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The Value of Don Bradman: Additional Revenue in Australian Ashes Tests

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Historical Note
In 1894 Julian Blackham's great-great uncle, John Blackham, and Bruce Chapman's great-great uncle, Syd Gregory, established the Ashes 9^{th} wicket Test batting partnership record of 154 (in Sydney), the only 19^{th} Century batting partnership record that holds today. The current authors' partnership is a sentimental tribute to their ancestors.

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ABSTRACT

One way to understand the value of sporting 'superstars' is to examine the effect they have on match attendances and revenue. Arguably, the most famous sports star in Australia was Sir Donald Bradman, whose batting average has far exceeded that of any cricket players. This paper examines the value of Don Bradman by estimating an empirical model of the effect of Bradman on cricket match attendances for Ashes Test matches in Australia. The attendance effect – of over 7,000 additional people each day on which he batted – is then used to derive an estimate of the effect on revenue. We find that Bradman generated considerable additional revenue, though the range of the estimates is very large. The Australian Cricket Board, as the monopoly supplier of cricket, was able to obtain all the extra proceeds.

Keywords: Consumer economics, Monopoly, Wages and compensation, Professional labour markets and occupations

JEL Classification numbers: D12, D42, J3, J44.

"As far as Australian crowds were concerned, the real objective was Bradman… [in 1936/37] it was discovered as a fact that if Bradman was dismissed cheaply in the morning, the expected receipts in the afternoon fell by some 2,000 pounds"
Rosenwater (1978) page 252.

1. Introduction

It is a consensus that Don Bradman was the shining star of Test cricket, arguably even the world's most exceptional athlete. Cricket lovers tend to be obsessed with records of his performances, perhaps because the game lends itself so well to measurement. Indeed Bradman's Test batting average of 99.94 is likely to be cricket's best known single piece of data, familiar enough to have been readily accepted as the Australian Broadcasting Commission's Sydney postal box address (GPO Box 9994).

This paper concerns the derivation of another statistic related to Bradman: his effect on Test crowd sizes and thus the additional revenue accruing to the Australian Cricket Board.[1] It is important to understand that because of the rules associated with player eligibility for Test cricket there was no competitive reason for the monopoly supplier to share the rents of a star performer. This meant that none of the direct financial rewards were then delivered to players, a point explained further below.

There are other exercises of this broad kind with respect to overseas sporting stars, and there have also been two empirical investigations of the determinants of Australian Test cricket crowds, including the effect of Bradman's presence. In what follows we both replicate and extend the latter analyses by converting the estimates of additional daily attendance at Tests into approximations of the value of the revenue benefits to the ACB. These are derived under a range of alternative assumptions concerning interpretations of both levels and investment returns to these additional revenues.

We find that Don Bradman delivered considerable financial profits to Australian cricket, but that the range of the derived estimates is very broad. With respect to the latter, it is critical to highlight the role played in financial calculation scenarios of the value over time of revenue obtained at a particular point in time.

[1] Known at the time of Bradman's active participation in Tests as the "Board of Control".

2. The economics of 'sporting stars': the literature and Don Bradman's institutional context

2.1 Conceptual issues

Like most areas of economic analysis, studies of the economic effects of sporting-stars encompass both theoretical and applied analysis. The seminal theoretical piece in this area is Rosen (1981), in which a model is derived in order to explain why the most talented people in many fields (not just sports) appear to obtain a disproportionate share of the financial returns. It is argued that there are two main reasons for this observed "superstar" effect.[2]

First, there is imperfect substitution among participants,[3] in simple terms "lesser talent often is a poor substitute for greater talent".[4] Second, there is the role of the production technology: the performance of a sports person is a form of joint consumption good. Joint consumption refers to a situation in which the cost of supply is largely unrelated to the size of the market. In the case of contemporary sports-stars, the delivery technology – large stadiums and TV/radio broadcasting – allows a few outstanding performers to supply almost the entire market.

Important as the Rosen contribution is, much of his analysis is not directly relevant to calculations of the direct financial spoils from Don Bradman, which can be seen to be the result of the lack of effective competition for players in the Test cricket market. That is, the Board of Control (and its English counter-part, the Marylebone Cricket Club) had complete jurisdiction over the conditions of Test cricket, and this meant that it could capture fully the rents (the profits) from a star player.

Thus a cricketer with outstanding attraction for the public had no option but to play by the rules and accept the rewards offered by his national supplier, since there was no international alternative. Even if Bradman had decided to emigrate to England for example - as South African Tony Greig did in the 1970s to escape the international cricket boycott resulting from apartheid - there was a period of five years before he would have been eligible for English selection. Restrictions of this type, in combination

[2] Rosen and Sanderson (2001) provide a discussion of these concepts in the contemporary context of labour markets in professional sports.
[3] The effect of imperfect substitution also implies an assumption of 'scarcity' (Rosen and Sanderson, 2001). If there were many top sporting performers, all of a very similar standard, then imperfect substitution with respect to talent is of little importance.
[4] According to Rosen (1981), "Imperfect substitution implies convexity in the earnings function: small differences in talent become magnified in larger earnings differences, with great magnification if the earnings-talent gradient increases sharply near the top of the scale".

with poor remuneration, arguably were highly significant forces in the development of World Series Cricket in the 1970s in which most of the Australian Test team defected to play with an alternative international competition paying considerably higher salaries.

Of course, Don Bradman could have refused to play Test cricket. There were at least two reasons why he didn't, both revealed in private correspondence with one of the authors after he was sent a draft of Chapman, Fischer and Maloney (1987), showing early estimates of his value to the ACB.[5] First, he may not have been aware of, or interested in, his crowd pulling power, a possibility highlighted by his comment that: "Certainly the news that I was worth so much to the ABC reached me 50 years too late". Second, the culture of the game at the time, and his strong nationalism, were such as to imply that no extra rewards were expected, as suggested with his remark: "Not that I would ever have pursued a professional sporting career – it was always against my instincts. I have no objection to professional sportsmen but I don't think they derive the same pleasure from their exertions as the people who play sport primarily for enjoyment."

2.2 Previous empirical analysis

This is by no means the first statistical exercise of this type, and in terms of the empirical studies of the economic effects of sporting stars two main approaches are used. Before outlining these studies, a basic question is, what exactly is a sporting star? Essentially, star-status is defined in two ways: selecting individual players using personal judgement, a decision presumably influenced by the player's public profile and history of exceptional performances; or by using a more 'objective' criterion, such as whether the player has won awards or has reached some measurable level of performance.[6]

The first approach in the estimation of super-star effects is to examine whether sports star-status increases individual earnings (eg player salaries). This is usually done by estimating a log-linear earnings function, with a subjective measure of star-status as an explanatory variable. Empirical studies of this kind have found significant positive sports-star effects on individual earnings in the Italian Soccer League (Lucifora and Simmons, 2003) and the National Hockey League (Idson and Kahane, 2000). It is worth

[5] Written correspondence between Sir Donald Bradman and Bruce Chapman, February 1987.

[6] For example, 'objective' superstar measures include: for hockey, "the number of times a player is selected as an all-star player plus the number of NHL trophies he has won" (Idson and Kahane, 2000); for soccer, a career average of "more that 0.4 goals per series A game" (Lucifora and Simmons, 2003).

noting that a significant proportion of player earnings, particularly for star players, is gained from endorsements, and this is generally not taken into account.[7]

As noted above, if the institutional context is such as to mean that players have no bargaining power in terms of the distribution of rents from star status, this approach is not particularly interesting with respect to measuring the financial returns associated with Bradman. This is much less true today, given both that Test cricketers are paid differential salaries and have significantly greater economic opportunities with respect to commercial endorsements.

The second empirical approach examines the effect of 'sporting stars' on match attendance. In this case, a subjective identification of star-status (eg, if the player won awards or has reached some measurable level of performance) is made and applied in the context of an empirical consumer demand model of match attendances. An approach of this kind has been used in a wide variety of sports, including *inter alia*: the English Premier League (Baimbridge *et al*., 1996); the Malaysian Semi-Pro Football League (Wilson and Sim, 1995); British Rugby League (Jones *et al*., 2000); the National Hockey League (Jones and Ferguson, 1988); and one-day cricket series in the U.K. (Schofield, 1983).[8]

Two studies involving the U.S. National Basketball Association (NBA) have examined the effect of individual sports-stars, and this is the approach we have adopted for the Bradman exercise. In the first Berri *et al.* (2004) found several star basketball players had no positive effect on attendances, and in fact, found a significant negative effect for one player.[9] In the other, Hausman and Leonard (1997) suggest that Michael Jordan doubled attendances,[10] = and also had a significant positive impact on TV ratings.

Also, as noted, two previous Australian studies have examined the effect of Bradman on Test match attendances, both in the context of more general estimation of crowd size determinants. First, and the approach adopted here, is that of Chapman, Fischer and Maloney (1987), which examined English-Australian Test crowds from 1920 to 1969. As well, a study of Test match attendances in Australia by Bhattacharya and Smyth (2003) extended the Chapman *et al*. (1987) approach through the use of more

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[7] Star basketball player Michael Jordan in the season before retirement received a salary of $3 million per season, compared with around $35 million in endorsements.

[8] Additional applications are available in Siegfried and Eisenberg (1980) and Noll (1974)).

[9] The player Grant Hill had a negative effect on crowds, other 'star' players included: Shaquille O'Neal, Charles Barkley and Michael Jordan.

[10] This paper did not formally model the effect of Michael Jordan on attendances they did, however, estimate a regression of the effect of Jordan on TV ratings and found a significant positive effect.

years of data (1911 to 1984), somewhat different specifications, and by analysing Test matches with non-English oppositions. Comparisons are offered below.

3. Estimation methodology and data

3.1 Method

The general theory of consumer demand is an uncontroversial theoretical tool available for analysis of the effect of Bradman on Test cricket crowds (and match revenue). The demand for Test cricket, defined as daily match attendance, is assumed to be a function, *inter alia*, of population, admittance price, income, the price and availability of complements and substitutes, the opportunity cost of attendance, tastes and the expected utility of cricket generally and the state of the particularly match specifically. *Ceteris paribus*, the quantity demanded increases with lower admittance price, lower prices of complements (such as food and drink sold at the ground), higher prices of substitutes (such as radios), lower/high income (depending on whether the good is inferior/normal), and with the decreased opportunity cost of time.

The decision of whether or not to attend Test cricket depends in part on the expected quality per unit time of the entertainment. This, presumably, is a function of player skill, excitement, opponent, weather, and ground facilities. Obviously, the presence of a player of exceptional talent, a super-star such as Don Bradman, increases consumers' utility through the first two variables.

In summary, these observations imply, in the presence of ideal data, the following estimating equation:

$$Q_d = f(Pop, P, PC, PS, Y, OP, QA)$$

where Q_d is the quantity demanded of Test cricket, Pop is population, P is the price of admittance, PC is the price of complements, PS is the price of substitutes, Y is income, OP is the opportunity cost of time and QA is the expected quality of the entertainment.

Several issues related to the estimation of Test cricket attendances are worthy of note. First, a distinctive feature of Test cricket consumption is that the process takes considerable time. It is unusual for a game to be concluded in less than four days and, before the rules were changed restricting matches to five playing days (in 1960), it was not unusual for games to last six or seven playing days. This is important for economic modeling because attention needs to be accorded to the opportunity cost of time involved.[11]

A second issue is that changes in technology, leisure activities and business practices over the 50-year period (beginning 1920) are likely to have had a substantial effect on cricket crowds, and it is difficult to believe that they can be adequately accounted for with existing data. As examples we note the following. One, radio broadcasting of matches was not consistent in coverage, neither is the direction of its influence obvious in the short term. Two, it was not uncommon in the early part of this period for business meetings to be conducted at Test matches, and Cashman (1985) reports significant numbers turning up for business negotiations or contacts even though play was not possible due to rain. Clearly, these factors are extremely difficult to measure or model.

A final estimation issue concerns the diagnostic testing of the econometric models for correct specification and/or function form. The discontinuous occurrence of games means that Durbin-Watson and other test statistics for serial correlation are not meaningful. However, RESET tests are still useful, and as economic theory offers little insight into specification, these are employed to provide guidance as to the robustness of the models.

3.2 Data

Daily data concerning crowd sizes were obtained from Cashman (1985) for English-Australian Test matches played in Australia[12] in the 1920-69 period,[13] distinguished by whether or not Don Bradman batted on the day in question (which happened on 32 occasions after 1930). Figure 1 shows the aggregate data and suggests

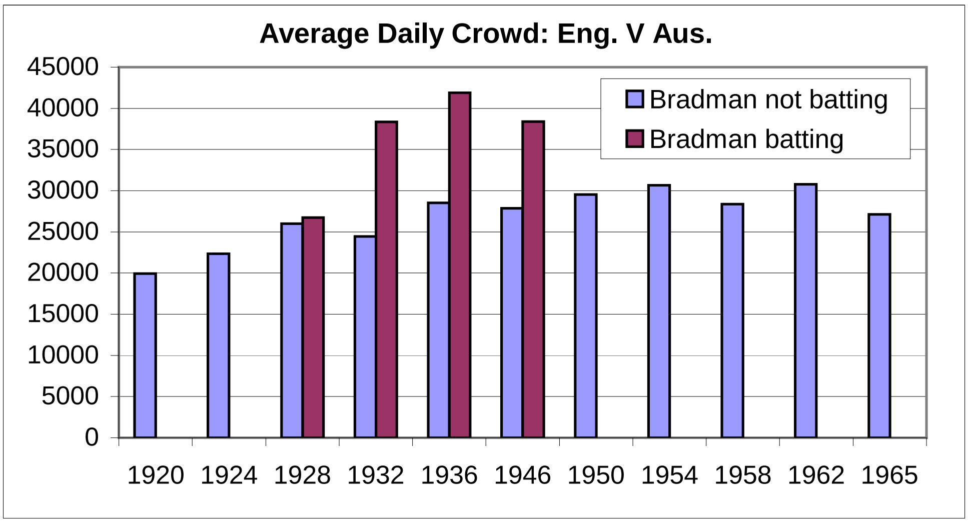
[11] A previous study of Test cricket demand in the U.K. by Hynds and Smith (1994) captured this opportunity cost effect by including a dummy variable for each day of the week; they found that play on weekends had a positive and highly significant effect. The only such study for Australia (Bhattacharya and Smyth, 2003) modeled average daily attendance of a Test match and did not correct for this opportunity cost effect.

[12] Data were also collected for Tests played against West Indies, India, Pakistan, and South Africa (no Tests were played against New Zealand or Sri Lanka in this period). The analysis was restricted to English-Australian Tests because of the difficulty encountered in finding adequate and parsimonious econometric models for data pooled across opponents. This implies that crowd determinants, including the effect of Bradman batting, differed significantly depending on the team played.

[13] Considerable changes in Australian Cricket took place in the 1970s, including World Series Cricket, one-day internationals and colour television coverage. These complexities encouraged us to limit the analysis of the pre-1970 period, extending the modelling to later years would also appear to add little to an examination of the effect of Bradman (for an analysis of Test match attendances over a longer period and for a larger range of opposition countries see, Bhattacharya and Smyth [2003])

that significantly more people did indeed attend Ashes Tests on days when Bradman batted, at least after 1930.

Figure 1



Obviously, to isolate properly the effect of Don Bradman on crowd sizes (and from this, revenue), regression models are necessary, and these need to include as many as possible of the broad range of economic and match 'quality' variables noted above. Table 1 presents the means, standard deviations and brief descriptions of the variables used. The economic variables come from Withers *et al.* (1985), and much of the other information was collected through analysis of daily newspaper reports concerning, for example, the weather and the state of the game and the series.

Direct economic variables included were outer ground admission price (PRICE), average weekly male earnings (AWE) (entered as a quadratic) and the total unemployment rate (UNEMP) (also entered as a quadratic). Variables with some economic interpretation were: venue (the Sydney Cricket Ground [SCG]; the Melbourne Cricket Ground [MCG]; the Adelaide Oval [AO] and the Brisbane Cricket Ground [GABBA], which reflects in part the availability of alternative leisure activities; Saturday, Sunday, or public holiday play (SSP), to capture the decreased opportunity costs of attendance on such days; and whether or not it rained (RAIN),[14] to reflect the increased cost per unit of playing time for days in which play was interrupted.[15]

[14] Days where there was no play at all due to rain were excluded entirely. Days where rain affected the pitch but not playing time were treated as RAIN equals zero.
[15] We did not test for stationarity with respect to the non-dummy variables. However, Bhattacharya and Smyth (2003) did so for their variables, which are the same as we used albeit for a longer period in their exercise, and found evidence to support stationarity in all cases.

In addition, a host of dummy variables were constructed in an attempt to capture the expected quality of the entertainment. There were AWIN and EWIN, set to 1 if Australia and England respectively leads the current series, ABAT set equal to 1 if Australia batted, FCON set equal to 1 if the result of the game was a foregone conclusion on the last day,[16] and ASA and ESA set equal to 1 if Australia and England respectively had an unbeatable lead at the end of the previous day's play.[17] Additional controls were POP, the population in millions of the city where the Test was played, LDAY, a variable to indicate the last day's play, and TIME, the year of the Test.

Table 1
The Data Described

Variable	Mean	Std. Dev.	Variable description
Continuous variables:			
CROWD	28,567	17,336	Daily paying crowd
PRICE*	6.41	1.27	Outer ground admission price
AWE*	349.80	89.47	Average weekly male earnings
UNEMP	6.918	6.389	National unemployment rate
POP	1,040,022	624,187	Population in city of play
Dummy variables:			
BRAD	0.115	0.319	Bradman batting on day
BSERIES	0.276	0.448	Series in which Bradman played
McCABE	0.086	0.281	McCabe batting on day
SCG	0.290	0.455	Sydney Cricket Ground
MCG	0.330	0.471	Melbourne Cricket Ground
AO	0.226	0.419	Adelaide Oval
GABBA	0.154	0.362	Brisbane Cricket Ground
SSP	0.237	0.426	Saturday, Sunday or public holiday
ABAT	0.742	0.438	Australia batting
FCON	0.054	0.226	Game a foregone conclusion
ASA	0.111	0.315	Australia has unbeatable lead on previous day
ASB	0.054	0.226	England has unbeatable lead on previous day
RAIN	0.065	0.246	Play affected by rain
LASTD	0.190	0.393	Last day of play of the test
AWIN	0.387	0.488	Australia leading current series
EWIN	0.269	0.444	England leading current series

*In 2004 dollars

[16] Often the last day begins with only a handful of runs or wickets needed by one team to win. The variable is set equal to 1 if it is subjectively considered that play is likely to end within the pre-lunch session.
[17] An unbeatable lead is defined as the team batting last requiring for victory greater than 500 runs or fewer than 100 runs with all wickets intact.

For the purposes of this paper the main quality variable of interest is BRAD, a variable set equal to 1 if Bradman batted on the Test day. It should be noted that this variable is confined to Bradman's innings from 1932 until his last Australian Test in 1947. This is due to the fact that although he made his Test debut in 1928, he did not establish his batting reputation until the 1930 tour of England in which he made 904 runs at a freakish average of 139.[18]

A dummy variable, BSERIES, has been included in some specifications to identify the series in which Bradman played (from 1930 to 1947), and this has been done to capture his potential externalities. In other words, the presence of Bradman in the Australian team may have had a 'spillover effect' on crowds on days he didn't bat, and even for Tests in the series he didn't play, by giving cricket a higher public profile. Further, for a comparison of the effect of Bradman with that of a more typical star, the variable McCABE, is included, set equal to 1 if Stanley McCabe batted.

4. <u>Crowd size regression results</u>

As the correct functional form of the model is not obvious from theory, linear and log-linear models were estimated and subjected to RESET (Ramsey [1969]) tests of functional form to gauge their suitability. These results are presented in Appendix 1. On the basis of these tests the log-linear form of the model was preferred, the linear model exhibiting functional misspecification at the 1 per cent significance level.

Table 2 reports the OLS coefficients for the log-linear model of daily crowd size.[19] The full model, Equation 1, incorporates the full set of independent variables, including controls for McCABE, and BSERIES to capture the possible externality effect of Bradman. Two other regression models are also presented: Equation 2, which excludes McCABE, and Equation 3, which excludes both McCABE and BSERIES.

[18] Econometric tests of this proposition supported it strongly.
[19] Heteroskedastic robust t-statistics are presented; implemented using the robust errors option in STATA.

Table 2
OLS Estimates of Test Crowd Determinants*

	Equation 1		*Equation 2*		*Equation 3*	
Variable	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
PRICE	-0.080	-1.11	-0.082	-1.15	-0.062	-0.99
AWE	-0.002	-0.09	-0.003	-0.15	-0.011	-0.72
AWE^2/1000	-0.010	-0.14	-0.006	-0.09	0.016	0.28
UNEMP	0.051	1.38	0.054	1.50	0.067	2.25
$UNEMP^2$	-0.002	-1.52	-0.002	-1.60	-0.002	-2.18
BRAD	0.228	2.34	0.244	2.82	0.253	2.98
BSERIES	0.109	0.64	0.102	0.60		
McCABE	0.038	0.34				
SCG	0.745	4.14	0.747	4.16	0.753	4.20
MCG	1.050	6.88	1.051	6.91	1.048	6.90
AO	0.694	8.33	0.694	8.34	0.688	8.34
SSP	0.384	7.46	0.382	7.47	0.383	7.50
TIME	0.054	0.84	0.058	0.91	0.079	1.48
$TIME^2$	0.000	-0.44	0.000	-0.49	-0.001	-0.80
ABAT	0.058	1.09	0.060	1.16	0.057	1.10
FCON	-0.785	-7.24	-0.788	-7.31	-0.790	-7.34
ASA	-0.461	-5.68	-0.459	-5.68	-0.456	-5.66
ASB	-0.350	-3.28	-0.351	-3.30	-0.357	-3.37
RAIN	-0.249	-2.78	-0.246	-2.77	-0.245	-2.76
LASTD	-0.444	-6.55	-0.443	-6.55	-0.444	-6.56
AWIN	-0.235	-3.44	-0.235	-3.46	-0.230	-3.41
EWIN	-0.126	-1.78	-0.128	-1.83	-0.135	-1.94
POP	0.096	0.7	0.095	0.70	0.091	0.67
CONSTANT	8.353	12.08	8.366	12.14	8.489	12.92
Adjusted R^2	0.762		0.762		0.763	

Observations = 279
*Dependent variable = log(daily crowd)

Interpretative estimates of coefficient sizes are presented in Table 3 for significant regressors from Equation 3. The table shows the percentage and level change in the crowd and level change in (average) gate receipts for a unit increase in dummy variables and a 1 percentage point increase in the unemployment rate, calculated at the mean. The final column shows the daily revenues associated with changes in the independent variables, calculated by multiplying the number of additional people attending by the price of an outer ground ticket, in 2004 dollars.

Table 3
Interpretative Estimates of Coefficient Sizes

Variable	Percentage change in crowd	Absolute change in crowd	Change in average receipts ($2004)
UNEMP	3.7	1,066	8,397
BRAD	25.3	7,227	56,952
SCG+	75.3	21,511	169,506
MCG+	104.8	29,938	235,913
AO+	68.8	19,654	154,874
FCON	-79.0	-22,568	-177,835
ASA	-45.6	-13,027	-102,649
ASB	-35.7	-10,198	-80,364
RAIN	-24.5	-6,999	-55,151
LDAY	-44.4	-12,684	-99,948
AWIN	-23.0	-6,570	-51,775
OWIN	-13.5	-3,857	-30,390
SSP*	38.3	10,941	86,216

+Compared to the GABBA.
*Compared to a normal weekday.

With respect to crowd sizes, the most important results of Tables 2 and 3 suggest the following.

(i) The direct economic variables are not important in all cases. Neither average weekly male earnings[20] nor outer ground admittance price were shown to significantly affect crowd sizes, although the latter has the expected sign. However, increased unemployment increases crowds, but at a decreasing rate as unemployment expands.

(ii) Crowds differ by venue, with the MCG averaging about 30, 36 and 105 per cent greater than the SCG, AO and GABBA respectively. This could reflect the availability and price of alternative leisure activities, transportation costs, ground facilities or even crowd capacities; due to data limitations this last possibility is not easily modeled.[21]

(iii) Variables that could be interpreted in the light of either opportunity cost or the price per unit of time of consumption are very significant. Play on non-working days attracted additional attendance of 38 per cent, rain decreased the

[20] It is prudent to note that the results do not refute the notion that average weekly earnings are relevant in terms of crowd determination, it is likely that a high level of collinearity exists between AWE and TIME.
[21] There is anecdotal evidence that on occasion crowds actually exceeded so-called capacity.

crowd by about 25 per cent[22] and last day's play had around 44 per cent fewer spectators.

(iv) More subjectively, the "excitement" factors were very important. If the results of the Test were obvious, or the state of the series was not in balance, crowds were substantially lower. *Ceteris paribus*, a foregone conclusion on the last day, and Australia or England ahead in the series respectively resulted in about a 79, 23 and 14 per cent decrease in attendance. Australia or England substantially ahead in the match decreased the following day's crowd by 46 and 36 per cent respectively.

(v) Most importantly for our topic, Bradman at the batting crease increased crowd size by about 25 per cent, a result significantly different from zero at the 1 per cent level. On average, this translates into just over 7,200 people for each day on which he batted.

The major result ((v)) can be compared with those derived in both Chapman *et al.* (1987) and Bhattacharya and Smyth (2003). In the former the Bradman effect was found to be about 22 per cent, a disparity traceable in the main from the inclusion of Bradman's innings in the 1928 series. The latter research found an almost identical result of around 23 per cent on average crowd sizes, even though their exercise included many more post-1969 observations, data on other opponents and somewhat different regression specifications. We interpret the strong similarities of these comparative findings as indicating that our estimate of the Bradman crowd effect is sensible, because it is so clearly robust to these different approaches.

The third column, showing additional daily revenue (in 2004 terms), by definition reflects the crowd size effects, with the major result being that each day in which Bradman batted delivered about $57,000. This figure is derived through the use of averages, and a more accurate figure using data on individual days is used later in our exercise.

Potentially, several problems remain in the current exercise in interpreting both economic relationships and the effect of Bradman. In relation to the former, it is difficult to interpret the price results. One reason is that officials might have decreased admittance

[22] Not surprisingly, rain (or bad light) interruptions was found to have a significant negative effect on crowd size in most studies of cricket attendance. For Australia, Bhattacharya and Smyth (2003) found a significant negative effect of about 18 per cent.

charges because they perceived a decrease in interest in Test cricket, and in this circumstance the estimated price elasticities will be underestimated.

As far as the Bradman effect is concerned, one caveat warrants noting. Cricket officials were aware of his potential to increase crowds, a point evidenced by the presence of advertisements to this effect. If such advertisements were effective it follows that the Bradman coefficient also reflects the effect of promotional expenditure. In their absence the estimated effect of Bradman would be lower, although it is difficult to sustain a compelling case that advertising was a major factor. It is not clear that this matters for interpretations of the effect of a star on cricket revenues.

5. Interpreting Bradman’s financial contribution to Australian cricket

The crowd size effects shown in Table 3 can be used to illustrate the effect of Don Bradman on cricket revenues. However, the estimate now reported converts the percentage increase in the crowd into a daily revenue estimate by adjusting the actual crowd on the day, rather than the average as shown in Table 3, by the price of admission recorded for that day (in $2004). This gives an average daily revenue increase when Bradman was batting of just over $65,000, which translates into a total of just over $2 million for his post-1930 period of Australian Ashes Tests.

To this figure we could add estimates of the Bradman externality effect, computed through the use of the addition of the BRAD and BSERIES coefficients from Equation 1, Table 2. This results in a total Bradman effect of about $2.7 million, but this could be argued to be too high since the presumed externality effect coefficient is not statistically different from zero.

These estimates tell only a part of the story of the effect of Bradman on Australian cricket. This is because, in a sense, the figures reported could be interpreted as reflecting only a change in income for Australian cricket, as if they are lottery winnings spent on consumption. However, presumably the additional revenue could be used by cricket authorities for investment in infrastructure and other facilities, including coaching and promotion.

Under an investment scenario it might be suggested that cricket authorities received an on-going return on the additional finances received by the presence of Bradman. To put it differently, the resources could have been used to buy financial assets providing annual (compounded) returns, and implicitly this is what is likely to be the case with respect to infrastructure investments. It is thus useful to ask: what is Bradman’s

2004 value to Australian cricket, under the assumption that the resources were invested in the development of cricket at the time of Bradman batting, and received different real annual returns.

It is not clear what the correct real rate of return to assets is, but it would be reasonable to suggest that it lies between 1.5 and 4 per cent per annum.[23] Table 4 shows what the 2004 value of these investments would be under the two rate of return assumptions, and for both the individual Bradman effect and the individual Bradman effect plus the estimated externality effect.

These different approaches imply a substantial range in our estimates of the value of the Bradman effect, from about $5.5 to $35.4 million. This highlights clearly the very significant role played by compound rates of interest. Importantly, if the revenue had been used in a way that there has been no return at all, the figure of around $2 million might still be the best estimate.

Table 4
2004 Value of Additional Revenue

Real interest rate of 1.5% per annum	
Total revenue	$5,511,255
Total revenue (with externality effect)*	$7,121,279
Real interest rate of 4% per annum	
Total revenue	$27,362,393
Total revenue (with externality effect)*	$35,355,871

*Based on combined value of BRAD & BSERIES coefficients

On the other hand, our analysis concerns only Ashes Tests played in Australia. However, it is very likely that Don Bradman delivered similar returns to the Australian Cricket Board for each of the (single) Test series he played in against India, South Africa and the West Indies. If the revenue benefits were similar as for Ashes Tests the estimates reported above could be approximately doubled.

6. Additional illustrations of the financial value of Bradman

Don Bradman's financial value can be expressed in a number of alternative ways. One approach is to compare the additional revenue from Bradman with the amount the Australian Cricket Board paid him for each series in which he played. This can be

[23] Since 1900 the average real interest rate for Australia is around 1.5 per cent, but the long-term real rate of return on a diversified investment portfolio is around 4 per cent (Fraser, 1991)

thought of as a measure of the financial surplus from Bradman received by the ACB. As discussed previously, the ACB, through is control over Test matches and the regulation of transfer conditions, is likely to have been able to secure substantial windfall gains from players of exceptional talent.

A way to express the financial surplus from Bradman is in terms of the ratio of additional earnings per series to his series fee. The extra revenue from Bradman batting per series is based on his estimated overall effect on revenue averaged over all series (post 1930).[24] This is estimated to be about $694,700 per series (in $2004), with the figure for the 1937/38 series being somewhat higher (at around $964,100). We have available Bradman's 1936/37 series fee of around $10,428 (in $2004) and have used this as his average series fee.

Table 5 shows that for all series (excluding Bradman's first in 1928/29) the ratio of extra revenue to Bradman's presumed average series fee was around 67. To put it in its most extreme form, the extra revenue from Bradman was about 6,600 per cent of the amount paid to Bradman by the ACB. These two figures are significantly higher for the 1936/37 series.

A different way to assess the financial value of Bradman is to compare the additional revenue produced by Bradman with that estimated to have been produced by an average worker at the time. Two assumptions are made for the purposes of this comparison.

First, since Test series happened about every six months, we argue that a player's contribution represents six month's of a typical worker's production. Second, six-month's revenue produced by an average worker is based on a six-month total of male average weekly earnings in 1936 (which, from male average weekly earnings is $295 per week in 2004 dollars). Assuming that the wage of an average worker is equal to their marginal revenue product, the data of Table 5 imply that Bradman had around 125 times the revenue product of the average worker in 1936, in addition to his contribution as a more normal Test cricketer.

[24] This ignores the possibility that the extra crowd coming to watch Bradman may have incurred some additional costs, such as ground staff and rubbish collection, which should be subtracted from the estimated revenue.

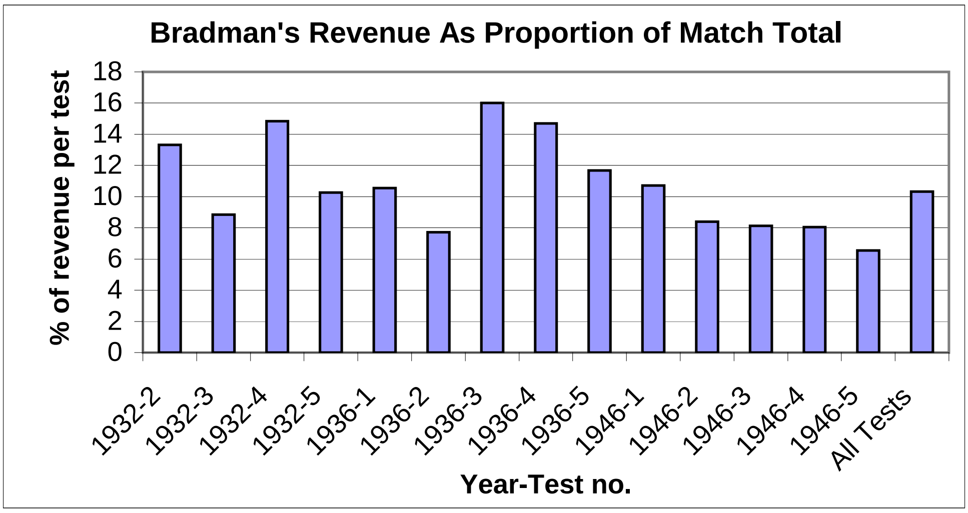
Table 5
Additional Measures of Bradman's Financial Value*

Bradman's 'surplus' to Australian Cricket Board	
All Series (post 1930)	
Extra revenue per series/series fee	67
Extra revenue as percentage of series fee	6,561 per cent
1936-37 Series	
Extra revenue/series fee	93
Extra revenue as percentage of series fee	9,145 per cent
Comparison with revenue of average employee	
6-months average employee revenue*	$7,660
6-months marginal revenue of Bradman*	$964,141
Ratio of Bradman's revenue/average revenue	125

*In 2004 dollars

Finally, it is also informative to consider the proportion of total Test revenue contributed by Bradman. While the estimated effect on daily crowds from Bradman was around 25 per cent, Bradman did not bat on each day. Therefore, his proportionate contribution to overall revenue will be less than the estimated effect on crowd size (and hence revenue) for the days on which he batted. Figure 2 shows the estimated percentage contribution of Bradman to overall revenue for each Test match in which he played.[25] Averaged over all tests (the last column of Figure 2), Bradman contributed around 10 per cent to total match revenue for the Tests in which he played.

Figure 2



[25] Bradman did not play in the first Test in 1932.

7. Conclusion

Don Bradman's Test batting contributions are legendary, and there is considerably anecdotal evidence that his presence at the crease significantly affected crowd sizes. Our exercise has confirmed that this is indeed the case; roughly, every day on which he batted in an Australian Ashes Test after 1930 the crowd was 25 per cent higher than otherwise, and this is controlling for a large number of economic and cricket-specific variables.

The equivalent of the Australian Cricket Board controlled all the rules concerning player eligibility, with this implying that if there were rents to be gained from the higher attendances associated with a super-star, there was no reason to share the higher revenues. This implies that Australian cricket was the direct financial beneficiary of Bradman's popularity, and we have been able to use estimates of the crowd increases to calculate the additional revenue accruing to the ACB.

The estimates vary considerably, depending particularly on the assumptions used concerning the use to which cricket authorities put their Bradman revenues. If there has been no return over time, the benefit was of the order of $65,000 per Bradman batting day in 2004 terms, or just over $2 million in total. While this might not seem to be extraordinary, it is worth noting that it represents over 10 per cent of all Ashes crowd revenues in the 1932-47 period, and is over a hundred times more than our presumption of a typical worker's earnings at the time.

We have also been able to estimate what the increase in the value of the stock of real assets might have been to 2004 for Australian cricket as a result of the additional Bradman revenues. At a low return of 1.5 per cent the estimate is around $5.5 million, but this rises to a (questionable?) figure of $35 million or so if the return was a high 4 per cent per annum.

Since our focus is limited to the financial implications of Don Bradman, the figures reflect just a small aspect of his national contribution. Undoubtedly many will argue that his non-economic effects were very considerably higher than even the highest estimate reported above.

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Appendix

Ramsey's RESET Tests*

Linear	F(3, 256) =	14.17
	Prob > F =	0.000
Log-Linear	F(3, 252) =	0.53
	Prob > F =	0.662

*test using powers of fitted dependent variable