NATIONAL ACADEMY OF SCIENCES

SHERWIN ROSEN
1938–2001

A Biographical Memoir by

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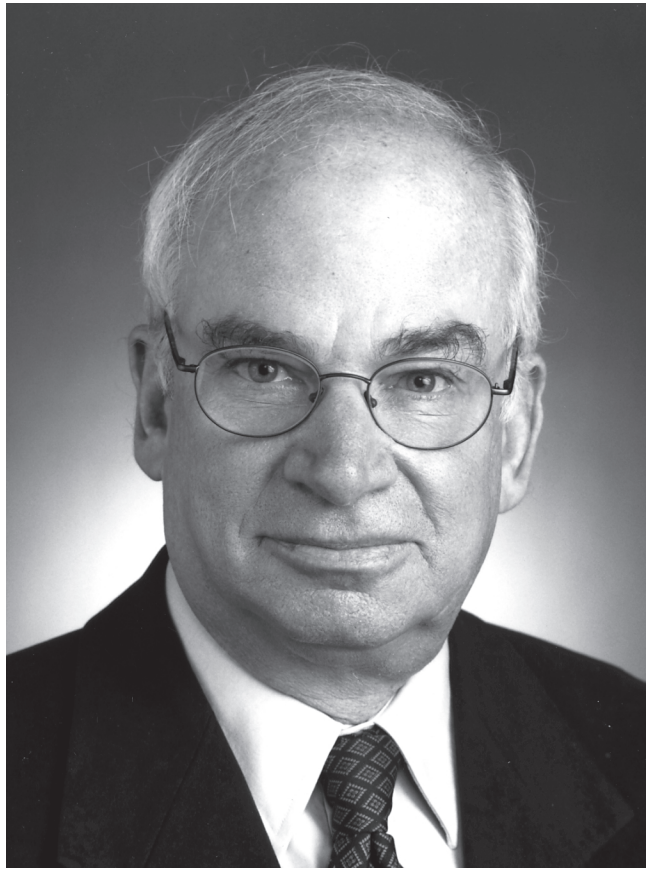
Biographical Memoirs, VOLUME 83

PUBLISHED 2003 BY
THE NATIONAL ACADEMIES PRESS
WASHINGTON, D.C.



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SHERWIN ROSEN

September 29, 1938–March 17, 2001

BY EDWARD P. LAZEAR

SHERWIN ROSEN WAS ONE of the great applied microeconomic theorists of recent decades. His life was devoted to understanding how diverse people, products, and technologies could be brought together and allocated appropriately. As an example of the kind of analyses that Rosen pioneered, consider the many varieties of automobiles that are produced. Some are higher quality than others, some are small, some are large, some fast, some slow, some are beautiful, and others are comfortable. People have different preferences with respect to these attributes. A larger person might prefer a larger car. A daredevil might like a faster one. How does the right car get to the right person? The obvious answer is that the market ensures that cars are available and consumers, through free choice, purchase the car they want. But at what price? How are the prices of the various attributes set so as to equate supply with demand, not just for some homogeneous commodity like wheat but also for some complex good like an automobile?

Most economists would probably classify Rosen as among the twentieth century's finest labor economists because much of his work focused on labor markets. In labor markets, too, diversity is key. Workers have different skills and tastes

for job attributes (like hours flexibility, danger, location) and jobs have different requirements and abilities to accommodate worker preferences. How do wages get set to ensure that workers and jobs are paired appropriately? Much of Rosen's work centered on labor allocation and wage determination in the context of heterogeneous workers and jobs.

Sherwin was born to Nell and Joe Rosen in Chicago in 1938. His mother was Canadian and his father was from Illinois. His parents met on a kosher dairy farm in Quebec, Canada. Sherwin's father, Joe, and his Uncle Harry jointly owned a hardware store and Sherwin spent a good bit of his childhood playing in that store. Despite this on-the-job training Sherwin was hopeless at performing any kind of repair work. Sherwin was very close to his brother, Eddie, who died when he and Sherwin were both only in their 30s.

Sherwin spoke often of his father, describing him as a bit of a character who had an eye for women and a slight wild streak. Sherwin inherited part of that from his dad. Sherwin loved fast cars and enjoyed an occasional journey to the track to bet on a horse or two. He described these field trips as educational, of course, as he attempted to understand at the purely intellectual level the system of pari-mutuel betting.

Sherwin attended Purdue University and studied engineering. This served him well as an economist. In our joint work he would put me to shame when it came to integrating-by-parts and teased the rest of us mercilessly for our ineptitude at differentiating complex integrals. But Sherwin was not cut out to be an engineer and decided to attend graduate school in economics at the University of Chicago. At first there was concern that he did not have the touch for economics either. He failed the general exam known as "the core" and was advised by Milton Friedman to drop out

of economics to pursue another discipline. Perhaps, suggested Milton, he might make a better accountant. Even Milton Friedman errs occasionally, and fortunately Sherwin did not follow his advice. He persevered and eventually received his Ph.D., studying under one of the great teachers in labor economics, H. Gregg Lewis.

The most important event of Sherwin's undergraduate career consisted of a trip back to Roseland, Illinois, where he met a girl named Sharon Girsburg from the north side of Chicago. Sharon would become Sherwin's wife of 40 years. Sharon is herself a remarkable person, having both charm and strength. Sherwin's tendency to experience occasional mood changes was regulated by Sharon's love and consistency. Sharon and Sherwin had two daughters, Jennifer and Adria. Jennifer still lives in Chicago and Adria, now a teacher in Berkeley, California, has just provided a grandchild appropriately named Leonardo Sherwin.

Sherwin was a truly sophisticated person. He had a deep understanding of music, art, and literature. He was an intellectual in the best sense of the word, curious about everything and able to enjoy the finer things that the world had to offer. He had many hobbies. He was an avid golfer from childhood; he played jazz piano and enjoyed a good meal and fine wine.

SHERWIN THE TEACHER

Sherwin was my most important teacher. In many respects he was a superb teacher, but his classes were often tough sledding. Sherwin was a clear speaker, but hardly an impassioned orator. The truth is, he was sometimes hard to follow. What set Sherwin apart as a teacher (and also as a scholar) was the depth of his understanding. Because he understood things at a level deeper than most economists, what he taught was sometimes less than transparent. But

eventually the student fell in love with both the substance and style of what he said. He made it clear that the superficial understanding of a topic that we had was simply insufficient. He understood issues at so many different levels and would think about the same problem literally for years, each paper tackling another layer of it. For this reason his classes could be daunting to the unwashed graduate student.

My early impressions of Sherwin as a teacher were not only from the class that he taught when I was a graduate student at Harvard. Sherwin was then a 34-year-old visiting professor teaching labor economics. Perhaps equally important was our interaction in the Chicago-style seminar at Harvard that was attended by Chicago expatriates like Zvi Griliches and by Chicago wannabes like myself. Sherwin attended that seminar. I was constantly amazed by his insight. Sherwin would appear to be thinking about something else much of the time, drawing elaborate doodles on the day's paper, and staring out the window. He literally seemed out of it, almost ignoring the talk that was taking place. Then, in a somewhat clumsy manner, he would blurt out a one-sentence comment that would completely change the nature of the talk. Sherwin would see right through the problem and cut to the key point, or more often, key flaw in the speaker's logic. The point was never delivered in an aggressive or belligerent way. Sherwin never tried to look good at the speaker's expense. He just understood the issue at a level far deeper than that contemplated by the speaker and made it clear to all. As a teacher, that was his style throughout his career, and many in this audience have benefited from his insights.

Sherwin began his teaching and research career at the University of Rochester in 1964, where he remained until 1977. He was a dominant figure in the economics department because of his ability to look deeply into so many

issues. He made many friends there, the closest of which was Stanley Engerman, and they remained friends until Sherwin's death. Much of Sherwin's early important research was done at Rochester, including the classic paper on hedonic prices. Additionally, Sherwin influenced a number of Rochester students who are now themselves fine economists.

But Sherwin was not really home until he returned to the University of Chicago in 1977. The University of Chicago is unique. It epitomizes intellectual activity. Those of us who have spent significant parts of our careers at Chicago view it as the center of the universe. Despite Sherwin's happiness with the University of Rochester and despite his many good, productive years there, he could not resist the sirens that beckoned him to return to Chicago. It was for him the pinnacle, and he came home. Chicago defines the term "tough love," and like the rest of us, Sherwin enjoyed a number of "romantic" experiences in the Chicago workshops, where his work, although admired, was taken apart piece by piece. And this made him better.

Sherwin and I worked closely together and we were each other's most frequent coauthor. But Sherwin also enjoyed the personal and intellectual company of a number of Chicago greats, most notably Gary Becker and Bob Lucas. Both influenced Sherwin. It is impossible to overstate the significance of the workshop that he ran jointly with Gary for many years, not only on his own work but also on that of the rest of us who participated.

Sherwin had a number of offers to move elsewhere during his career, but Chicago was his soul. He spent summers and occasional winter months at the Hoover Institution at Stanford, but was unwilling to leave the Chicago department even for the beauty and climate of the San Francisco Bay area. His Chicago students and colleagues

and Chicago's intellectual atmosphere were simply too much a part of him.

Since his death, so many of his students have talked about Sherwin in much the same way. He was as kind as any man I have ever known. Although sometimes gruff, Sherwin spent much of his life ensuring the well-being of his students and junior colleagues. He was generous with his insights. He shared them with others, especially his junior colleagues, and so many of us profited as a result.

SHERWIN THE SCHOLAR

Although Rosen's impact on his students was profound, one can only affect a few through direct classroom contact. By far his greatest impact was through his written work, of which there was much. Rosen published about 80 papers in scholarly journals, and many have become classics. Probably his best-known paper is "Hedonic Prices and Implicit Markets" (1974). This paper forms the basis for understanding diversity—how the market solves the problem of matching buyers and sellers along many different dimensions of quality.

Two examples help clarify the issues: one from the labor market and one from product markets. A product market example has already been mentioned and it involves the pricing of attributes of quality.

To make things simple, think about automobiles as having one dimension of quality, namely horsepower. (This is consistent with Sherwin's love of speed.) Individuals have preferences over horsepower, and it may be that other things equal, most prefer more horsepower to less. Now, individuals might be willing to pay more for higher levels of horsepower, but the relationship need not be linear. In fact, one might expect it to be concave; it is worth more to increase the horsepower from 50 to 100 than it is increase it from 350 to 400. But the problem is that it is costly to produce

cars that deliver more power, especially in a package that is small enough and light enough to be practical. There is an analogous relation on the producer side that matches that of the consumer. Producers can supply more output to consumers but only at increased cost. Furthermore, the increased cost relationship is probably not linear and is likely to be convex. It costs more to increase horsepower from 350 to 400 than it does to increase it from 50 to 100.

Which level of horsepower is provided and at what price? The Rosen analysis showed that if all consumers had the same preferences and all producers had the same cost technology, there would be one and only one type of car produced and its price would be determined uniquely. Of course, this is the extreme case. In the real world both sides of the market would be characterized by heterogeneity, and again the Rosen analysis explained under which circumstances an investigator could infer either preferences or cost technology. If consumers were identical, but firms differed in their ability to provide increasing horsepower at increased costs, then there would be many varieties of cars produced and the price would rise with horsepower in a concave fashion. The concave function that related price to horsepower would be an exact representation of consumer preferences. That is, it would tell us how much consumers were willing to pay for additional horsepower at every level of horsepower. For example, if the price of a car with 100 horsepower were priced at $15,000 and an identical car with 150 horsepower were priced at $18,000, this would imply that every consumer (since they are identical) viewed 50 additional horses as being worth $3,000.

The converse is also true. If consumers differed in their preferences, but producers were identical in their ability to produce horsepower at increasing cost, then the market relation of price to horsepower would trace out the producers'

cost relation. For example, if the price of a car with 150 horse power were $18,000 and the price of one with 200 horsepower were $25,000, then this would imply that the extra 50 horses cost $7,000 to produce.

If, as is typical, both sides of the market are heterogeneous, then the market prices provide neither the preferences nor costs of any given producer. This is because sorting occurs and the market facilitates this sorting. Those producers who produce cars with 150 horsepower at $18,000 could not increase horsepower to 200 at a cost of $25,000. Although there is some firm that could provide that higher level of power at that price, the firm that chooses to produce the lower horsepower car is the one that has a comparative advantage at low horsepower and a comparative disadvantage at high horsepower. Analogously, the person who buys the 150-horsepower car at a cost of $18,000 would not be willing to pay an extra $7,000 for 50 more horsepower. Indeed, that is why he chose the low-cost, low-horsepower car in the first place. Conversely, the individual who buys the $25,000 car with 200 horsepower would not settle for a 150-horsepower car at $18,000. She preferred the high-horsepower car at a cost of $25,000 to the low-horsepower car at a cost of $18,000. This revealed preference is generated by the market mechanism that Rosen identified.

The point is even more profound in the labor market context. To put it simply, when choosing a job, money isn't everything. People care about other aspects of the job and Rosen showed us how to analyze and understand the tradeoffs. Again, to make it simple, suppose that jobs differed in only one dimension—flexibility of hours. Some people (e.g., mothers of small children) prefer jobs that offer a great deal of flexibility and might be willing to accept significantly lower wages to have such jobs. Others (e.g., 54-year-old men) might be less interested in flexible hours. Although

they would accept somewhat lower wages to obtain flexibility, the amount they would be willing to give up to obtain flexible hours is not as large as the amount mothers of small children would give up.

On the employer side, it is costly to provide flexible hours, but more costly to some types of firms than to others. For example, firms that can accommodate telecommuters, like bill-tracking operations, can offer flexible hours with less harm to production than those running assembly lines. Factories will prefer to pay relatively high wages and require rigid work schedules, whereas bill-tracking firms prefer to pay lower wages and allow flexible hours. The market will sort accordingly so that we should see few mothers of small children on assembly lines and few 54-year-old men who prefer high wages working for bill trackers. The wage mechanism established by the market induces people to self-sort.

Furthermore, the Rosen approach allows a conceptually appropriate way to value nonmonetary amenities of a job. If firms that offer flexible hours pay $100 per day less than those that require rigid schedules, we can say that the market value of flexibility is $100, that the marginal worker values flexibility at $100 and the cost to the marginal firm of offering flexibility is $100. Thus, we have found a monetary equivalent for nonmonetary attributes. All of this is possible in a world of heterogeneity.

An extension of valuing attributes allowed Rosen to conceptualize and estimate the value of a life. This approach is still used today both in academics and in litigation that involves damages for wrongful death. The idea is to examine different earnings in risky and less risky occupations. If an occupation that has a slightly higher probability of death also carries with it a 10-percent higher salary, then that 10-percent additional salary must compensate for the higher

probability of death. By using estimates from real wage and hazard data it is possible to estimate how much one's heirs would have to inherit to compensate for one's own life. Many researchers have used this approach, with some modifications, in the health economics context to determine the cost effectiveness of various medical treatments.

The Rosen work on hedonics is probably his most important contribution, but there are many others as well. Sherwin and my collaboration in the late 1970s resulted in a literature called "tournament theory." Our paper "Rank-Order Tournaments as Optimum Labor Contracts" (1981) was followed by Sherwin's paper "Prizes and Incentives in Elimination Tournaments" (1986). Tournament theory explains wage dynamics in hierarchies. How large a raise should individuals receive when they are promoted from director to vice-president? There are a number of puzzles and basic questions that can be answered by using tournament theory. For example, why do salaries jump so dramatically when an individual is promoted from vice-president to chief executive officer? If he would work for $500,000 per year as a vice-president, would he really turn down the CEO job at $800,000? Is it necessary to pay him $2 million, and if so, what function does it serve the firm? Why are earnings skewed so that the promotion from assistant vice-president to vice-president carries a lower raise than the promotion from vice-president to president?

The basic idea behind tournament theory is that a firm's internal labor market can be thought of in the metaphor of, say, a tennis tournament. There are three main points.

First, in the tournament all prizes are fixed in advance and based on relative performance. The player who wins the championship does so not because he is good—all players in the tournament are excellent—but because he is *better* on that given day than his rival. The statement is relative.

In firms the person who receives the promotion is generally the one who is regarded as the best of all the choices. Furthermore, to a first approximation, when he is promoted, he receives the salary that goes with the job, not the one that matches his ability.

Second, the larger is the spread between the winner's and loser's prizes, the more effort that goes into the contest. Players work harder in a winner-take-all contest than in one where the prize money is split evenly between winner and loser. In the firm the larger the difference in salary between the president and vice-president, the more effort the vice-presidents will put into their jobs so that they can win the presidency. The president's salary serves as a motivator for the vice-presidents as much or more than it does for the president.

Third, the spread can be too large. If the difference in prize money is too great, effort is too high and individuals will not voluntarily join the firm. Recruitment and retention difficulties place limits on the size of the spread and create equilibrium where a unique, optimal salary structure is determined.

The theory helps explain why there is a larger spread in earnings between the top and bottom in new industries than in old ones. Think about playing tennis in a hurricane. Players would tend to give up because their effort would have little impact on the probability of winning. Similarly, when luck is an important component of the industrial environment, the managers tend to give up as well because their effort has little impact on the probability of being promoted. To counter this tendency, the spread between the prize of the winner and prize of the loser must be increased, which results in a larger difference in earnings. New industries are riskier; they have more luck associated with the production process. To counter this, new

industries reward winners in a bigger way than do old industries, which results in a large difference between the top and bottom wages in the firm.

The mathematics of the tournament theory is perhaps the earliest application of game theory to the labor market. Rosen was a pioneer in bringing new formal techniques to a field that was previously institutional.

Always interested in why wages take the form that they do in the real world, Rosen often revisited the topic of earnings skew. The most important paper on this topic was probably "The Economics of Superstars" (1981). This was a truly remarkable paper because it provided a simple and convincing explanation for the existence of a highly skewed income distribution. Rosen's analysis explained why there were a few very high earners in each occupation and which occupations were most likely to have a skewed earnings distribution. His argument relied on economies of scale, best illustrated by the example of performers. Suppose that there are two or three great tenors in the world. Among them are clearly Luciano Pavarotti and Placido Domingo. Suppose further that most opera fans rank Pavarotti above Domingo (although many aficionados might reverse the ranking). Even if the difference between the two were minuscule, Pavarotti could end up with earnings many times that of Domingo. The reason is that there are tremendous economies of scale in the recording business. Pavarotti can, with the same effort, produce one CD of *Tosca* or 100 million CDs of *Tosca*. As a result, if most view Pavarotti as better, then he will sell many more CDs than Domingo and his earnings will be many times higher, despite his talent being only trivially greater.

The theory implies that occupations that are subject to the greatest economies of scale will be the most skewed. Furthermore, over time, as technology allows greater econo-

mies of scale (e.g., the invention of the phonograph and radio), earnings of workers in those occupations will become more skewed.

Chief executive officers leverage their talent by combining it with capital and other labor. A variant on the superstars theory helps us understand why CEOs of large firms earn more than CEOs of small firms. They are essentially combining their talents with other factors of production to make greater use of the given amount of talent, which can be spread over a larger unit. Just as Pavarotti can entertain many simultaneously, the CEO of a firm that has $1 billion in assets can make the same amount of talent more productive than the one who presides over a firm with only $1 million in assets.

Sherwin was a major contributor to the theory of hierarchies and related this to the relation of earnings to firm size just described. In a couple of papers, including "Authority, Control, and the Distribution of Earnings" (1982), Rosen determined how individuals with various talents would sort among firms of different sizes and levels. This is the question of whether it is better to be a big fish in a small pond or a small fish in a larger one. Again relying on his deep understanding of diversity and equilibrium, Rosen affirmed that the marginal individual must be indifferent between being a level-two individual in a large firm or a level-one individual in a small firm. This idea, coupled with some assumptions about underlying technology and talents, not only provides a rich theory of wages within a hierarchy but also has implications for the size distribution of firms and the number of hierarchical levels that each has.

Rosen examined so many different areas in labor economics that it is impossible to discuss all of them. But it is important to feature the work that he did with Robert Willis on sorting in labor markets. A problem that plagued labor

economists for many years (and still does to some extent) is whether the positive relation of earnings to education is causal or simply indicates that more able people go to school. While few doubt that some is causal, the question of bias in statistical estimates remains. In "Education and Self-Selection" (1979) Willis and Rosen were able to shed light on this question. Through a very clever technique that relied on revealed preference in a sorting context, they found that not only were those who went on to college better at doing college jobs, but those who did not were better in an absolute sense at high school jobs. Thus, those who got college degrees did so for two reasons. First, they were good at jobs that required a college degree. Second, they were bad at jobs that required only a high school diploma. This meant that the biases in estimates of the return to investing in education were unlikely to be biased very much, which is the prevailing view after 30 years of statistical estimation.

Rosen worked in a large number of other areas, including labor market segmentation, discrimination, agricultural economics, housing, occupational choice, risk, and product market pricing. His contributions were profound and will have lasting impact on the profession.

SHERWIN THE MAN

Despite Sherwin's many accomplishments he was an overwhelmingly modest person. His own view of his accomplishments was far less favorable than that held by his colleagues, students, and the economics profession at large. Sherwin loved to laugh and had a wonderful sense of humor. I remember Sherwin once talking admiringly about one of his colleagues. He described him as a "real man" and said that the expression, although not politically correct in these times, captured the essence of the individual. More than anyone I have known, *Sherwin* was a real man.

He didn't gloat over his many successes. More important, he never revealed his displeasure when things didn't go his way. Sherwin took his lumps in silence and bore the pain without comment.

Sherwin's recognition came late in life. His election to the National Academy of Sciences came when he was 59. I remember how thrilled he was at the news. The following year he was elected president of the American Economics Association, which is the 25,000-member, preeminent society in economics. This, too, brought him great pleasure and he enjoyed enormously organizing and attending the January 2001 meeting.

It was at this meeting that he began to feel some of the symptoms that were associated with the disease that took his life. He found out that he had very advanced cancer in February 2001. Knowing that there was not much time left, I suggested to Sherwin that we have a conference that would bring together all his friends to talk about his work. "Nah, I don't want people to have to do that," he replied. "If my work is any good, people will talk about it after I am gone." But his wife Sharon and I persuaded him that he would enjoy the conference and seeing everyone at least one last time. He agreed. Unfortunately Sherwin's first instinct prevailed because he died just one month after hearing his diagnosis.

The memorial service held in Chicago in May 2001 attracted a huge crowd from around the world. Sherwin truly underestimated the feelings that others had for him. He was a scholar who had a deep understanding of the world. He was teacher who inspired and nurtured his students. He was a man who was a beacon to his family and friends. His career was cut short while he was still writing insightful papers, but the economics profession is fortunate

that he was so productive during his career. The vast and important literature that stems from his work is his legacy.

THE AUTHOR THANKS Sharon Rosen and Michelle Rosen for their input into this biography.

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