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Disappearance of the .400 Hitter**

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## **Abstract**

This paper argues (following Gould, 2003) that the disappearance of the .400 hitter in major league baseball is due, not to a decrease in ability at the top end of the talent distribution, but to better methods of screening out players at the low end of the distribution. The argument is related to the economic literature on minimum quality standards in markets with imperfect information.

**Journal of Economic Literature Classification:** D82, L83

**Keywords:** Minimum quality standards, .400 hitters

## **Minimum Quality Standards in Baseball and the Paradoxical Disappearance of the .400 Hitter**

In 1941, Ted Williams batted .406, thus accomplishing for the final time a feat that was once relatively common in major league baseball. By the time “Teddy Ballgame” surpassed the mark, .400 hitters had already become rare. As Table 1 shows, 22 of the 35 times a hitter has batted .400 or better occurred before the turn of the century, and, prior to Williams, no one had done it since 1930.

Several explanations have been offered for this trend. The first is that players were simply better back then (“There were giants in those days.”) This explanation, however, is based more on nostalgia than any firm evidence. The fact is that the league batting average has remained remarkably stable throughout the history of baseball. Referring again to Table 1, note that the league average from 1876-1890--a period when twelve players batted over .400—was .259, exactly the same as it was for the decade of the 1980’s, and lower than it was for the 1990’s. But beyond the numbers, it is simply implausible to argue that today’s exquisitely conditioned and trained players are inferior to their counterparts from a century ago, not to mention the greatly increased pool of talent that became available with the influx of Latin and black players, which occurred *after* the last .400 hitter.

Two other explanations are based on changing strategies of the game.<sup>1</sup> The first is that the style of play after about 1920 (when Babe Ruth first appeared on the scene) began to emphasize power over high batting averages, bunting, and stolen bases. The second is the specialization of relief pitching, which occurred around the same time and

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<sup>1</sup> See Felber and Gillette (2001: pp. 95-96).

confronted hitters in late innings with top-flight pitchers rather than tiring starters or mop-up men. While these explanations are more plausible, they still do not explain why the league average has remained steady while extreme performances have disappeared.

Stephen Jay Gould (2003, pp. 151-173) has offered a different kind of explanation for the “extinction” of the .400 hitter based on an analogy to biological evolution. He argues that the downward trend in maximum averages, accompanied by a corresponding increase in minimum averages, reflects a general decrease in *variation* in averages around a stable mean as the game has matured and methods of play have become standardized. According to this interpretation, .400 averages were in effect “outliers” in the overall distribution of averages, and disappeared as the variance of the distribution decreased.

Gould (2003, p. 163) summarizes his argument as follows:

Variation in batting average must decrease as improving play eliminates the rough edges that great players can exploit, and as average play moves toward the limits of human possibility and compresses great players into an ever decreasing space between average play and the immovable [limit of human capacity].

Zimbalist (1992, p. 144) has advanced a similar argument:

The fact that a smaller proportion of a more athletically talented population is playing baseball produces...compression of talent at the top end. The variation among players in performance statistics has narrowed steadily over the years.... Today's top sluggers face fewer weak pitchers and more excellent hurlers with a broad array of dazzling pitches than did Babe Ruth, Jimmy Foxx, and Hank Greenberg....

Another way to say this is that the “technology” of baseball has changed in such a way as to eliminate the lower tail of the talent distribution. This has occurred through better scouting, better coaching, better equipment, and better conditioning of players. The fact that there has not been a concomitant increase in league averages as a result of these changes is due to the conscious and ongoing efforts of baseball rulemakers to maintain a

constant balance between hitters and pitchers, for example by adjusting the height of the pitching mound and altering the definition of the strike zone (Gould, 2003, p. 157). What has happened, however, is the disappearance of extreme performances. Thus, Gould (2003, p. 163) concludes that “The extinction of .400 hitting is, paradoxically, a mark of increasingly *better* play” [emphasis in original].

It is instructive to draw an analogy between Gould’s argument and the economic literature on efforts to establish minimum quality standards in markets for goods of uncertain quality (Akerlof, 1970). For example, Leland (1979) has argued that government licensing of certain professions is intended to improve the average quality of these professions by preventing entry of low ability practitioners. In the baseball context, owners and managers have similarly developed an extensive system of scouting, training, and evaluation of young players to ensure that only the most promising make it to the major leagues. As these methods have improved, the minimum ability of those players who make it has correspondingly increased (holding fixed the total size of rosters). And, according to Gould’s argument, this has had the paradoxical effect of *lowering* the maximum performance of the best players, assuming that the ability of the best players has not changed over time. As a result, the observed decrease in high averages is a consequence of successful truncation at the *low end* of the ability distribution.

To see this formally, suppose, following Leland (1979), that players’ abilities are indexed by  $q$ , with higher  $q$  indicating higher ability. Further, suppose that abilities are distributed according to the distribution function  $F(q)$  with density  $f(q)$ . Let

$q_L$  = lowest ability level in the league;

$q_H$  = highest ability level in the league.

The average ability in the league at any point in time is thus given by

$$q_A = \frac{\int_{q_L}^{q_H} qf(q) dq}{\int_{q_L}^{q_H} f(q) dq} \quad (1)$$

I assume that  $q_H$  is fixed and remains constant over time, but that  $q_L$  can be increased by the development and use of better screening methods. Differentiating  $q_A$  shows that the average ability in the league is increasing in  $q_L$ :

$$\frac{\partial q_A}{\partial q_L} = f(q_L) \left[ \int_{q_L}^{q_H} f(q) dq \right]^{-2} \int_{q_L}^{q_H} (q - q_L) f(q) dq > 0. \quad (2)$$

To make this analysis compatible with Gould's argument, we need to incorporate the fact that a player's measured performance depends not on his absolute ability but on his ability *relative to the average ability in the league*. This reflects the fact that measured performance in baseball describes relative rather than absolute performance in a competitive setting, one that pits players against each other rather than against an absolute measure like the clock.<sup>2</sup> To capture this, we assume that the batting average of a player of ability  $q$  is a positive function of the ratio  $q/q_A$ . Thus, variations in the maximum batting average should depend on variations in the ratio  $q_H/q_A$ . Given this specification, it follows immediately from (2) that if  $q_H$  remains fixed over time (i.e., if the ability of the best players does not change), but improved screening succeeds in raising  $q_L$ , then the maximum average should fall.<sup>3</sup>

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<sup>2</sup> Thus, for example, swimming and running times have steadily fallen over time, in contrast to the constancy of batting averages in baseball.

<sup>3</sup> Note that the performance of the average player is normalized to one, and hence held constant, in this formulation. Further, if the distribution of  $q$  is fairly uniform, then  $q_L/q_A$  will rise with  $q_L$ , thereby improving the performance of the worst players. Gould (2003, p. 168) provides some evidence for this

There are at least three ways that screening has improved over the history of baseball: improvements in scouting, expansion and improvement of the minor league system, and, more recently, increasing reliance on college baseball as a training ground for major leaguers (a change which has partially reduced the need to rely on the minors (Shughart and Goff, 1992)). Based on the Gould's theory, these factors have worked in the direction of reducing extreme performances, while improving the overall quality of play (i.e.,  $q_A$  has gone up, causing  $q_H/q_A$  to go down).

Two factors that work in the opposite direction are expansion, which lowers  $q_L$  (and hence  $q_A$ ) because of the need to add more players to major league rosters; and performance-enhancing drugs like steroids, which increase the attainable level of human performance (thereby increasing  $q_H$ ). Both of these factors will therefore tend to increase the frequency of extreme performances. Based on this logic, Zimbalist (1992, p. 144) observed that "One salutary effect of expansion would be more approaches to [longstanding] records." His prediction has certainly proved prophetic (at least regarding home run records), but recent events suggest that this power surge has been more due to steroids than to the dilution of talent from expansion.

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effect which, combined with the lowering of the performances of the best players, reduces the variance of overall performance.



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**Table 1**

**League Batting Average and Number of .400 Hitters,  
by decade, 1876-2000**

Decade	League Avg.	# of .400 Hitters
1876-1890	.259	12
1891-1900	.280	10
1901-1910	.253	1
1911-1920	.259	4
1921-1930	.288	7
1931-1940	.277	0
1941-1950	.261	1
1951-1960	.259	0
1961-1970	.250	0
1971-1980	.258	0
1981-1990	.259	0
1991-2000	.266	0

Source: Calculations by the author using data from J. Thorn, P. Palmer, and M. Gershman (Eds.), *Total Baseball*, 7<sup>th</sup> Edition. Kingston, NY: Total Sports Publishing (2001).