The Effect of Social Preferences and Group Identity on Supply Chain Forecasting and Ordering

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Extended Abstract

In a supply chain, two crucial activities are demand planning and production planning. These activities are often assigned to different departments and individuals. The quality of production planning in such a situation depends partly on the effort invested by demand planning and whether production planning can anticipate the effort invested by demand planning. Higher demand planning effort reduces forecast errors, and reduced forecast errors allow production planning to better match production quantities with customer demands by lowering safety stocks. The effort that demand planning has invested into producing demand forecasts is, however, difficult to observe for the production planners.

To align the activities of demand and production planning, monetary incentive systems are frequently used. However, monetary incentives can have negative behavioral consequences, such as crowding-out intrinsic motivation, deception, dishonesty, and decreased trust. In this research, we therefore propose an alternative or supplemental approach for incentive alignment that builds on social preferences. Social preferences and group identity have been identified by the economics literature as an alternative to monetary. An increased group identity increases prosocial behavior towards group members and leads to more trust and trustworthiness among group members. Our interest lies in analyzing how social preferences affect the effort of demand planners and the production decisions of production planners in a supply chain and how group identity can be used to increase social preferences and thereby supply chain performance.

Research Methodology and Positioning

We develop a game theoretic model with a single demand planner and a single production planner. The demand planner can invest effort into improving the accuracy of the demand forecast. Effort is costly and decreases the payout of the demand planner, but effort increases the expected payout of the production planner if it is correctly anticipated. We derive equilibrium strategies of the game and provide analytical results regarding the effects of effort cost and social preferences on these strategies. Based on the analytical results, we derive hypotheses and test them in a laboratory experiment.

To model social preferences, we use the well-known model of Charness and Rabin (2002) (altruism, competitive preferences, and inequality aversion) through a utility function for the demand planner that depends also on the payout of the production planner. To control for group identity, we use project groups that were formed through extensive project-work and we compare their behavior with randomly assigned groups.

Our model goes beyond the existing literature on social preferences by considering a principalagent setting between the demand planner (agent) and the production planner (principal), where the actions of the principal depend on the effort and the signal of the agent. Unlike existing literature, the effect of social preferences on the demand planner's effort must be anticipated by the production planner and the demand planner must be aware of the anticipation. To our best knowledge, such a setting has not been analyzed before, although it is frequently observed in supply chain management, where information from one stage is used for decision making in upstream stages.

We also extend research on behavioral aspects of forecast sharing (e.g., Ozer et al. 2011, Scheele et al. 2014) by considering the incentive conflict arising from the effort cost of creating precise

forecasts. Existing research on this topic has mainly focused on incentive conflicts arising from different valuations of underage and overage cost.

Preliminary Results and Research Contribution

We find that demand planners invest effort even if it reduces their monetary payoffs, which is consistent with the social preference literature. More surprisingly, we also find that production planners anticipate the behavior of the demand planners and that they adapt their safety stocks accordingly to take into account the improved accuracy of the demand forecasts, which leads to significantly greater profit in situations with high social preferences than in situations with low social preferences. This is an important insight and indicates that supply chains are also effective if the behavior of the demand planner is not observable by the production planner and is affected by social preferences.

The results of our research have important managerial implications. A greater organizational divide between demand planning and production planning can decrease social preferences for the other party by reducing the identity of the group. Our research suggests that such a reduction results in a decrease in the demand planners' motivation to invest effort into demand forecasting. This effect can be accounted for when designing the organizational setup of supply chains and we suggest that group identity can be used as an alternative or supplement to monetary incentives.

References

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