The Impact of Upper and Middle Management on Team Production

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Abstract 2015-211
Saturday, June 6, 2015
20-minute oral presentation
(including questions)
(Frontenac)

Introduction
Empirical investigation aimed at estimating the impact of management on firm outcomes has received only modest attention in the academic literature despite its prevalence in the popular media. Despite early work to the contrary (Lieberson & O’Connor, 1972; Hall, 1977), recent investigation supports the notion that heterogeneity in both management characteristics and quality have a tangible impact on firm outcomes (Bertrand & Schoar, 2003; Mair, 2005; Terviö, 2008; Goldfarb & Xiao, 2011). We extend this line of literature by taking the unique approach of simultaneously analyzing the impact of both upper level and middle level management on firm production. We do this in the context of Major League Baseball (MLB), where both firm outcomes and management characteristics are readily observable.

Model
To formalize, assume that team production for team i has three inputs, labor (li), capital (ki) and management (mi). We explicitly separate managerial from labor inputs, such that in our setting labor only refers to the players the team hires. Management inputs encompass the managerial contribution to team production at different levels of the firm hierarchy. As such, we allow for both management at the middle level (mmi), i.e. the field coaches, and upper level (mu_i), i.e. the general manager or GM, to have an impact on team production. Teams further differ in the firm specific productivity (ω_i), with which they produce on-field performance out of inputs. Additionally, one team in each contest enjoys a “home advantage” (γ_i), because every competitive MLB game is played at one team’s home stadium.

In our baseline application we model the result (yi_{ij,t}) of a game between two teams, i and j, at time t as a function with two possible outcomes, a loss or a win for team i. Given the zero-sum nature of sports contests, it is common to assume that each team’s production matters only in a relative sense, i.e. in relationship to its opponent’s production. To account for this, Peeters and Szymanski (2014) suggest to estimate an adapted version of the standard Tullock contest success function, which uses a latent continuous variable y_{ij}^* to model relative production.

Data and Methods
To estimate this model we first take the logarithm for each term in y_{ij}^* and add an exponential error term. This yields

\[ \log(y_{ij}^*) = \log(\gamma_i) - \log(\gamma_j) + \log(\omega_i) - \log(\omega_j) + \log(m_{mi}) - \log(m_{mj}) + \beta_l \log(l_i) - \beta_l \log(l_j) + \beta_k \log(k_i) - \beta_k \log(k_j). \]

We further assume that the error term \( \epsilon_{ij} \) is independently normally distributed across games. This enables us to estimate the above model with an instrumental variable probit procedure using clustered and bootstrapped standard errors. The dependent variable is a binary measure where a loss is coded as 0 and a win as 1. To test robustness, we use an ordered probit to estimate an alternative production model where we replace the binary dependent variable with the number of runs a team produces and concedes. We implement the production outlined above in a dataset of over 42,000 MLB games played in the 1989-2012 seasons. We account for labor inputs through the inclusion of both total team payroll and its standard deviation. We control for variation in capital through the inclusion of stadium capacity and stadium age.

To estimate the impact of upper and middle managers on firm performance we adapt the methodology developed by
Graham et al. (2011). These authors use traditional manager dummies while also developing an identification strategy based on Abowd et al. (1999), where a manager’s individual effect is identified as long as he works at a firm with at least one moving manager. This allows for the identification of the time-invariant firm component, which can then be used in the identification of all non-moving managers. Further, we examine the relationship between manager characteristics and team production. We follow Goodall et al. (2011) who directly introduce manager characteristics in the production model. Here, we drop the manager dummies and consequently reintroduce the dropped observations to allow for identification.

**Results and Implications**

To briefly summarize, our preliminary results indicate that both upper and middle level management matter in the production of team success. Generally speaking, we find that a larger percentage of middle level managers (coaches) are significant as compared to upper level managers (GMs). This suggests important variation in the ability of middle management to impact firm outcomes, which confirms the results reported by Mair (2005) and, to some extent, Siebert and Zubanov (2012). We also find that the majority of managers have similar impacts on firm outcomes and only an elite group of coaches and GMs have the ability to impact outcomes at levels that are substantially different from their peers. We also find evidence that high level professional playing experience along with both attending and graduating college is positively associated with firm outcomes for middle managers. For upper level management, the only characteristic significantly associated with outcomes is the quality of the institution attended.

These results add to the limited empirical literature measuring the impact of management on firm outcomes. To our knowledge, this is the first work which simultaneously estimates the impact of both middle and upper level management on firm production. Given that the majority of managers appear to have comparable impacts on firm outcomes, our results also suggest that clubs may find it difficult to select managers who can deliver appreciable performance gains over an incumbent.