"I take care of my own": A field study on how leadership handles conflict between individual and collective incentives

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From the early literature on the role of firm managers (Alchian and Demsetz 1972) to the industrial organisation on contracts and mechanism design (Laffont and Martimort 2009), economists have given a lot of attention to find solutions to the imperfect alignment between individuals' incentives and an organisation's collective goals (Prendergast 1999). In that literature a key role of managers is to monitor individuals to reward behaviour aligned with the collective goals and reduce suboptimal behaviour, such as shirking. However, another strand of literature, since Akerlof (1982), has put forward a vision of reciprociprocal behaviour between an organisation's leadership and its members: gifts (high wages, recognition) from the organisation are reciprocated by high effort from the members of the organisation. By rewarding individual members (rather than strictly monitoring them), organisations may benefit from greater effort and cohesion. Experimental research in organizational economics has provided mixed results suggesting that agents do react to personal incentives but also that reciprocal behaviour can play a substantial role (Camerer and Weber 2012).

This study contributes to the empirical literature investigating how the existence of individual specific incentives affects individuals' behaviour in organisations, and how leadership deals with such incentives. We use cricket matches as the setting of a naturally occurring quasi-experiment where variations in individual-specific incentives and individual and team strategies are observable. Namely, we use an existing discontinuity in batsmen's individual specific rewards around milestones (scoring 50, 100 or 200). This discontinuity allows us to cleanly identify a causal effect of individual-specific incentives on players' and team captains' strategic behaviour.

We find that, in line with traditional industrial organisation literature, players react to these incentives by adopting suboptimal strategies for the team. However, we also find that team captains adjust their strategies to allow batsmen to reach these individual rewards. We conjecture that captains' behaviour may be the tell-tale sign of an implicit norm whereby they are expected to care about each player's individual rewards. Such a norm can be efficient if it leads to higher level of effort and team cohesion in line with Akerlof's gift exchange mechanism. Such findings suggest that the relation between individual-specific incentives and team incentives may be more complex than the conflict assumed in most standard economic models.

I. The game of cricket

A. The game

Cricket is a sport played mostly in Commonwealth countries. It is one of the major sports in the UK, Australia, New Zealand, South Africa and the Caribbean islands and the most popular sport in India, Pakistan, Sri Lanka and Bangladesh. It is a batting game where teams bat in innings. In each innings, the batting team can align 11 batsmen, who are fielded in pairs. Innings are divided in overs, which consists of 6 balls thrown by a given bowler. Each batsman protects a "wicket", three wooden stumps with two little wood pieces, "the bails", on top of them. Batsmen are typically dismissed when the bowler manages to hit the wicket with his ball or when a shot from the

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batsman is caught clean in the air. When a batsman is dismissed, another one comes "to the crease" to form a new pair. Teams aim to score more "runs" in their batting innings than the opposite team.

The game exists in different length formats. In this paper we use historical data from one-day matches and test matches both at the international level. In "one-day" cricket, a format first played at international level in 1971, teams bat one innings each in a match that lasts one day. In each innings, there are 50 overs (300 balls). The team with the highest score wins. A draw can only happen when both teams score exactly the same number of runs, which rarely happens. In "test" cricket, the oldest form of the game, each team bat in turn over two innings in a match that lasts up to five full days. To win, a team needs to score more "runs" when batting *and* to dismiss all the batsmen of the opposition in their two innings. If a team scores more than the opposition but does not dismiss all the other team's batsmen twice within five days, the match ends in a draw. There are no limits to the number of overs per innings; a team continues to bat until all their batsmen are dismissed or until its captain *declares* the innings closed when he is satisfied that the achieved score is high enough.

B. Batsmen's incentives and strategies

In a match, batsmen should aim to bat in a way which maximises the team's expected number of runs. Batsmen face a risk-return trade off in their batting strategy. High scoring rates come with higher risks of dismissal. Thus, batsmen have to optimise their risk-taking by choosing the right "strike rate" (average number of runs per ball) to aim for. The optimal strike rate from a team point of view will typically depend on the match's score, the batsman's ability and the number of batsmen left in the team. Clarke (1988), Clarke and Norman (1999), and Preston and Thomas (2000) use dynamic programming to compute the optimal strike rate of a batsman as a function of the match's score and the batsman's ability. In one day matches, the limited number of balls creates an opportunity cost of scoring at a low rate. Therefore, a team benefits from a batsman adopting a strike rate that is higher and riskier than the one which would maximise his individual total score (Barr and Kantor 2004).

However, batsmen also face individual specific incentives: scoring many runs increases their reputation and chances to be selected to play in future matches. Batsmen's achievement in their career is assessed by two types of statistics: first the average number of runs they have scored in a match; second their ability to reach very high scores. Reaching "half a century" (50), a "century" (100) or a "double century" (200) in an innings is a symbolic achievement for a batsman. Batsmen's carreer performance are often summarised by how often they reached these milestones. Table 1 shows that batsmen reach such high scores only rarely.

While reaching landmarks brings clear rewards to the player, they do not affect the team's chances of winning the match. Specifically, the team's marginal benefit of a run scored is very similar when a batsman increases his score from 98 to 99 than when he passes from 99 to 100. For these reasons, the discontinuity in individual incentives around these landmarks gives us an opportunity to cleanly identify the effect of individual-specific incentives on the players' strategic behaviour. If the behaviour of the players is only driven by the team's success, we should not observe any change in the strategic behaviour of the players when they pass symbolic landmarks. On the contrary, we conjecture that batsmen decrease risk taking before a landmark in order to decrease their chance of dismissal and raise their chances of reaching this landmark.

C. Team captains' strategies

To investigate how captains react to the existence of these individual incentives, we can use a unique feature of test matches. In order to win in this format of the game, need to both score more than the other team and dismiss all the opposition batsmen in each of their two innings. If a team

Table 1—Frequency of milestones being scored by batsmen (percentage per innings).

	50	100	200
Test matches (unlimited overs per innings)	12.12	4.56	0.45
One day internationals (50 overs per innings)	11.87	2.17	0.01

with a higher number of runs fails to dismiss all the opposition's batsmen at the end of the 5th day, the match ends in a draw which is fairly frequent in test matches (34.8% vs <0.1% for ODI, in our data). The captain of a leading team has therefore an interest to consider stopping to bat and "declare" his team's innings closed. When doing so he needs to balance the risks of waiting too long to declare (likely draw) versus declaring too early (giving a chance to the opposite team to win the match). The decision to declare and when to do so is a key strategic decision: "a decision regarding the timing of a declaration is arguably the most critical decision in the game, in terms of the effect the decision can have on match outcome" (Scarf and Akhtar 2011).

For the declaring decision to optimise the team's winning chances, it should be entirely determined by the team's overall score, not by its individual batsmen's score. However, we conjecture that the captain may be mindful of the individual specific rewards the batsmen are facing. If a captain is thinking about possibly declaring, he may well decide to wait a bit more if one of the batsmen is close to a landmark (50, 100 or 200). For instance, if a batsman has a score of 90, a declaration by the captain will remove the chance for this batsman to score a century. In that case we conjecture that the captain may wait until the player reaches the 100 landmark (or is dismissed) to declare. While this may come at a slight cost in terms of the team's winning chances, it brings substantial individual rewards to the batsman.

II. Data and results

A. Study of the players' strategies

We collected data on the number of runs scored by each batsman over 3,543 one day international matches during the period 1971-2014 (61,836 observations). We use this data to estimate whether a break exists in the density of dismissals around landarks (McCrary 2008). Figure 1 shows the density of batsmen's dismissal near the landmarks 50 and 100 (the subsample is too small for 200s landmarks). The number of runs scored is the number of runs reached when the batsman was dismissed. This figure shows a clear break at each landmark ($p < 0.001$ for 50s, $p < 0.001$ for 100s). Indeed batsmen are less likely to be dismissed just before reaching the landmarks than just after.

To study whether this discontinuity in the probability to observe a dismissal around a landmark is due to variations in batsmen's strategic level of risk taking, we collected a subsample of recent matches for which information about the ball-by-ball play was available. We obtained this information for 1,256 matches over the period 2001-2014. We then computed the number of runs scored by batsmen for each ball they faced. Our data set contains information for 21,473 players batting in an innings and 674,594 balls played. Figure 2 shows the strike rate around the 50 and 100, landmarks. We observe a significant discontinuity with batsmen adopting a lower strike rate (less risky) before reaching the landmark ($p < 0.001$ for 50s, $p = 0.003$ for 100s).

Such an adjustment of the batsmen's strategy has a cost for the team in terms of the chances to win the match. Any decrease in risk taking will come with a decrease in

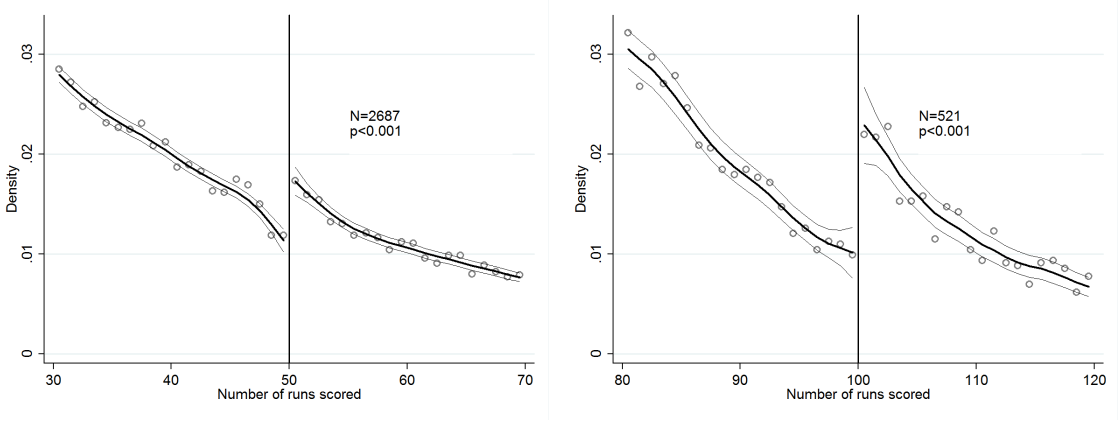

FIGURE 1. MCCRARY TEST FOR THE LANDMARK 50 (LEFT) AND 100 (RIGHT)

Note: Bandwidth of 5 runs, bindwidth of 1 run.

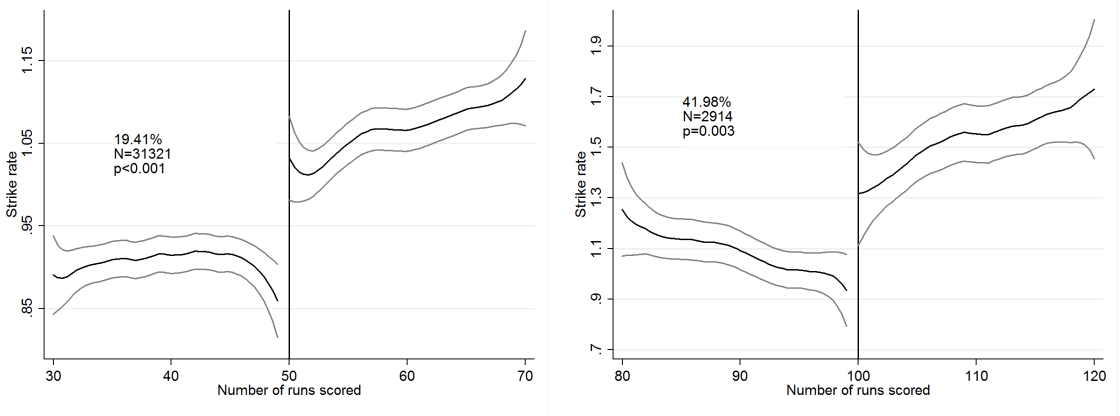

FIGURE 2. DISCONTINUITY IN THE STRIKE RATE (AVERAGE NUMBER OF RUNS PER BALL) PER OVER AROUND LANDMARKS 50 (LEFT) AND 100 (RIGHT).

Note: Local linear regression, triangle kernel, bandwidth of 5 runs.

the expected final score and therefore in the team's chances. By decreasing their risk taking, batsmen are trading a smaller chance for the team to win the match for a higher chance for them to reach this personal milestone.

B. Study of the captains' strategies

To study how team captains strategies are affected by batsmen's individual incentives, we collected data on declaration time in 2,089 test matches over the period 1880-2014. We look at the density of batsmen's scores near each landmark, in matches where a declaration was made around each landmark, using the same test of break in density (McCrary 2008). Figure 3 shows the results of the test. This figure shows a clear break at each landmark. Indeed, when a declaration is made, batsmen are much more likely to have reached a landmark than to be just below one. This implies that, when a batsman is close to achieving a landmark, captains are delaying their declaration decision to allow the batsman to reach their landmark score.

This delay may increase the risk of a draw and decrease the chance of a win. Our data does not allow us to test for the magnitude of this cost. It is possible for the cost to the team to be relatively small if the batsman is close enough to the landmark. However, simulations by Scarf and Akhtar (2011) suggest the possibility of a substantial cost. If a captain waits for one of his batsman to score around 10-20 runs to reach a landmark, he will in practice be waiting for the team to score around 20-40 runs (as a batsman scores on average half the runs of the batting pair). Scarf and Akhtar (2011) give the example of a team having reached a lead of 400 in the third inning and considering whether to declare with 1.3 days left to play. Their model suggests that waiting the time required to score another 40 runs will actually decrease the winning chances of the team by 20 percentage points. While we cannot be sure about the exact cost for the team, our evidence suggests that team captains are willing to trade such a cost to the team in favour of a substantial reward to a particular player.

III. Discussion

We find clear evidence that batsmen and team captains' behaviour in cricket are affected by batsmen's individual-specific incentives in the game. First, batsmen adopt suboptimal strategies in order to increase their chances of reaching symbolic landmarks at the cost of the team's winning chances. Second, team captains seem mindful of such incentives and delay the decision to declare an innings closed when a batsman is near a symbolic landmark, here again at the cost of their teams' winning chances.

This study contributes to our understanding of the effect of individual-specific incentives on individual and leadership's strategies in organisations. In line with standard economic theory predictions, we find that players react to individual-specific incentives in ways which can be detrimental to the team as a whole. However, the most important contribution of this study is to show that team captains also react to individual-specific incentives by *accommodating* them. Doing so, the team captain does not seem *at first sight* to implement an optimal strategy from the team point of view. We conjecture that it is an example of what Akerlof (1982) called a gift exchange norm between an organisation leadership and its members whereby gifts from the leadership are reciprocated by high effort from the members of the organisation. Here, the captain may allow players to reach strictly personal gains whenever the cost to the whole team is not too large. This norm may lead to a higher level of overall performance if players reciprocate with high effort.

Importantly, captains' decisions are public and observable by all players. In organisations, leaders may grant rewards to specific individuals in order to secure a backing coalition. In the case of a cricket match, such considerations may not be absent (the tenure of a captain depends on the support of the players). However, the fact that all players can observe the captain's decision

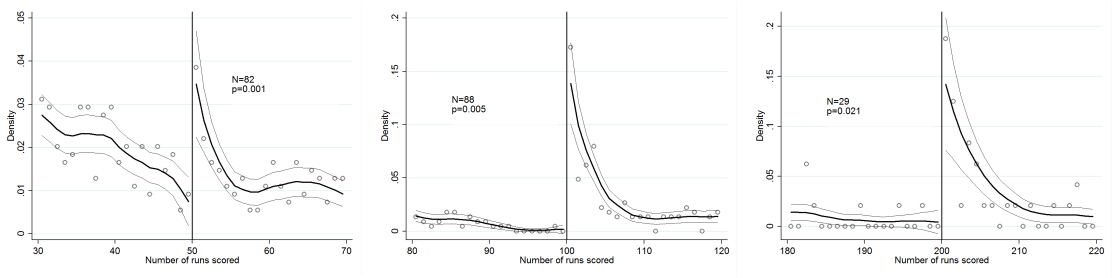

FIGURE 3. MCCRARY TEST FOR THE LANDMARKS 50 (LEFT), 100 (CENTRE) AND 200 (RIGHT) WHEN A DECLARATION TOOK PLACE.

Note: For the landmarks 50 and 100 we use a bandwidth of 5 runs and a bindwidth of 1 run. Given the small number of observations for the landmark 200, we used a bandwidth of 10 runs.

requires for the team not to fundamentally disapprove his decision making. This suggests that captains' decisions reflect a reciprocity norm tacitly accepted within the team: that if a batsman is within range of scoring a landmark, he should be offered this chance–provided the cost to the team's winning chances is not too high. If teammates foresee that such a convention will improve the contribution of the player later on and contribute to fostering a cohesive spirit through mutual reciprocity, it is rational for them to support the captain's decision. Our results therefore suggest that a complex interplay may exist between individual and team incentives instead of the necessary conflict often assumed in economic models.

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