

Austrian themes, data, and sports economics

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Abstract This paper uses data from Major League Baseball and themes from *Moneyball* by Michael Lewis to empirically illustrate Kirznerian entrepreneurship. While Kirzner envisioned competition in markets for profit, the sports economics literature shows that sporting competition has things in common with market competition. This is important because a strength of sports economics, namely, the abundant data, can help overcome a perceived weakness of Austrian economics, namely, the lack of empirical content. This paper describes and empirically confirms how certain front office decision makers of the Oakland Athletics were alert to opportunities that were being overlooked by other baseball executives.

Keywords Austrian economics · Kirznerian entrepreneurship · Sports economics

JEL Codes B53 · L83 · M13

In *Competition and Entrepreneurship*, Israel Kirzner sets forth his view of entrepreneurship as a discovery process undertaken by alert individuals who find profitable opportunities in the current (dis)equilibrium.¹ Entrepreneurs need not bring any resources to an activity in order to be successful, except perhaps that part of their human capital that allows them to discover, or uncover, opportunities that are already there. The profit opportunity can take a variety of forms such as: the discovery of a new production process or a different way of doing things, the discovery of a new market for one's output or a new product that better satisfies an existing want, and/or the discovery of a new cheaper source for an existing input or even a wholly new combination of inputs. The person making such a discovery can act upon the information

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¹ See Shmanske (1994) and the response by Kirzner (1994) on the issue of whether the world should be seen as in equilibrium or disequilibrium prior to an entrepreneurial discovery. The ultimate resolution of this issue is not important to the use of Kirznerian entrepreneurship in this paper.

or sell it to someone who will act on it, either way earning a stream of profit (or the capitalized value of such a stream) until others catch on and imitate thereby forcing product prices down or input prices up and diminishing the profitability of the activity.

Kirzner's story of how profit seeking in a competitive market process works to satisfy wants, reduce inefficiencies, economize on resource usage, and foster innovation and growth is central to the Austrian school's view of economics and the policy directives that come from the school. Those policy directives almost always tilt in favor of private property, open markets, and low taxes and against governmental intervention. By contrast, almost all intermediate theory textbooks present standard static equilibrium analysis that is interpreted to allow government intervention that in some cases restricts, taxes, or regulates market behavior and in other cases subsidizes certain behaviors or encourages certain outcomes.² While many economists are convinced of the correctness of the Austrian school's view based solely on the persuasive verbal argumentation of Kirzner and others, there are many others for whom the Austrian view remains unpersuasive and incomplete because of the lack of verifiable or falsifiable empirically testable implications.

One of the several reasons why the Austrian school is not empirically inclined is the lack of appropriate data that captures alertness, discovery, and their aftermath. An industrial setting may spawn dozens or even hundreds of entrepreneurial discoveries, but it may be impossible to unravel the individual contributions and institutional settings in which the discoveries occur or to isolate their effects on the bottom line. Here is the crack through which the sports economics wedge enters. The beauty of sports economics is the abundant supply of data of all sorts with which to test economic propositions. Furthermore, by nature of its collection for sporting purposes, the abundant data are clean and objective, especially, in comparison to industrial profit data or national income, inflation, or unemployment statistics, which have many known theoretical, aggregation, and measurement problems. This paper will use data from Major League Baseball to examine the relationship between a team's expenditure on players' salaries and a team's winning percentage in an attempt to discover whether specific data point outliers to that relationship can be explained in terms of specific instances of entrepreneurial discovery by baseball executives.

It is the welding of empirical data from baseball to entrepreneurial acts by some baseball executives that makes this paper possible. However, the motivation for the paper in the first place is the unmistakable Kirznerian language used by Michael Lewis, in his best-selling book, *Moneyball: The Art of Winning an Unfair Game*. Lewis describes the activities of certain executives of the Oakland Athletics baseball team in storytelling that uncannily captures the essence of Israel Kirzner's description of entrepreneurial discovery by those with superior alertness. Lewis, an Art History major and ex-Wall Street player who studied economics in graduate school at the London School of Economics, may or may not be aware of the Kirznerian connection.

² The referee pointed out that some advanced textbooks treat innovation, strategy, and change. However, the textbook the referee suggested has only passing reference to Schumpeter, and no mention of Kirzner. The dynamism in the textbook follows directly from the neoclassical method of optimization subject to constraints, considering such questions as who has greater incentive to innovate, an incumbent monopolist or a potential entrant? Such questions are examined in an equilibrium framework. While these questions and the models examining them are interesting, they largely miss the significance of Kirzner's views.

Today, he is known predominantly as a reporter, journalist, and author of the best-selling book. He does not cite Kirzner or any other economists (Kelvin Lancaster would be a possibility), which is probably appropriate given the target audience for his book. Nevertheless, he describes three or four instances that could become stellar textbook examples of Kirznerian entrepreneurship. Furthermore, the outcome of at least a couple of the instances leads to testable implications that this paper will confront with real world data.

Interestingly, Goff, McCormick, and Tollison (2002) have explored an earlier innovation in baseball that might be Kirznerian, but from a completely different starting point. They look at the dispersion of the use of black players in Major League Baseball as a statistical regularity following an S-curve in an idea they attribute to Griliches (1957). Kirzner's story of an alert innovator who is imitated by entrants in open markets provides one possible theoretical underpinning for such a dispersion, but there are others. For example, whether Branch Rickey is to be seen as a Knightian risk taker or as a Kirznerian entrepreneur turns on whether one thinks he took a huge gamble that paid off, or whether one thinks he was simply the first to notice things that everyone else could have noticed, namely that African-American ballplayers had copious talent and that the world would not come to an end if baseball's color bar was broken. For the story of the Oakland Athletics as told in *Moneyball*, the Kirznerian connection is undeniable.³

The remainder of the paper is divided into three sections. Section 1 offers a brief background of the similarities and differences between economic competition and sporting competition and explains how each is relevant to the paper. Section 2 describes several instances of Kirznerian entrepreneurship, including the capturing of pure entrepreneurial profit, the use of pre-existing information in a new way, the blindness of others to the same opportunity, and the attempts by some to copy the successful innovation. The empirical analysis of the relationship between a team's salary expenditure on talent and a team's outcome in terms of winning percentage in the sporting competition is in the final section. Using twenty years of data from Major League Baseball, regressions clearly show that the Oakland Athletics significantly outperform the rest of the league in the relevant period directly after their innovations.

1 Economic competition versus sporting competition

One of the first lessons of sports economics is to distinguish between sporting competition on the field of play where success is measured by winning percentage, and economic competition in the market place where success is measured by profit. Professional sports leagues do their best to ensure vigorous athletic competition between teams, which attracts fans and increases revenue. This sporting competition between teams is also a type of economic competition *vis a vis* the rest of the economy, in the sense that a better baseball game product attracts consumers who might otherwise spend their money at the movies or the opera. However, sports leagues try to curtail profit-eroding economic competition between the teams by

³ The possible connection to the Goff, McCormick, and Tollison (2002) paper was suggested by the referee.

establishing exclusive territories, by limiting individual or overall salaries, and by limiting the competition for new talent. The concepts of sporting competition and economic competition should be kept conceptually separate, but of course, the two are connected. More wins means more attendance and more revenue. Meanwhile, more expenditure on talent means more wins.

The owners of a sports franchise instruct their front office executives to somehow balance the cost of extra talent with two dimensions of benefits, namely, winning games or championships, and earning extra profit. The exact nature of this balance is a matter of contention. Some owners may care more about championships than dollars, and others may care more about the bottom line. In one sense, however, there is no controversy between these objectives. In a constrained optimization setting with a given budget for player salaries, the objective of maximizing wins is coincident with the objective of maximizing profit because of the assumed strictly positive relationship between gate revenues and winning percentage. The goal of either a win maximizer or a profit maximizer would be the efficient expenditure of the given budget.⁴

It is the efficient and innovative, expenditure of a given budget by the Oakland Athletics that the paper examines in the empirical section. This is important because we can examine the outcome of the sporting competition, that is, winning percentage with much better data than the outcome of any economic competition. Indeed, league reporting of its costs and revenues and the reporting of such by individual teams are notorious for their obfuscation.

One other aspect about competition deserves mention here. The sporting competition, by definition, is a zero-sum game if only the teams are considered. One team's win is another's loss. However, if the fan's enjoyment is also considered, then heightened sporting competition is welfare-increasing. Meanwhile, some forms of economic competition may be negative-sum games for the teams involved but zero-sum games overall. Consider, for example, an auction type bidding war for a free agent. As teams bid against each other the league owners as a collective lose out, but, except for the bargaining cost, the player and his agent gain dollar for dollar what the owners pay over and above the reservation wage. Compare these cases with what happens in the competition phase of the Kirznerian story. Competition to Kirzner means that imitators copy the entrepreneur's discovery, thus lowering the market price and costing the suppliers as a whole their profits. However, the lost profits to the sellers are not lost to society, they show up as increased consumer surplus in a positive-sum game for society in general.

2 Kirznerian entrepreneurship in *Moneyball*

In a nutshell, *Moneyball* by Michael Lewis describes how a baseball statistics geek, Bill James, questioned the usefulness of some of the traditional statistics tracked by Major League Baseball, and developed some of his own that could be more useful. A baseball

⁴ A possible exception is expenditure on an aging superstar who might not contribute to wins but who might increase attendance due to fan nostalgia. Pele playing in the now defunct North American Soccer League is perhaps an example, although his skills, if not his stamina, were still considerable. No recent examples in baseball would seem to make a quantifiable difference.

executive for the Oakland Athletics, Sandy Alderson, focused on one particular aspect of this statistical work, namely that “batting average” (which was widely referred to and lavishly remunerated) was not as important or valuable as “on-base percentage,” (which was largely ignored).⁵ Lewis describes how Alderson was able to implement his innovative philosophy in the Athletics Minor League farm system, but was ignored at the Major League level where decision making was dominated by ex-ballplayers and not by Ivy League lawyers like Alderson. So Alderson hired an ex-ballplayer, Billy Beane, who understood, further honed, and implemented the insights of James and Alderson. The result is that the Oakland Athletics achieve success on the playing field, while spending only a little more than half of the league average on salaries.

There are tangential stories, flashbacks, personalities to describe, and a general literary flair that contribute to the success of Lewis’ book. This paper will focus on a few of these that describe instances of successful entrepreneurship, some of which in turn lead to the statistical testing in the next section.

2.1 Bill James and Sabermetrics

Bill James was dissatisfied with what was misleadingly captured in and with what was left out of baseball statistics as they were traditionally portrayed, and he decided to write about it. In Lewis’ words:

James’s first book was self-published—photocopied and stapled together by himself—and ran just sixty-eight pages (production budget: \$112.73). Its formal title was: *1977 Baseball Abstract: Featuring 18 Categories of Statistical Information That You Just Can’t Find Anywhere Else*. To sell it, James took out a single one-inch advertisement in *The Sporting News*. Seventy-five people found it alluring enough to buy a copy.⁶

From this modest beginning, James ultimately wrote twelve annual editions of the *Baseball Abstract* and spawned an interest in the serious formal analysis of the game of baseball. This interest is now institutionalized and carried on by so-called sabermetricians who are named for the acronym of the Society for American Baseball Research. James was certainly entrepreneurial in the sense of discovering what was right there waiting to be discovered, especially with the importance he placed on on-base-percentage to a baseball team’s offensive production. And he probably made a lot of money on his books. In addition, his efforts were mimicked and extended by other sabermetricians, many of whom did it simply as fans of the sport and some of whom tried for commercial success. For example, Dick Cramer, a kindred spirit even before James came along, started STATS Inc. to develop more useful statistics than the official statistics which were produced for Major League Baseball by the Elias Sports Bureau. Meanwhile, the Elias Sports Bureau tried to steal some of James’s

⁵ For the most part, batting average is the ratio of safe hits to the sum of safe hits plus outs, the denominator being called official at-bats. On-base percentage adds walks and is hit by the pitch to both the numerator and the denominator. There are other minor adjustments having to do with sacrifices, fielder’s choices, and errors.

⁶ Lewis (2004) pp. 65–66.

book market by publishing the *1985 Elias Baseball Analyst* which looked just like James's *1985 Baseball Abstract*.

The STATS Inc. story itself is interesting. Cramer thought that the baseball teams would be interested in his careful statistical research, but he and his business representatives were rebuffed, time and time again when they approach the team owners. The business was going nowhere fast. Bill James, too, wanted to influence the owners and baseball insiders but also realized that the baseball fan was a potential market for STATS Inc. When STATS Inc. focused on providing information to fans it became a success and was eventually bought out by Fox News Corporation.

James's entrepreneurship was in noticing something about baseball statistics as they were traditionally viewed. He was able to reap economic profit as an author and as an investor in STATS Inc. His activities also spawned a lot of competitors and imitators. These activities all fit the classic Kirznerian story of entrepreneurship in the business realms of book selling and provision of statistics. However, James was unable to carry his innovation over into the realm of sporting competition in the game of baseball. For that, another entrepreneur or two would be required.

2.2 Sandy Alderson, walks, and on-base percentage

Sandy Alderson was hired as the General Manager of the Oakland Athletics in 1983. When Mike Lewis introduces Alderson in *Moneyball* he describes a situation that was ripe for a Kirznerian entrepreneur. In Lewis' words, Alderson was

... a complete outsider to baseball. This was rare. Most GMs start out as scouts and rise up through the baseball establishment. Alderson was an expensively educated San Francisco lawyer (Dartmouth College, Harvard law School) with no experience in the game. . . [Alderson] concluded that everything from on-field strategies to player evaluation was better conducted by scientific investigation—hypotheses tested by analysis of historical statistical baseball data—than by reference to the collective wisdom of old baseball men. By analyzing baseball statistics you could see through a lot of baseball nonsense. For instance, when baseball managers talked about scoring runs, they tended to focus on team batting average, but if you ran the analysis you could see that the number of runs a team scored bore little relation to that team's batting average. It correlated much more exactly with a team's on-base and slugging percentages. A lot of the offensive tactics that made baseball managers famous—the bunt, the steal, the hit and run—could be proven to have been, in most situations, either pointless or self-defeating. "I figured out that managers do all this shit because it is safe," said Alderson. "They don't get criticized for it."⁷

In the language of Armen Alchian (1950), Alderson would have said that the existing managers were pursuing a reasonable strategy by imitating other successful managers in order to have the same adoptability. But what was needed was some adaptive innovation by someone with a fresh perspective. Alderson was not blinded by conventional baseball wisdom, and he had read all of James' analyses. He was

⁷ Lewis (2004) pp. 56–57.

ready to implement a new baseball strategy based on the work of the sabermetricians and the wisdom of an old baseball saying, “a walk is as good as a hit.”

The problem with the old baseball saying is that it was most often targeted toward the weaker players in youth leagues. The better players would hope that the weaker players would not swing, miss, and strike out, but instead would just stand there and hope for a walk. After all, a walk would be the best chance for a weaker player to reach base. The better players, of course, would not be content to passively reach base on a walk (the same as a weak hitter could do) and, if having done so, certainly would not stand out in the eyes of friends, coaches, or scouts. For personal advancement in the game, receiving a lot of walks was not going to get you noticed. “A walk is as good as a hit” said to a good player who walks was meant sympathetically and apologetically.

For the good of the team, however, “a walk is as good as a hit” is very true, in fact a walk may be even better than a hit. A base hit on the first or second pitch that a pitcher throws is nice, but walking requires the pitcher to throw at least four pitches, and possibly six or more. The more pitches thrown, the more tired the opposing pitcher, and the better chance that your team will score more runs later. James and the sabermetricians could show this conclusively, but no one in baseball (except Alderson) was paying attention.

At this point the Kirznerian discovery had been made but was still only a theory in need of implementation. Lewis describes how Alderson was able to implement this new strategy for Oakland’s affiliated minor league teams. Karl Kuehl, one of Alderson’s deputies recalled, “. . . No one had ever heard of on-base percentage, but when your being called to the major leagues depends on your on-base percentage, it gets your attention.”⁸ Alderson, himself, would be a hands-on enforcer. One minor league team was not drawing enough walks and Alderson said, “I got my reports. I can see they aren’t taking any walks. I called the manager and said, ‘They go up or you’re fired.’ And they went up. Quickly.”⁹

But the Major League team was another story. The well-respected Tony La Russa was the manager of the Oakland Athletics at the time. “Alderson didn’t march into Tony La Russa’s office and tell him, ‘The walks go up or you’re fired.’ No one did. There was no very good reason for this; it’s just the way it was. . . .”¹⁰ Alderson had developed a new corporate culture built around on-base percentage everywhere in the Oakland Athletics system except for the Athletics themselves. The Major League Baseball insiders were still not listening. Alderson needed the team’s on-field manager to heed the General Manager. So, in another act of entrepreneurship Alderson got a new manager, Art Howe, who would obey the General Manager, and a new General Manager who understood the system, ex-ball player, Billy Beane. Beane would have both the ear of the manager and the respect of the players and other baseball insiders.

Alderson’s entrepreneurship may have enriched him through his ability to earn a salary higher than his reservation wage. There is little or no data to test this with any kind of statistical precision. Likewise, Alderson’s business decisions may have enriched the owners of the team, but quantifying this would be next to impossible.

⁸ Lewis (2004) p. 59.

⁹ Lewis (2004) p. 60.

¹⁰ Lewis (2004) p. 60.

So we cannot really say anything empirically about Alderson's entrepreneurship. But most of Lewis' book is not about Alderson, it is about Beane, and fortunately, the implementation by Beane of the entrepreneurial discoveries (whether made by Alderson or Beane) leads directly to the tests in this paper's last section.

2.3 Billy Beane discovers and exploits market inefficiencies

Billy Beane became the General Manager of the Athletics in 1998 after learning the ropes for a time as Alderson's assistant. This was also after the team had been sold to a new ownership group that desired to trade or not offer new contracts to many of their high-priced superstars in order to reduce the salary structure of the team. Through a series of stories involving how to evaluate different players, how to draft new talent, and how to make trades, Lewis chronicles how Beane was able to use the available information to best advantage. The following delves into two examples of the several given in *Moneyball*.

The first involved the drafting of new amateurs into professional baseball. Major League Baseball limits competition for new talent by staging a draft each year. Once drafted, a player can negotiate only with one team for the first six or seven years of his career. Even though this cuts the bargaining power of the player, the top prospects through savvy agents are able to earn handsome salaries through the threat of not signing a contract, which entailed waiting until the following year, or perhaps, playing overseas. The team is not going to offer to pay more than the present discounted value of the expected marginal revenue product (MRP) flow of the player, but if they offer too much below this amount, the team runs the risk of losing any expected surplus if the player does not sign. After six or seven years as a professional, the player can become a free agent and bargain with any team. At this point, a proven star player's salary might increase by more than ten million dollars per year as teams bid against each other for the player. In hindsight, these players have been "underpaid" for the first part of their careers. These players receive a lot of publicity, but there is an opposite side of this coin. There are many more players who sign contracts for amounts above their reservation wages who never even make it out of the minor leagues. If the stars have been "underpaid," then these minor leaguers have been "overpaid."

So, how in practice does one estimate the future expected MRP flow of a player? Ever since Scully (1974) first measured MRPs (essentially as the sum of separable characteristics in the fashion of Lancaster (1966)), teams and agents have measured a player's skills in different areas, (batting average, runs-batted-in, stolen bases, fielding percentages, etc.) placing dollar values on each and summing. The top prospects, of course, excelled in all categories and could expect a nice salary offer depending on the order in which they were drafted. Beane saw that drafting someone whom everyone thought was a top prospect, and paying bonuses and salaries with a present value close to the present value of the expected MRP flow, was not a money-making proposition. *Moneyball* describes how Beane, by paying more attention to walks and less to fielding ability and foot speed, focuses on players whom other teams will not want to draft early. Since these players and their agents also think they will not be drafted early, it appears that Beane is the only one who understands the real value of this type of ballplayer. Lewis describes one example of a player who expected to be drafted in

perhaps the 19th round being informed that the Athletics would draft him in the first round under a couple of conditions.

Jeremy Brown, owner of the University of Alabama offensive record books *as a catcher*, has been so perfectly conditioned by the conventional scouting wisdom that he refused to believe that any major league baseball team could think highly of him ... conditions. There were two. One was that he would sign for the \$350,000 the A's were offering, which was nearly a million dollars less than the thirty-fifth pick of the draft might expect to receive. The other was he needed to lose weight.¹¹

Israel Kirzner uses an example of an alert individual who finds a five dollar bill on the sidewalk and simply stoops down to retrieve it. For the cost of bending over, five dollars in value can be obtained. Billy Beane has done something similar. For the cost of \$350,000 Beane has purchased something worth, in expected value, about \$1,350,000. The one million dollar gain was available to other teams who drafted ahead of the Athletics. At least part of the one million dollar gain was available to the player and his agent who might have held out for a higher offer. But Beane captured the value for the Oakland Athletics in an entrepreneurial way.

Lewis explains how the Athletics implemented a different type of drafting philosophy. Being a low budget team, it did not make sense to draft consensus pick hot prospects and then have to pay them more than the team could afford. It was better to draft players who, because they, and everyone else, underestimated their true worth, would sign for less than they were worth. You do not get the best players this way, but you get the best deals for the money. And this is a testable implication that can be examined with data on team payrolls and team winning percentages.

It is interesting to note that the institutional arrangements in the baseball draft matter. Beane could not have practiced his entrepreneurship in the National Basketball Association, which has an agreement between the league and the player's union that sets salary ranges for draft picks. A basketball General Manager might be alert to a prospect that other teams miss, (the Kirznerian discovery part) but will be unable to cash in because of what amounts to a restrictive price control.

The second illustrative example of how Beane's entrepreneurship helped the Athletics concerns how the team would replace a superstar, Jason Giambi, whom they could not afford to resign once he became a free agent. Beane's thinking here evokes similarities to Lancaster's (1966) multidimensional model of consumer theory. Each player represents a bundle of skills, which can be evaluated and added to other players' bundles to achieve the total level of skill or talent of the team. In Lewis' words:

The previous season Giambi's on-base percentage had been .477, the highest in the American League by 50 points. (... the average American League on-base percentage was .334) There was no one player who got on base half the time he came to bat that the A's could afford; on the other hand, Jason Giambi wasn't the only player in the Oakland A's lineup who needed replacing. Johnny Damon (on-base percentage .324) was gone from center field, and the designated hitter Olmedo Saenz (.291) was headed for the bench. The average on-base percentage

¹¹ Lewis (2004) p. 102.

of those three players (.364) was what Billy and Paul¹² had set out to replace. They went looking for three players who could play, between them, first base, outfield, and DH, and who shared an ability to get on base at a rate thirty points higher than the average big league player. The astonishing thing, given how important on-base percentage was, or the Oakland A's front office believed it was, was how little it cost. To buy it they simply had to be willing to sacrifice other qualities in a player—such as the ability to outrun the hot dog vendor in a sixty-yard dash.¹³

Kirzner pointed out that profiting from simple arbitrage in the form of buying an item low and reselling it for a higher price was just the tip of the iceberg. If one could also buy a package of inputs, repackage them to add value and sell the resulting product, profits would be available. If one could use a different, cheaper, bundle of inputs to get the same result, one could also profit. This is essentially what is described in the above passage. Beane was able to hire a different bundle of inputs (players) to essentially do what the previous bundle did (at least the most important parts) at a cheaper cost because no one else was alert enough to the possibility. If Beane had truly discovered a case where the relevant inputs were mispriced, then an improved result should show up in the data. Again, by examining the relationship between winning percentages and team payrolls, one can confirm or falsify the view that Beane's activities represent Kirznerian entrepreneurship.¹⁴

Before moving to the data, however, there is other information to corroborate the Kirznerian story. Lewis' book goes on to relate how other teams attempted to imitate the Athletics. The Boston Red Sox, for example, attempted to hire Beane away from Oakland with an offer of 2.5 million dollars a year for five years, an outlandish amount. Beane's ego was stroked, but he decided he could not leave the West coast. The episode also makes Alderson, who hired Beane, look more like the source of the true entrepreneurship. Regardless who the true genius was, the imitators did not give up. In Lewis' words:

The Boston Red Sox, having failed in their attempt to hire Billy Beane, did the next best thing, and hired a very bright young man, Theo Epstein, who viewed Beane as his role model. The Toronto Blue Jays had already hired Beane's right-hand man, J. P. Ricciardi.¹⁵

Also, the imitators may be making inroads. The above-referenced paper by Hakes and Sauer supports such a conclusion. Lewis also acknowledges it in an *Afterword*

¹² Paul DePodesta, trained as a economist, was Beane's assistant who brought considerable computing and data management skills to the table. He now works for the Los Angeles Dodgers.

¹³ Lewis (2004) pp. 141–142.

¹⁴ Hakes and Sauer (2006) directly test the mispricing proposition with regressions of salaries on relevant skills to estimate the marginal value of each skill. Following the sabermetricians, Hakes and Sauer show that on-base percentage should be more valuable than slugging percentage. (Slugging percentage is a weighted batting average in which doubles receive twice as much weight as singles; triples, three times as much; and home runs, four times as much.) The mispricing is evident in the early years of their sample, 2000–2003, because slugging percentage has a higher coefficient than on-base percentage. In 2004, the magnitude of the coefficients is reversed.

¹⁵ Lewis (2004) p. 294.

that was added to the paperback version of *Moneyball* to answer some of his critics. Some of this response is in the form of questions and answers, and in the final excerpt some appropriate economic reasoning stands out clearly.

Q: If Billy Beane's so smart, and he says that on-base percentage is so important, how come the A's don't score more runs?

A: They don't score more runs because their on-base percentage is not that great—much worse than it used to be. The market for on-base percentage has changed, thanks in large part to the success of the Oakland A's. Still, the A's on-base percentage retains one important trait: it's good for the money. And the point is not to have the highest on-base percentage, but to win games as cheaply as possible. And the way to win games is to buy the qualities in a baseball player that the market undervalues, and sell the ones that the market overvalues.¹⁶

Here again, is the Kirznerian theme in a nutshell—being alert to opportunities to buy low and sell high, because you have noticed something in the statistics that is not being correctly exploited, and then to be imitated by others following your example, making it harder to continue to do so.

3 Statistical verification of an Austrian theme

The moment of truth is here. The above could all be a nice story that has no real consequence if the on-base percentages, slugging percentages, expenditures on salaries, and winning percentages they lead to all fit within some normal random variation. But if there is a systematic difference in the relationship between performance and salary for the Athletics, then the Kirznerian story cannot be so easily discounted.

The empirical work proceeds in two stages. The first brief stage is to test whether the Athletics were able to employ a systematically different type of talent due to the entrepreneurship of Alderson and Beane. To test this, the paper examines the ratio of the sum of on-base percentage and slugging average, OPS, (which Alderson and Beane say is important) to the batting average, BA, (which was traditionally thought to be important).¹⁷ Thus, OPS/BA was calculated for each American League team for the 11 seasons from 1995–2005.¹⁸ The mean for all 154 observations was 2.849. There were only three positive outliers and two of these were for the Oakland Athletics right after Beane took over.¹⁹ The mean for only the Oakland observations was 2.936, and this was significantly different from the mean of all the other teams equal to 2.842.²⁰ Furthermore, no other team's OPS/BA when broken out separately was significantly different from the that of the rest of the league. There is some statistically verifiable

¹⁶ Lewis (2004) p. 292.

¹⁷ I thank the referee for suggesting this line of empirical testing.

¹⁸ National League teams would be different because of the lack of the designated hitter.

¹⁹ Outliers are herein defined as data points lying more than two standard deviations from the mean. The three positive outliers were Oakland (1999), Oakland (2000), and New York Yankees (2004). The lone negative outlier was the expansion franchise Tampa Bay 1998.

²⁰ The z-score for the simple difference in means test was 3.86, significant at the 99% level.

truth to the view that Oakland was doing something different by attempting to get players with high on-base percentages (and slugging averages) and eschewing the traditional batting average measure. The remaining question was whether this was paying off in terms of winning games more cheaply than the other teams.

The essence of the second stage of the empirical testing is to find the statistical relationship between a baseball team's expenditure on player salaries and the team's performance in terms of winning baseball games. With the relationship in hand, one can discover if the Athletics (or any other team for that matter) differ significantly from the norm. The statistics below will use a regression equation where winning percentage is a function of the salary level of the team relative to the average salary level for the year in question. Outlying error terms will be examined and dummy variables employed to highlight the result for particular teams.

The regression equation can be simply expressed:

$$\text{WINPCT} = \underset{(47.127)}{0.415} + \underset{(10.227)}{0.0885} \text{ SALARYINDEX} + e, \quad (n = 558, \text{ adj. } R^2 = 0.157) \quad (1)$$

where WINPCT is the winning percentage of the team in any given year, SALARYINDEX is the team's salary expenditure for the year divided by the average team salary for the year, e is the error term, and the t -statistics are in parentheses. The data set is a panel of all Major League teams for the years 1985–2004.²¹ There were 26 teams at the start of the sample and two expansions to 28 teams in 1993, and then, to 30 teams in 1998. As Eq. (1) shows, and as theoretically expected, there is a significant positive relationship between the variables, although there is a lot of unexplained variation. Over 84% of the variation in team's winning percentages is due to things other than their salary structure—things like weather, injuries, coaching, and just plain luck. Nevertheless, a team with double the league average in salaries will add almost nine percentage points to their winning percentage.

A similar regression was undertaken recently by Hall, Szymanski, and Zimbalist (2002) for a different purpose. Their sample period starts and ends earlier but there is much overlap, and their results are essentially the same as those in Eq. (1). Their slope coefficient is 0.097 and their adjusted R^2 is about 0.24.

Examination of the error terms in Eq. (1) indicated that there were 22 data points lying farther than two standard deviations from the regression line. Of these, eight were positive and three of those eight were for the Oakland Athletics! No other team had more than one positive outlier, so it seems that there is something different about Oakland's performance.

The next test was to add a dummy variable for individual teams as illustrated for Oakland's equation in

$$\text{WINPCT} = \underset{(46.703)}{0.4113} + \underset{(10.487)}{0.0873} \text{ SALARYINDEX} + \underset{(2.998)}{0.0439} \text{ OAKLAND} + e, \quad (n = 558, \text{ adj. } R^2 = 0.169) \quad (2)$$

²¹ The data were retrieved from www.rodneymfort.com. The website has multiple lists of team salaries that differ when trades take place over the course of the season and in how well they capture incentive clauses. I used the salary figures that were derived from *USA Today*.

As Eq. (2) shows, Oakland's performance, controlling for salary, is above average by 4.39 percentage points, and the positive effect is statistically significant. When similar equations for each of the other 29 teams were calculated, there was only one other case of a significant positive effect, that of Houston, but the effect was smaller quantitatively (0.03) and statistically significant at a lower level (the t -statistic was 2.073).²²

A variation on the theme of estimating an equation like Eq. (2) separately for each of the teams is to estimate a fixed effects model which simultaneously includes a dummy variable for each team (except for the control team, the New York Mets²³). The coefficients of each of the teams are not reported to save space, but the teams with statistically significant coefficients are included in Eq. (3).

$$\begin{aligned} \text{WINPCT} = & \underset{(21.213)}{0.414} + \underset{(7.521)}{0.081} \text{ SALARYINDEX} + \underset{(-2.460)}{-0.070} \text{ TAMPABAY} \\ & + \underset{(2.261)}{0.046} \text{ OAKLAND} + B \times T + e, \quad (n = 558, \text{ adj. } R^2 = 0.205) \end{aligned} \quad (3)$$

where TAMPABAY is the dummy variable for the significantly underperforming expansion franchise in Tampa Bay, and where B and T are the vectors of fixed effects coefficients and the individual team dummy variables, respectively. As Eq. (3) shows, Oakland is the only team that significantly outperforms the median team in Major League Baseball during the period in question.

Finally, Oakland's dummy variable was split into two separate dummy variables to represent the period before Beane took over OAKLAND97 (1985–1997) and the period when Beane was in control, OAKLAND98 (1998–2004). If there is something special about Oakland, but not Beane, then each of these dummy variables will have the same coefficient, but if there is something special attributable to Billy Beane, then the effect should show up only in OAKLAND98. The results in Eq. (4) tell the story.

$$\begin{aligned} \text{WINPCT} = & \underset{(46.441)}{0.408} + \underset{(10.862)}{0.0903} \text{ SALARYINDEX} + \underset{(0.633)}{0.0113} \text{ OAKLAND97} \\ & + \underset{(4.317)}{0.1055} \text{ OAKLAND98} + e, \quad (n = 558, \text{ adj. } R^2 = 0.182) \end{aligned} \quad (4)$$

The results are clear. Coincident with Billy Beane taking over as General Manager of the Oakland Athletics, they significantly outperform the rest of the league in the ability to get wins out of a limited budget. The point estimate is that the Athletics

²² An interesting tangent that does not bear on Oakland's results was the significant negative dummy variables calculated for Baltimore, Chicago Cubs, Detroit, and Tampa Bay. These teams are mismanaged in the sense of getting less for their money than the average team.

²³ Examination of the coefficients of the fixed effects model indicates that the New York Mets were one of the median teams. Using the median team as the omitted dummy variable allows the t -statistic for the included dummy variables to determine whether that team's performance is significantly different from the median of all the teams. In Eq. (2) where only one team is captured in a dummy variable the t -statistic determines whether that team's performance is significantly different from the average of the other team's performances.

under Billy Beane, win over 10% points more often than they should. Meanwhile, no other teams turned in such extraordinary performances over the last twenty years.

Ultimately, with respect to the regression equations, there are two possible candidates exercising entrepreneurship in Kirzner's sense—Alderson who hired Beane, and Beane who implemented daringly different decisions about personnel. Perhaps they both deserve credit. Lewis' book is mostly about Beane who was at the center of the execution of the team's strategies. Beane discovered the prospects and players who were being relatively underpaid and signed them. And it is Beane who seems to be the scarce input in the process, the one whom other teams are trying to lure away with huge salary offers, and failing that, the one whom other teams are trying to copy. But it was Alderson who set up a new organizational hierarchy, (Alderson–Beane–Howe) to implement strategies based on statistical regularities that baseball insiders seemed to ignore.²⁴ This may have been the true innovation. Beane implemented the strategies by discovering which players or prospects were undervalued or overvalued by everyone else, and acting on the knowledge. But Beane made these discoveries because he knew where to look, not because he was simply alert, but rather because he had been alerted by Alderson. In this view, Beane is a Robbinsian optimizer carrying out the plans of Alderson, the source of the Kirznerian entrepreneurship.

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²⁴ Raymond Sauer suggested this analogy.