Ensuring Corporate Social Responsibility in Supply Chain Networks through Bilateral Bargaining

With increasing consumer awareness of corporate social responsibility (CSR), firms have started integrating CSR into their business strategies to create social and environmental impacts as well as generating additional revenue, e.g., by increasing consumer willingness-to-pay and expanding their market segments. For example, Starbucks is committed to ensure that their coffee is 100 percent ethically sourced. Therefore, Starbucks, the founding member of the Sustainable Coffee Challenge, a joint initiative of over 60 partners, collaborates with other industry leaders to make coffee a sustainable agriculture product and improve the livelihoods of coffee farmers to ensure a long-term supply of high-quality of coffee.

In order to ensure the success of CSR programs, proper incentives must be provided to all entities involved in a supply chain through the allocation of additional profit generated by CSR. The existing literature typically applies coalition game theory such as the Shapley value to determine the gain sharing among supply chain members. We propose an alternative approach based on Nash bargaining. The advantages of our approach lie in the following two aspects. First, the Shapley value-based approach only generates an allocation scheme, but does not provide any practical measure to implement such a scheme. In contrast, our bargaining-based approach leads to an implementable solution that efficiently shares the benefit generated from the CSR program through a set of bilateral contracts. Second, the application of Shapley value does not allow the modeling of imbalanced negotiation powers among supply chain entities, while our multiunit Nash bargaining framework provides the flexibility of capturing a wide range of gain sharing arrangements—Indeed, the solution obtained using Shapley value is a special case of our approach when the bargaining power is equally distributed between any possible negotiation pair within the supply chain.

Specifically, we consider a general supply chain network with one retailer, whom we assume, without loss of generality, to be the initiator of the CSR program. The network consists of multiple tiers of
suppliers, some may have trading relationship with common upstream or downstream members. In order to fulfill the CSR program’s requirements, every member involved must exert an effort through an investment. If all agree to invest in the CSR program, additional revenue materializes at the retailer as a result of consumers’ positive reception of the program. However, if anyone in the supply chain network fails to comply with the CSR requirement, the program is considered a failure. The assumption that all entities in a supply chain must participate to generate value from the CSR program is justified under most practical situations. For example, Starbucks is committed to ensure that their coffee is 100 percent ethically sourced, i.e., all suppliers in their supply chain must meet the standard of business ethics. In many instances, CSR programs may come to a failure or may even backfire if some suppliers fail to comply with CSR requirements. For example, Walmart and Sears had claimed that their products were ethically sourced by striving to prevent problems such as child labor and substandard working conditions. However, after an industrial fire killed more than 117 people in 2012 at one of their garment suppliers’ factory in Bangladesh, Walmart and Sears encountered widespread criticisms for not keeping their earlier promise on CSR, inadvertently hurting their brand images. Therefore, providing proper incentives to ensure all parties participate in the CSR program is crucial. We address this issue through bilateral negotiations between companies over their CSR investment decisions and the corresponding transfer payment.

We first characterize the gain sharing among all entities in the supply chain based on the Nash bargaining solution and describe how such allocation is implemented practically through bilateral contracts. We show that the gain sharing scheme derived based on Shapley value is a special case of our approach, where the bargaining powers of all entities are equal. We then study how the initiator of the CSR program can benefit from the imbalance of bargaining powers through proper negotiation structures. A negotiation structure is a graph that describes whether two entities in the supply chain conduct a bilateral negotiation over the terms of the CSR program. We show that the optimal
negotiation structure gives rise to a new optimization problem similar to the minimum spanning tree problem and a greedy algorithm is designed to find the optimal solution efficiently.

We further extend the model to the setting where the CSR investment decisions involve continuous investment effort levels and the CSR investment costs are non-decreasing in the corresponding investment levels. We find that, with our bargaining-based approach, the CSR investment level decisions are coordinated, i.e., the decentralized optimal investment levels of all entities result in the centralized optimal solution. Furthermore, we study the case where the bargaining structure is formed via a decentralized hierarchical delegation procedure, where down-stream companies delegate the negotiation responsibilities to their up-stream suppliers, who, in turn, further delegate the responsibilities to their own suppliers. We show that the equilibrium negotiation structure resulting from the hierarchical delegation process is equivalent to the optimal structure in the centralized case. This suggests that a retailer who has a large-scale supply chain, and thus, may not be able to control the negotiation relationship between all entities in the supply chain, can still achieve the optimal negotiation structure by choosing only some suppliers to directly negotiate with and then delegating the negotiation responsibility to these suppliers.

In summary, departing from the commonly used approach in the literature, we propose a bargaining-based approach to determine the allocation of profit from the CSR program. Our approach not only enhances the existing studies along the dimensions of supply chain structure and negotiation power distribution, but also provides a practical method for implementing the gain sharing scheme through a set of bilateral contracts. This formulation using bargaining also leads to a new optimization model for optimizing the negotiation structure and we show that it can be solved efficiently using a greedy algorithm. We further demonstrate the robustness of our approach and results with respect to general investment decisions and delegation of negotiation responsibility.