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Heterogeneous Worker Ability and Team-Based Production: Evidence from Major League Baseball, 1920-2009

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ABSTRACT

A detailed longitudinal dataset is assembled containing annual performance and biographical data for every player over the entire history of professional major league baseball. The data are then aggregated to the team level for the period 1920-2009 in order to test whether teams built on a more intermediate distribution of observed talent perform better than those teams with either too high or too low a mixture of highly able and less able players. The key dependent variable used in the regressions is the percentage of games a team wins each season. Our finding is that conditioning on average player ability, dispersion in team pitching and hitting talent prior to the start of a season is related in a non-linear way to subsequent team performance. This suggests that there is an optimum heterogeneity of ability at the team level that maximises joint output. This result is robust to the inclusion of team fixed effects as well as year dummies and after controlling for the potential endogeneity of skill dispersion. These findings have potentially important applications both inside and outside of the sporting world.

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Executive Summary

Is skill dispersion a source of competitive advantage for teams? Or does a more compressed distribution of skills foster greater collective output? While it is established that the aggregate endowment of skill is an important determinant of team performance, Alex Bryson, Kerry Papps and Rafael Gomez investigate whether the distribution of skills inside a team can play a significant role in the determination of overall team performance.

Most managers would attest that mobilising collective effort is markedly different than managing a collection of individuals that require no collaborative interactions. All else equal, at the individual level, the most skilled worker would always be preferred over the least skilled. In a team-based environment, however, it is not necessarily the case that output is maximised by attracting individuals with the largest aggregate endowment of skills, without regard to what effect those individuals have on the distribution of skills within the team.

Recently, economists have become interested in the importance of skill dispersion as a determinant of outcomes as varied as aggregate trade flows (Ohnsorge and Trefler, 2007), educational achievement (Lavy et al., 2009), and firm productivity (Hamilton et al., 2003). The consensus is that the distribution of skills, whether at the level of a nation, region, classroom or organisation matters. Where disagreement still exists is over the effects produced by greater or lesser skill dispersion. In some studies, greater spreads of talent seem to be beneficial to aggregate output while in others the opposite appears to hold true.

Our research asks whether or not there is an optimal spread of talent that maximises performance in settings where team-based production is operative. Specifically, we consider whether it is optimal for managers to assemble teams solely on the basis of average ability (irrespective of the effect this may have on the distribution of skills) or whether organisations should manage the selection of workers so as to prevent too wide a gap opening up between the best and poorest performers. Put another way, if a manager is forced to choose two workers (e.g., baseball players in our case) whose average ability is the same (e.g., a combined historical batting average of 0.275), is it better to approximate the average more closely (0.270 and 0.280 respectively) or should one star (0.325) and one less able player (0.225) be hired? And at what point would too large or too narrow) a spread in ability be damaging to team chemistry and performance?

Our analysis is based on annual performance and biographical data for every player over the entire history of major league baseball, which for the purposes of this study, are aggregated to the team level for the period 1920-2009. As individual performance measures, we use earned run average (ERA) for pitchers and on-base plus slugging percentage (OPS) for hitters. A low ERA or a high OPS indicates a good player. Our key finding is that heterogeneous ability measured prior to the start of a season is related in a non-linear way to team success, in that teams with a ‘balanced’ distribution of

on-base plus slugging percentage among hitters and earned run average among pitchers win more games than teams with either too low or too high a skill spread.

One of the major implications of this research is that in settings where output is jointly determined, such as in any team-based enterprise, considerations of skill distribution are likely to emerge. We find evidence of an optimal level of performance dispersion within baseball, even though both offensive and defensive roles require less on-the-field coordination and interaction than other team sports such as basketball, football or hockey. This is because baseball output is still subject to intermediation, which much like assembly line work, depends in large measure on who precedes or follows a player in a pitching rotation or batting order.

The question of the optimal spread of individual ability within any given team, however, will always be decidedly hard to answer and future work would be productively directed at specifying what organisational attributes foster a more optimal spread of talent.