative Efficiency vs. X-Efficiency” in the *American Economic Review*, questioning whether market forces could be assumed to ensure allocative efficiency. To make his case, Leibenstein reported on a number of descriptive studies, which cast doubt upon allocative efficiency.

Leibenstein pointed to theoretical studies, which, in contrast to the empirical literature, suggested that deviations from allocative efficiency were trivial. The most influential of these studies was Arnold Harberger’s (1954) article, “Monopoly and Resource Allocation.” According to Harberger’s calculation, the complete elimination of monopoly in the United States would raise national income by only $\frac{1}{13}$ of 1 percent, no more than a trivial rounding error. Using tools that would be appropriate for an undergraduate economics class, Harberger (1954) produced a supply and demand diagram in which monopolistic power shifted the supply curve upward. Harberger then measured the welfare losses from monopoly with a small triangle

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formed by a vertical line drawn from the new intersection of the supply and the demand curve to the old supply curve. Harberger (1959) returned to this idea five years later, suggesting that removing distortions in Chile's economy would produce a relatively insignificant improvement in economic performance. Harberger's article continues to be quite influential. Although economists had used this kind of diagram for more than a century (as discussed in this journal by Hines, 1999), nobody before had tried to apply it empirically. The "Harberger triangle" diagram is a wonderful demonstration of the power of straightforward price theory to produce strikingly counterintuitive results. Many of the popular disputes regarding monopolies revolve around their capacity to redistribute income at the expense of consumers. In contrast, Harberger measured total welfare, without taking into account the distributional effects of monopoly, explicitly dismissing any concern about distribution as metaphysical (Harberger, 1954, p. 87).

Leibenstein (1966) did not take issue with Harberger in this regard; instead, he suggested that deeper fundamental problems lurked within Harberger's model. He began by pointing out that the design of Harberger's model prevented monopoly from affecting economic welfare. Even if monopolies controlled half the economy and were able to increase prices by 20 percent, assuming the elasticity of demand as 1.5, the resulting welfare loss would be a mere 1.5 percent.

But whether Harberger's method ruled out any significant effects of monopoly on welfare was beside the point for Leibenstein, who focused on a more serious defect in Harberger's approach. In estimating the consequences of monopolies' ability to raise prices, Harberger assumed that all production was carried on efficiently, regardless of the structure of the economy. Leibenstein insisted that absent strong competitive pressure, firms are unlikely to use their resources efficiently. For this reason, monopolies are destructive of social welfare because of a weakened incentive to minimize costs. Leibenstein, of course, was attacking a fundamental economic assumption: that firms minimize costs. In effect, Leibenstein was proposing a different theory, in which economists would pay attention to the gap between ideal allocative efficiency and actually existing efficiency, a gap he called "X-inefficiency."

Leibenstein's Spotty Evidence

Leibenstein (1966) knew that he was not providing a formal theory or empirical proof of the existence of X-inefficiency. Nonetheless, he was confident that he was identifying a powerful force that economic theory had not yet addressed. In naming this force, 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" (as quoted in Leibenstein, 1976, p. vii). Following Tolstoy's lead, Leibenstein introduced the concept of "X-efficiency." He modestly offered what he called "spotty evidence," which he still considered "sufficiently persuasive to suggest

the possibility that X-efficiency exists, and that it frequently is much more significant than allocational efficiency” (Leibenstein, 1966, p. 398). Leibenstein realized: “Most of the evidence has to do with specific firms or, at best, industries, and not for the economy as a whole” (p. 399).

In a sense, Leibenstein had not discovered anything new. Many economists already understood that firms, shielded from competition, will not be efficient. For example, Adam Smith (1776 [1970], b. I, ch. 11, p. 163) observed, “monopoly . . . is a great enemy to good management.” Similarly, Alfred Marshall (1888 [1926], p. 92) observed that business might not bother to maximize productivity until hard times come, when “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.”

In addition, various empirical subdisciplines of economics offer frequent confirmations 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 (for example, Scherer and Ross, 1990, pp. 668–72). One indication is that management seems to be able to ramp up efficiency quickly in response to the shock of new competition (p. 669). Borenstein and Farrell (2000) analyzed the rash of cost-cutting announcements in the petroleum industry in the wake of the 1986 oil price crash. The ability to make such sudden adjustments was symptomatic of an industry where X-inefficiency had been endemic. On a more macroeconomic scale, Field (2003) found evidence that the years of the Great Depression made up the most technologically progressive period in U.S. history. Presumably, a previous laxity in cost cutting must have played a role. A similar analysis was common among institutionalist economists who argued that higher wages can “shock” managers to increase efficiency. Similarly, higher resource costs can shock firms to improve their performance (Porter and van der Linde, 1995; Perelman, 1999, ch. 7).¹

Finally, the historical literature on large oligopolistic corporations provides substantial detail about managerial slack—U.S. Steel was a favorite example. No doubt the fate of the U.S. automobile industry will supply fodder for such studies in the future. The business press routinely discusses how some firms lag behind because of gross inefficiency and how other firms surge ahead by becoming more efficient.

Leibenstein (1966) offered his own catalogue of evidence of X-inefficiency. He reported on studies of “largely identical” factories in Britain and the United States that showed substantial differences in productivity. One Egyptian oil refinery had half the productivity of another one less than a half mile away. After many years of stagnation, management changed and the refinery suddenly managed “quite spectacular improvements in efficiency with the same labor force.” International comparisons of the dissimilar performance of comparable plants offered

¹ In fact, I argue in Perelman (2006) that one can read the history of the U.S. economy as a story of the tension between the contradictory consequences of intense competition. On the one hand, intense competitive pressures are potentially deflationary; on the other hand, they promote improvements in efficiency.

further confirmation of X-inefficiency. Leibenstein also included studies reporting on a reluctance to invest in equipment or research in the absence of competitive pressures. His summary of the International Labour Organization's "productivity missions" found a large number of cases in which simple reorganization of production methods produced large savings, frequently above 25 percent. Reports of the effects of British consulting services suggested similar results.

Leibenstein's (1966) catalogue of evidence also included various studies of how poor labor management relations, incentive systems, selection of workers, or excessive hours of work created inefficiencies. In addition, he divided the causes of X-inefficiency into three elements: (1) intra-plant motivational efficiency, (2) external motivational efficiency, and (3) nonmarket input efficiency. He further offered four reasons why the production function is indeterminate: (1) contracts for labor are incomplete, (2) not all factors of production are marketed, (3) the production function is not completely specified or known, and (4) interdependence and uncertainty lead competing firms to cooperate tacitly with each other in some respects and to imitate each other with respect to technique to some degree. Leibenstein identified X-inefficiency with Robert Solow's (1957) unexplained residual and the results of other efforts to construct growth equations. He also included two graphs and references to production possibility surfaces, suggesting that he might be attempting to integrate his theory into the mainstream of economic thought. Nonetheless, his categories all revolve around matters of behavior. For example, Leibenstein uses "trustworthiness" as an example of a nonmarketed input.

In effect, Leibenstein was chipping away at abstract price theory by reminding economists of the importance of the principal-agent problem in which both management and labor lack the motivation to maximize firm efficiency.

Challenges to Harberger

Harberger's (1954) work raised tricky policy questions. Harberger estimated that, according to his method, the corporate income tax also had a relatively trivial impact on economic welfare, even though it was still five times as great as the effect of monopolistic practices (Hines, 1999, p. 179). If neither monopoly nor the corporate tax rate had much effect on social welfare, the same reasoning would suggest that intrusive regulatory policies would be equally inconsequential. Some conservatives were concerned about the theory's implication that tampering with markets would do little harm. Future Nobel laureate Robert Mundell (1962, p. 622) worried that if distortions did so little damage, "someone inevitably will draw the conclusion that economics has ceased to be important!" Along this line, in his discussion of Harberger triangles in this journal, Hines (1999, p. 183) hints that the literature on rent seeking might have been a delayed response to Harberger's article.

Harberger's (1954) brilliant display of applied price theory also 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 the insignificant dimensions of Harberger's triangles by invoking Harberger to support Keynesian demand management. Not without a touch of intended provocation, Tobin (1977, p. 468) 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.

Jaroslav Vanek (1989, p. 93), went further in commenting on the respective dimensions of Harberger's triangles, Tobin's Okun gaps, and X-inefficiency, comparing them to "fleas, rabbits and elephants," respectively.

Leibenstein was not entirely clear at the time of his 1966 article in articulating the magnitude of the social costs of X-inefficiency, but in a later defense of his work, he noted that in "the absence of pressures to contain costs there is a general cost rising tendency, in part because of a failure to take advantage of new techniques of cost containment" (Leibenstein, 1978, p. 205). Thus, even though the immediate effect of X-inefficiency might be small, an accumulating degree of X-inefficiency will take an ever larger toll on productivity over time.

Leibenstein's Challenge to Economic Theory

Had Leibenstein (1966) only published a survey of the literature on deviations from cost minimization, his analysis would have been unremarkable. He admitted that readers might be inclined to dismiss reports of individual studies as nothing more than curious but atypical anecdotes (p. 399). Besides, similar stories had existed side by side with classical price theory for many decades without much interaction between these two lines of research. However, Leibenstein suggested that the phenomenon of deviations from cost minimization is pervasive. This claim posed a serious challenge for price theory, the cornerstone of microeconomics. Leibenstein went further, calling for the creation of a theory of the firm without the assumption of cost minimization.

Leibenstein was an unlikely rebel. Unlike Harberger, who began his 1954 article with a provocative statement suggesting that he intended to upend conventional economic thinking about monopoly, Leibenstein's tone was modest. Indeed, Leibenstein seemed to have an aversion to conflict. He resigned from the University of California, Berkeley, repelled by the campus turmoil of the 1960s (Dean and Perlman, 1998, pp. 133–34). In a later retrospective, Leibenstein (1988, p. xv) seemed to shy away from the conflict over X-inefficiency as well, almost denying any responsibility for igniting the controversy. He recalled that 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." Because these

findings “contradict standard micro theory . . . I was forced by the data to reconsider my previously held positions.”

Leibenstein’s (1966) X-efficiency thesis found little support from mainstream economists. His most distinguished supporter may have been Herbert Simon, who devoted the final section of his Nobel Lecture to the subject, singling out Leibenstein along with Richard Cyert and James March (Simon, 1979, pp. 50–89). Simon, however, was not committed to standard micro theory. Before Leibenstein’s article appeared, Simon had largely withdrawn from the discipline of economics, having published only three articles in the *American Economic Review* and one in the *Journal of Political Economy*.

Perhaps some controversy regarding Leibenstein’s challenge was inevitable, but the X-efficiency article created a firestorm of criticism. Dean and Perlman (1998, p. 141) note: “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.” JSTOR’s more recent references to X-efficiency suggest that the controversy has not yet died down.

Rescuing the Damsel of Maximization

At the forefront of Leibenstein’s powerful critics was George Stigler, who was very protective of classical price theory. As Claire Friedland (1993, p. 780), his close coworker, observed in a *Journal of Political Economy* Stigler memorial issue: “Much of his work centered around saving the damsel in distress, neoclassicism, from her attackers.” Harold Demsetz’s (1993, p. 800) 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.” Thomas Sowell (1993, p. 787), 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.” Symbolic of his combative nature, Stigler (1987, p. 99) once 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 was no exception in this regard.

Stigler’s longstanding battle against the theory of monopolistic competition was a necessary part of the struggle to defend classical price theory. Stigler signaled the importance of this effort by choosing the subject of monopolistic competition for both his Richard T. Ely address and two of his *Five Lectures on Economic Problems* (Stigler, 1949).

Stigler is commonly credited for the quip that data is not the plural of anecdote. For Stigler, Leibenstein was proposing to treat the collection of anecdotes as

data; pushing matters even further to the level of principle, he was proposing that the existence of X-inefficiency meant the assumption of profit maximization had to be replaced. For that mistake, Leibenstein had to be rebuked.

In 1939, Stigler had already laid the foundation for his future attack on the theory of X-efficiency by demonstrating how evidence suggesting an absence of profit maximization can be an illusion. At the time, Stigler (1939) was discussing how flexibility needed to be taken into consideration in understanding efficiency. Without knowledge of the context, Stigler warned that a static observation of small, underutilized, high-cost plants might be taken as evidence of inefficiency. However, that conclusion might be unjustified; perhaps these plants represent the most efficient method of using sunk costs to meet surges in demand, but then again they may not. Perhaps the underutilized plants are just the result of an unwillingness or inability to take advantage of the most efficient technology. While Stigler's observation was that flexibility may be a dimension of efficiency, making that point does not constitute a proof of efficiency.

Stigler's initial response to Leibenstein came in an article titled, "The Xistence of X-Efficiency." Stigler (1976) explained that he 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." Because Leibenstein had not provided a formal theory to explain X-inefficiency, his approach was unacceptable.

In his critique, Stigler (1976) dismissed Leibenstein's evidence for differential productivities. Firms that seem to be in the same industry may not necessarily be producing the same goods; for instance a firm may be producing different quality tomatoes or a product that requires less shipping because of advantageous location. Ultimately, the notion of an industry depends upon arbitrary classifications. Cross-product competition adds a further complication to an analysis of industrial organization. As a result, comparisons of the performances of individual firms or comparisons in terms of some industry standard are meaningless. Stigler insisted that what appears to be inefficiency is illusory. As in 1939, he explained how anecdotal reports of X-inefficiency may actually be consistent with profit maximization.

Just as Leibenstein's "spotty evidence" did not constitute a proof of the nonexistence of profit maximization, Stigler could not prove the nonexistence of X-inefficiency. Nonetheless, Stigler would have his readers agree that every observation purporting to be evidence of X-inefficiency should be dismissed as nothing more than a curious anecdote of no wider significance. Although Stigler could offer reasons why such observations might possibly be misleading, he, no more than Leibenstein, could provide proof of his position. In the end, just as Leibenstein invoked an invisible X-force that caused the appearance of deviations from profit maximization, Stigler relied on an equally invisible force that guaranteed the nonexistence of X-inefficiency.²

² Strangely, Stigler (1976, p. 213) in his critique also promised to make the case that what Leibenstein called X-inefficiency "can usefully be assimilated into the traditional theory of allocative inefficiency." It

But to make his critique, Stigler (1976, p. 213) used a curious example to show how an illusion of X-inefficiency could arise. He suggested that apparently inefficient firms may be producing nonmarketed outputs, “including leisure and health.” Stigler did not mean the leisure and health of the workers, but the well-being of employers. In contrast to the theory that managerial benefits spur productivity, Stigler was suggesting that managerial benefits explain low productivity. In terms of the conventional measure of efficiency, the actions that raise managerial utility at the expense of the firm do not qualitatively differ from embezzlement. Certainly, from the perspective of a shareholder, diverting resources to personal use does not constitute profit maximization—the same assumption that Stigler set out to rescue. Stigler was undoubtedly correct that chief executive officers will sometimes 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 (as summarized in Perelman, 2007, p. 9).

Stigler’s dismissal of Leibenstein’s evidence may be taken as an example of what Reder (1982) described as a stubborn adherence to the “tight priors” of neoclassical economics—a key feature of Chicago economics at the time. Central to this package of tight priors was the belief that because firms optimize, competitive forces, left to themselves, would ensure optimal outcomes. Displacing tight priors to the satisfaction of their adherents is virtually impossible. One of Stigler’s collaborators, James Kindahl, described the strength of his resistance to evidence in a 1997 interview with Craig Freedman: “[I]f 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” (Freedman, 2008).

Classical price theory is built around the assumption that markets are efficient because prices provide accurate information about consumers’ needs and that competitive pressures force business to use this information to find the most cost-efficient way to provide for those needs. According to this approach, subjectivity, including managerial utility, exists only in so far as it can be inferred by preferences revealed in marketplace transactions. For example, Dierdre McCloskey (1994, p. 14) described Stigler reprimanding someone who strayed from this practice by “declaring loudly that all that mattered were the observable implications.” The managerial welfare invoked by Stigler in his 1976 critique, of course, is not observable.

Most economists have been scrupulous in excluding questions of utility from the productive side of the economy. Economists who strayed from this practice by suggesting that the utility or disutility of work was worthy of consideration received harsh rebukes (Perelman, 2011). For example, Frank Knight (1921, p. 313) was

is never clear what “traditional theory” Stigler had in mind when he wrote those words. In the same essay, Stigler concluded by suggesting that such a theory would be impossible.

emphatic about his support for 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.

Stigler’s appeal to managerial utility suggested how far he was willing to go to save the core of classical price theory—profit maximization. In this fight against the idea of X-inefficiency, he was willing to make a significant concession by including nonmarketed managerial welfare in an effort to win the greater battle.

Leibenstein was bound to fail in his challenge of the tight prior of cost minimization. No amount of evidence would constitute a satisfactory proof. Yet Stigler’s critique also fell short. Stigler could explain away each instance of X-inefficiency by taking the position that nobody can scientifically define an industry or even precisely compare two different firms unless everything—the workforce, the location, equipment, and time frame—is absolutely identical. Of course, Stigler could not prove the nonexistence of X-inefficiency because of the difficulty of proving nonexistence in general. Instead, he put the burden of proof onto Leibenstein. Stigler (1976, p. 216) concluded by slamming the door shut on anyone who might be still inclined to take X-inefficiency seriously: “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.” But in effect, Stigler was redefining anything that Leibenstein might identify as X-inefficiency as something that actually conformed to neoclassical theory.

Harberger’s Encore

Many years after his original article, Arnold Harberger (1998a), based on his long career as a development economist, lent strong support to Leibenstein’s analysis in his presidential address to the American Economic Association. Harberger

never mentioned Leibenstein by name, but in various places he came close to Leibenstein's approach. For example, Harberger (1998a, p. 1) said: "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." Elsewhere, Harberger (1998b, p. 14) sounded like Tolstoy, observing "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 gave numerous examples 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, which might be one of the clearest examples of X-inefficiency, 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. Obviously, conventional price theory could not explain why competitive pressures had not made other firms introduce music into their factories, or even search out better music that might make the seamstresses work harder and wring out X-inefficiency. The fact that Harberger situated his discussion in the context of economic growth reinforced Leibenstein's association of X-inefficiency with dynamical growth models.

Conclusion

In a reply to Stigler's (1976) critique, Leibenstein (1978) was uncharacteristically combative, identifying his attacker as an unscientific "Xorcist" for assuming away whatever displeased him. Leibenstein condemned the "tautological interpretation," 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" (p. 210).

In this response, Leibenstein was clearer than he had been in 1966 in defining the causes of X-inefficiency as "postulates of incomplete contracts, effort discretion, inert areas, interpersonal influences, and different principal-agent objectives." He also went deeper in exploring the possible behavioral dimensions of X-inefficiency. Finally, he widened the scope for X-inefficiency, recognizing that even in the absence of monopolistic powers the phenomenon will remain to some degree (Leibenstein, 1978, p. 205).

Leibenstein's reports of differential productivities challenged economists to pay more attention to the way the production side of the economy works. For Leibenstein, too many economists follow Stigler, satisfying themselves that input prices and sales receipts offer sufficient information about the nature of the underlying production process. In Perelman (2011), I survey how and why the tradition

of the discipline of economics shies away from such work. Harberger's clothing plants offer an interesting example of the kind of information that firsthand knowledge of the process of production might offer. Leibenstein could have pushed his suggestion for research on X-inefficiency further. For instance, his recognition that X-inefficiency may exist alongside competition opens the door to a Schumpeterian line of research, exploring the full range of the costs and benefits of monopolistic competition. Such studies might indicate that competition may involve excessive duplication, while monopolistic industries may enjoy economies of scale.

Realizing that Leibenstein's idea of X-efficiency represented a serious threat to abstract price theory, Stigler (1976) rose to the occasion, pulling out all the stops. In terms of rhetorical success, Stigler's combination of brilliance and bluster mostly carried the day. Although Leibenstein's (1978) response to Stigler was well reasoned, it never resonated with many economists. Leibenstein remains undeservedly underappreciated. While some later researchers have followed the trail he blazed for further consideration of motivational and behavioral factors, such work still has not had any impact on the core theory of economics. In this sense, Leibenstein's challenge is as relevant today as it ever was.

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