Applied Economics Letters

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rael20

Pandora's groove: analysing the effect of the U-groove ban on PGA Tour golfers' performances and strategies

Todd A. McFall a & Julianne Treme b

a Department of Economics, Wake Forest University, PO Box 7505, Winston-Salem, NC, 27109, USA
b Department of Economics and Finance, University of North Carolina Wilmington, 601 S. College Road, Wilmington, NC, 28403, USA

Available online: 09 Sep 2011

To cite this article: Todd A. McFall & Julianne Treme (2012): Pandora's groove: analysing the effect of the U-groove ban on PGA Tour golfers' performances and strategies, Applied Economics Letters, 19:8, 763-768

To link to this article: http://dx.doi.org/10.1080/13504851.2011.603684

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.tandfonline.com/page/terms-and-conditions

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan, sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.
Pandora’s groove: analysing the effect of the U-groove ban on PGA Tour golfers’ performances and strategies

Todd A. McFall and Julianne Treme

Department of Economics, Wake Forest University, PO Box 7505, Winston-Salem, NC 27109, USA

Department of Economics and Finance, University of North Carolina Wilmington, 601 S. College Road, Wilmington, NC 28403, USA

This study examines how PGA Tour golfers’ playing strategies offset a ban on technologically superior golf club grooves and how the strategy changes translated into performance changes. The ban, which was implemented at the beginning of the 2010 season, effectively decreased golfers’ abilities to spin the golf ball from all on-course environments and offers a unique opportunity to examine offsetting behaviour in the light of a ban on the type of technology. We compare 2009 and 2010 PGA Tour results in a manner consistent with previous studies of offsetting behaviour and golf club groove construction. Our results suggest that offsetting behaviour mitigated the effects of the technological regulations on golf clubs in an economically and statistically significant way, as golfers’ performances improved following the technological ban.

Keywords: sports; golf; offsetting behaviour; risk; technology

JEL Classification: L83; L80; L51; D81

I. Introduction

The grooves etched on the faces of golf clubs can vary in depth and sharpness. The deeper and sharper the grooves, the more spin a golfer can impart on a ball. More spin generally translates to more control over the ball because it will not roll as much once it hits a green. It should not have been surprising then that tour professionals were worried about how they would adjust to the 1 January 2010 rule change regarding groove specifications implemented by the United States Golf Association (USGA) and the Royal & Ancient Society (R&A), golf’s two leading governing bodies. The rule change reduced the maximum volume of grooves on all clubfaces and the sharpness of grooves on the clubfaces of clubs with over 25° of loft.

The USGA’s reasoning in implementing the ban was straightforward: by making it more difficult for golfers to spin the ball it wanted to increase the premium paid to golfers who could hit the accurate shots that avoided the most chaotic course environments of tall grass and sand. When asked about the rule change in the middle of the 2010 season, long-time professional Andy Bean said, ‘I’m still working on them. I’ve definitely had some issues there, trying to get that same feel, that same ball flight, the distance consistency. It’s been a challenge, and it’s still a little bit of a challenge.’

*Corresponding author. E-mail: tremej@uncw.edu
We reverse the logic of offsetting behaviour introduced in Peltzman (1975), that the benefits of technological improvements are offset by agents engaging in increasingly risky behaviour, and posit that after the rule change golfers would offset the effects from the mandated technological decrease by choosing strategies that would decrease the likelihood that they would have to play a shot from a chaotic environment like tall grass or sand, where controlling the ball is more difficult. Using statistical analysis that mirrors the methodology used in studies conducted by the USGA and the R&A on the relationship between ball control and groove construction, we show that professional golf went through a quiet revolution following the rule change because golfers were substituting away from risky strategies in favour of strategies with surer outcomes. We conclude that after controlling for location and distance, similarly situated golfers took fewer shots to complete a hole in 2010 than in 2009, which implies that golfers’ offsetting behaviour swamped the effects of the mandated technological decrease.

II. Offsetting a Technological Decrease

To our knowledge, there are no economic studies of golfers’ offsetting behaviour following the groove rule change. However, we are building on a sizable body of economic literature that has focused on the possibility that agents mitigate the effects of technological changes with offsetting behaviour. The focus of much of these related studies has been on the efficacy of government safety regulations, especially in the market for automobile safety. Peltzman (1975) reasoned that there was no effect on the death rate of motorists on highways following the broad safety standards implemented by the National Highway Traffic Safety Administrations in 1966, because drivers offset any reductions of the probability of an accident being fatal with more risky driving. Several studies of automobile operator behaviour have supported Peltzman’s reasoning. Cohen and Einav (2003), Chirinko and Harper (1993), Risa (1994) and Peterson et al. (1995) analysed automobile operator behaviour after the introduction of safety equipment innovations, the implementation of speed limit laws and road construction improvements. Our research is unique to studies of offsetting behaviour because we are analysing how agents respond to a ban on technology, rather than an improvement in technology.

The changes to the constraints placed on golfers after the rule change was implemented are discussed in the ‘Second Report on the Study of Spin Generation’, the USGA’s and R&A’s final study on the effects that groove construction have on shot spin.\(^1\) There are four important points the study makes with regard to groove construction and spin generation:

- Shots struck with technologically superior grooves can impart between 15% and 30% more spin (depending upon club selection) than similar shots struck with technologically inferior grooves.
- Shots struck with technologically superior grooves have higher launch and landing profiles compared to similar shots struck with technologically inferior clubs.
- Because of the first two findings, shots struck with clubs with technologically inferior groove profiles ‘lead to significantly longer total bounce and roll for the V-groove compared to the U-groove’.\(^2\)
- The three aforementioned differences are larger for shots struck from long grass and smaller for shots struck from the fairway.

Based upon the information in the USGA Study and a reversing of the logic introduced in Peltzman (1975), we posit that the rule change increased the cost of attempting risky shots because, from all environments, golfers could control shots less after the rule change was implemented. To offset the effects of the rule change, golfers would substitute away from risky strategies in favour of strategies with more certain outcomes. Similar to previous studies of offsetting behaviour, it is possible that the effects from golfers’ more conservative strategies could have offset completely the effects from the technological change.

Golfers must always weigh the costs and benefits of their strategic decisions, and part of what they must consider is where their shot might finish if they do not strike the shot well. Prior to the rule change, the cost of missing a shot was not as steep because golfers could impart more spin on the ball from greenside rough or bunkers, hazards with which they might have to cope if they missed a shot. After the change, though, a

\(^{1}\)Henceforth, we refer to this study as the ‘USGA Study’ (USGA, 2007).

\(^{2}\)The USGA views the amount that shots roll after hitting the ground as being inversely related to the amount of control a golfer has on a shot. For instance, the USGA Study notes that shots struck with a club with technologically inferior grooves rolled approximately 60% more than shots struck with a club with more technologically advanced grooves.
A golfer would have been more inclined to aim his shot to an area that would maximize his chances of playing his next shot from the green and avoiding the relatively more chaotic environments that typically surround a green. On the margin, it might be difficult to discern visually between the strategies employed before and after the rule change, as these changes might mean a golfer is changing his target point only a few feet. The results of these differently aimed shots, though, could have a large impact on where a golfer’s next shot might be played.

### III. Data and Findings

We use data from the ShotLink database, a compilation of the characteristics of every shot struck by golfers in PGA Tour-sponsored events, to compare outcomes of professional golfers’ performances and behaviours across the 2009 and 2010 seasons, the two seasons that bridge the rule change. Similar to the USGA Study, which compared shots taken from different distance and environment locations, we identify 12 distance/location combinations by interacting shots taken from three distance categories and four location categories. We divide iron shots into three distance categories – wedge shots (more than 60 yards and less than 125 yards from the hole), short-iron shots (125–175 yards) and long-iron shots (175–225 yards). The four location categories (fairway, bunker, rough and intermediate rough) are based upon the condition from which a shot was played. Our variable of interest is strokes remaining, the number of shots it took for golfers to complete the hole from the point from which they are observed. To illustrate, strokes remaining would take on a value of 3 when golfer hit a shot from 125 yards in the fairway and then required two putts to finish a Par 4 hole. We limit our analysis to tournaments that were organized by the PGA Tour and awarded FedEx Cup bonus points to the tournament participants, which amounts to 31 tournaments in both seasons.

In Table 1, we present evidence that suggests that golfers offset the effects of the club groove ban by substituting away from risk in 2010, as golfers’ shots were more likely to stop on the green in 11 of the 12 distance–location combinations in 2010 than in 2009. These findings suggest that the PGA Tour went through a quiet revolution regarding the level of aggressiveness with which golfers chose to play, as golfers took pains to remain on the straight-and-narrow and avoid chaos on the course. These findings are more remarkable given the large differences in ball flight behaviour that are discussed in the USGA Study, especially for shots that were taken from the rough. Golfers found ways to increase the likelihood that their ball would stop on the green, despite the increases in roll distance, a measure of how much control golfers lost following the technology ban, after shots hit the green.

The results in Table 2 illustrate that the effects of substituting away from risky shot making often swamped the effects created by the decrease in technology. Note that in 9 of the 12 distance–location combinations performance was better in 2010 compared to 2009. To test how likely it was for performance to decline (or for the effects from the technological

**Table 1. Iron shots were more likely to finish on the green after the ban**

<table>
<thead>
<tr>
<th>Distance/Location</th>
<th>2009 Probability green hit</th>
<th>2010 Probability green hit</th>
<th>Probability difference</th>
<th>Probability difference &gt;0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wedge/fairway</td>
<td>0.8029</td>
<td>0.8217</td>
<td>-0.0184</td>
<td>0</td>
</tr>
<tr>
<td>Wedge/rough</td>
<td>0.6007</td>
<td>0.6184</td>
<td>-0.0177</td>
<td>0.02</td>
</tr>
<tr>
<td>Wedge/bunker</td>
<td>0.4506</td>
<td>0.4653</td>
<td>-0.0147</td>
<td>0.81</td>
</tr>
<tr>
<td>Wedge/intermediate</td>
<td>0.7933</td>
<td>0.7963</td>
<td>-0.0030</td>
<td>0.59</td>
</tr>
<tr>
<td>Short-iron/fairway</td>
<td>0.7377</td>
<td>0.7453</td>
<td>-0.0076</td>
<td>0</td>
</tr>
<tr>
<td>Short-iron/rough</td>
<td>0.4451</td>
<td>0.4667</td>
<td>-0.0217</td>
<td>0</td>
</tr>
<tr>
<td>Short-iron/bunker</td>
<td>0.3887</td>
<td>0.4396</td>
<td>-0.0509</td>
<td>0</td>
</tr>
<tr>
<td>Short-iron/intermediate</td>
<td>0.6666</td>
<td>0.6646</td>
<td>0.0020</td>
<td>0.42</td>
</tr>
<tr>
<td>Long-iron/fairway</td>
<td>0.5111</td>
<td>0.5340</td>
<td>-0.0228</td>
<td>0</td>
</tr>
<tr>
<td>Long-iron/rough</td>
<td>0.2286</td>
<td>0.2473</td>
<td>-0.0187</td>
<td>0</td>
</tr>
<tr>
<td>Long-iron/bunker</td>
<td>0.2007</td>
<td>0.2327</td>
<td>-0.0320</td>
<td>0</td>
</tr>
<tr>
<td>Long-iron/intermediate</td>
<td>0.4342</td>
<td>0.4429</td>
<td>-0.0088</td>
<td>0.26</td>
</tr>
</tbody>
</table>

---

3. The groove rule change really meant that errant shots were doubly expensive to golfers because they could not control recovery shots (chips from greenside rough or shots from sand) as much as they could previously. So, minimizing the cost of a potentially errant shot is even more important after the groove rule change.

4. This decision means that The Masters, the US Open and the British Open are excluded from this study.
decrease to swamp the strategy substitution), we present the results of one-tailed tests on the likelihood that the difference in the average number of shots taken across the two seasons was <0. In the case of 5 of the 12 differences, the hypothesis that performance deteriorated following the rule change can be rejected at the 5% level, and in none of the 12 distance–location combinations can one conclude with a reasonable amount of certainty that performance worsened after the rule change. Taken together, we view the evidence presented in Tables 1 and 2 as a strong indicator that golfers’ performances largely improved on the margins as a result of offsetting behaviour.

Of course, we must consider the possibility that playing conditions were made easier in 2010, in the light of the groove rule change. To explore this possibility, we use cross-section and random-effects regression models to account for possible changes to tournament conditions. We estimate the following cross-section and random-effects models:

- Model 1 – Cross-section model:

\[
strokes_{remaining|h} = \mu + a \times distance_h + \sum_{l=1}^{3} \beta_l \times location_l + \sum_{l=1}^{3} \delta_l \times distance \times 2009_{dummy} + \nu \times 2009_{dummy} + \sum_{h=1}^{3508} \lambda_h \times hole_h + \epsilon_{lh}
\]

at the 5% level, and in none of the 12 distance–location combinations can one conclude with a reasonable amount of certainty that performance worsened after the rule change. Taken together, we view the evidence presented in Tables 1 and 2 as a strong indicator that golfers’ performances largely improved on the margins as a result of offsetting behaviour.

Of course, we must consider the possibility that playing conditions were made easier in 2010, in the light of the groove rule change. To explore this possibility, we use cross-section and random-effects regression models to account for possible changes to tournament conditions. We estimate the following cross-section and random-effects models:

- Model 1 – Cross-section model:

\[
strokes_{remaining|h} = \mu + a \times distance_h + \sum_{l=1}^{3} \beta_l \times location_l + \sum_{l=1}^{3} \delta_l \times location_l \times distance
\]

\[
+ \sum_{l=1}^{3} \gamma_l \times location_l \times distance_h \times 2009_{dummy} + \nu \times 2009_{dummy} + \sum_{h=1}^{3508} \lambda_h \times hole_h + \epsilon_{lh}
\]

where \(E(\epsilon_{lh}) = 0, E(\epsilon_{lh}, \epsilon_{mn}) = 0\), if \(m \neq l\) and \(n \neq h\).

- Model 2 – Random-effects model:

\[
strokes_{remaining|h} = \mu + a \times distance_h + \sum_{l=1}^{3} \beta_l \times location_l + \sum_{l=1}^{3} \delta_l \times location_l \times distance
\]

\[
+ \sum_{l=1}^{3} \gamma_l \times location_l \times distance_h \times 2009_{dummy} + \sum_{r=1}^{T} \tau_r \times tourney_l + \sum_{r=1}^{3} \rho_r \times round_r
\]

\[
+ \sum_{l=1}^{17} \theta_h \times hole_h + \sum_{l=1}^{17} \gamma_l \times golfer_i + \epsilon_{il}
\]

where \(E(\epsilon_{il}) = 0, E(\epsilon_{il}, \epsilon_{mnp}) = 0\), if \(m \neq i, n \neq l\) and \(p \neq i\), and the covariates are uncorrelated with individual golfer effects.

The variables in the regressions are defined as follows: \(location\) is an indicator variable that identifies whether the shot was in the fairway, rough, bunker or

<table>
<thead>
<tr>
<th>Distance/location combination</th>
<th>Remaining shots-2009 (# obs.)</th>
<th>Remaining shots-2010 (# obs.)</th>
<th>ΔRemaining shots</th>
<th>Probability difference &gt;0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wedge/fairway</td>
<td>2.8005 (27 830)</td>
<td>2.7899 (28 359)</td>
<td>0.0105</td>
<td>0.01</td>
</tr>
<tr>
<td>Wedge/rough</td>
<td>3.0500 (6436)</td>
<td>3.0411 (7089)</td>
<td>0.0088</td>
<td>0.21</td>
</tr>
<tr>
<td>Wedge/bunker</td>
<td>3.2356 (1651)</td>
<td>3.2123 (1831)</td>
<td>0.0262</td>
<td>0.17</td>
</tr>
<tr>
<td>Wedge/intermediate</td>
<td>2.8512 (2124)</td>
<td>2.8711 (2057)</td>
<td>-0.0199</td>
<td>0.87</td>
</tr>
<tr>
<td>Short-iron/fairway</td>
<td>2.9249 (47 741)</td>
<td>2.9273 (46 757)</td>
<td>-0.0024</td>
<td>0.74</td>
</tr>
<tr>
<td>Short-iron/rough</td>
<td>3.2286 (16 804)</td>
<td>3.1994 (16 637)</td>
<td>0.0291</td>
<td>0</td>
</tr>
<tr>
<td>Short-iron/bunker</td>
<td>3.2918 (3790)</td>
<td>3.2585 (3767)</td>
<td>0.0333</td>
<td>0.02</td>
</tr>
<tr>
<td>Short-iron/intermediate</td>
<td>3.0065 (4643)</td>
<td>3.0169 (3953)</td>
<td>-0.0105</td>
<td>0.79</td>
</tr>
<tr>
<td>Long-iron/fairway</td>
<td>3.1595 (25 418)</td>
<td>3.1457 (25 454)</td>
<td>0.01378</td>
<td>0.01</td>
</tr>
<tr>
<td>Long-iron/rough</td>
<td>3.4825 (13 149)</td>
<td>3.4466 (13 044)</td>
<td>0.0359</td>
<td>0</td>
</tr>
<tr>
<td>Long-iron/bunker</td>
<td>3.5527 (2526)</td>
<td>3.5462 (2565)</td>
<td>0.0065</td>
<td>0.37</td>
</tr>
<tr>
<td>Long-iron/intermediate</td>
<td>3.2593 (2734)</td>
<td>3.2359 (2594)</td>
<td>0.0234</td>
<td>0.08</td>
</tr>
</tbody>
</table>
intermediate rough (the reference category); distance identifies the number of yards from the hole a golfer was when he struck a shot; tourney is a dummy variable reflecting the individual tournament a player competed in; hole is a dummy variable that identifies every hole played in every round in both seasons (3508 holes total); and golfer controls for individual golfer effects. Note that in the cross-section regression, we control for all 3508 holes that comprise the dataset, while we hold constant only tournament-specific effects in the random-effects model.

We present the results of the two regressions in Table 3. The models produce similar results, both of which support the hypothesis that golfers chose strategies that reduced the level of risk with which they played after the rule changes were implemented. For example, suppose we want to compare the number of strokes remaining across the two seasons for a golfer who was 150 yards from the hole and in the rough. Using the results from the cross-section model, we can estimate that for a golfer in this situation in 2009:

\[
\text{strokes remaining} = 2.33 + 0.03 + 150 \times 0.0025 \\
+ 150 \times 0.0002 \\
= 3.33
\]

In 2010, a golfer in a similar situation would take only 3.30 strokes to complete a hole, a difference that amounts to a 0.54 stroke difference per round.\(^5\) To put this in economically significant terms, Dustin Johnson had the 13th best scoring average on the PGA Tour at 70.13. The player with the best scoring average, Matt Kuchar, had a scoring average of 69.61, or a difference of approximately 0.54 strokes per round. The difference becomes even more meaningful when players with lower scoring averages are compared. For instance, a 0.54 stroke difference per round is equivalent to comparing the scoring average of Padraig Harrington, the player with the 15th lowest scoring average in 2010, to Webb Simpson, the player with the 66th lowest scoring average in 2010.

Given the findings presented in the USGA Study and these results, we can conclude that golfers in this particular situation took strong measures to offset the effects of the groove rule change. Further, since the coefficient estimate on the interaction term between location, distance and the 2009 indicator is positive, we can conclude, with varying levels of certainty, that similarly situated golfers in all situations took fewer shots to complete a hole in 2010 than in 2009. Coupling this evidence with the results from Table 2 allows us to conclude that golfers took precautions in 2010 that allowed them to offset, sometimes partially, other times fully, the effects from the U-groove ban.

### IV. Conclusion

This study examines the effects that offsetting behaviour had on PGA Tour golfers’ strategies and performances following a ban on certain methods of constructing golf club grooves. Professional golfers responded to the ban by taking more cautious strategies, and in many instances, these strategies actually improved golfers’ performances in economically and statistically significant ways after the ban was instituted.

Our findings are consistent with previous studies of offsetting behaviour, which found that economic agents tend to take more risky strategies following increases in technology, like safety devices on automobiles. Our study offers a unique perspective in the

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Model 1 ((R^2 = 0.1482))</th>
<th>Model 2 ((R^2 = 0.1138))</th>
</tr>
</thead>
<tbody>
<tr>
<td>constant</td>
<td>2.32865* (0.01959)</td>
<td>2.41355* (0.02508)</td>
</tr>
<tr>
<td>distance</td>
<td>0.00465* (0.00012)</td>
<td>0.00420* (0.00012)</td>
</tr>
<tr>
<td>fairway_dummy</td>
<td>-0.02573* (0.01984)</td>
<td>-0.02315 (0.01972)</td>
</tr>
<tr>
<td>fairway(distance)</td>
<td>0.00038* (0.00013)</td>
<td>-0.00037* (0.00012)</td>
</tr>
<tr>
<td>fairway(distance)×2009_dummy</td>
<td>0.00003 (0.00005)</td>
<td>0.00003 (0.00004)</td>
</tr>
<tr>
<td>rough_dummy</td>
<td>0.13984* (0.02139)</td>
<td>0.14108* (0.02131)</td>
</tr>
<tr>
<td>rough(distance)</td>
<td>0.00031* (0.00014)</td>
<td>0.00032* (0.00014)</td>
</tr>
<tr>
<td>rough(distance)×2009_dummy</td>
<td>0.00018* (0.00005)</td>
<td>0.00017* (0.00005)</td>
</tr>
<tr>
<td>bunker_dummy</td>
<td>0.38108* (0.02833)</td>
<td>0.35927* (0.02794)</td>
</tr>
<tr>
<td>bunker(distance)</td>
<td>-0.00058* (0.00018)</td>
<td>-0.00053* (0.00018)</td>
</tr>
<tr>
<td>bunker(distance)×2009_dummy</td>
<td>0.00018* (0.00008)</td>
<td>0.00017* (0.00007)</td>
</tr>
</tbody>
</table>

Note: *Significant at 5% level.

\(^5\)Of course, these calculations ignore hole-specific effects.
offsetting behaviour literature because we study an instance in which technology was banned. Potential future studies of offsetting behaviour should note differences amongst economic agents. Individuals who are more inclined towards taking risks might be affected more by technology increases than those who are more inclined to take conservative strategies. Understanding the relationship between peoples' tastes for risk and how their actions might be affected by technological change could aid in policy-making decisions in a number of settings.

References