How Can Integration Reduce Inefficiencies Due to *Ex Post* Adaptation?

Yusuke Mori*

Abstract

We explore how integrated firms can immediately settle ex post adaptation problems despite the possibility of employees' disobedience to the orders of their boss. We employ three crucial behavioral assumptions: reference-dependent preference, self-serving bias, and shading. In the model, immediate settlement may be interrupted because trading parties' expectations about adaptation outcome (that become their reference points) diverge due to self-serving bias. Nevertheless, we show that integration helps the parties settle the adaptation immediately. Since the boss expects her employees to obey orders, their disobedience causes the boss a huge amount of sense of loss, which leads to severe punishment (shading) by her. Such punishment is intensified by the boss's loss aversion, and thus its damage on the employees can be larger than their gain from disobedience.

Keywords: Reference-dependent preference; self-serving bias; contracts as reference points; transaction cost; *ex post* adaptation

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*Graduate School of Commerce and Management, Hitotsubashi University, 2-1 Naka, Kunitachi, Tokyo 186-8601, Japan. E-mail: cd101008@g.hit-u.ac.jp

1 Introduction

Transaction cost economics (TCE, e.g., Williamson, 1996) asserts that integration can settle *ex post* adaptations to unanticipated changes in trade circumstances without incurring any bargaining cost, which non-integration cannot avoid. This follows from the implicit assumption that integrated firms can use fiat, which is not available between non-integrated firms, to implement such adaptations. Nevertheless, TCE has not provided any formal justification for the assumption (i.e., TCE does not explain why employees obey their boss's orders).

This paper develops a simple model that explores how integration reduces inefficiencies due to *ex post* adaptation (especially the division of trade value) by employing three behavioral approaches: reference-dependent preference, self-serving bias, and shading (contracts as reference points). We show that integration indeed settles the adaptation more easily than non-integration even in the situation in which boss's orders are not necessarily obeyed. It is worth noting that three behavioral assumptions are all crucial to our result.

2 The Model

We focus on the situation where two risk-neutral trading parties (players 1 and 2) are to divide trade value, which is created through player 2's investment I, and compare two polar governance structures: non-integration and integration.[1][2]

The game proceeds as follows. First, a governance structure is chosen (non-integration or integration) to maximize the sum of the two players' utility. Second, the players set their reference points regarding the outcome of the *ex post* adaptation. An adaptation process is then initiated. We assume that under integration, player 1 (resp. player 2) becomes a boss (resp. a subordinate).

Reference Points (Expectation and Self-Serving Bias). As in the literature on reference-dependent preference (Köszegi and Rabin, 2006 and 2007), each player's reference point is his expectation about the relevant outcome. We further assume that the ways in which the players set their reference points depend on the governance structure chosen at the beginning; this stems from the difference in adaptation processes between non-integration and integration.

[1] We refer to player 1 as "she" and player 2 as "he" for the purpose of identification only.

[2] To focus on *ex post* inefficiencies, we assume that player 2's investment has been efficiently sunk, and hence there is no under-investment problem.

Under non-integration, as Williamson (1996, p. 17) points out, “the autonomous stages would need to bargain these [*ex post* adaptations] through to agreement,” and hence each player’s expectation regarding the outcome of the bargaining serves as his reference point. We thus assume that under non-integration, each player uses the Nash bargaining solution as his reference point. Under integration, on the other hand, “the unified firm can implement adaptations to unanticipated disturbances by fiat (Williamson, 1996, p. 17),” which means that the person who has decision rights (player 1) can order any division to her subordinate (player 2). That is, *ex post* adaptations proceed something like an ultimatum game, and hence each player’s reference point is given by his expectation regarding the outcome of the ultimatum game. In sum, player 1’s (resp. player 2’s) reference point payoff under integration is far greater (resp. smaller) than her (resp. him) reference point payoff under non-integration.

While how each player set his reference point is common knowledge (i.e., the Nash bargaining solution under non-integration and the equilibrium outcome of the ultimatum game under integration), each player has a self-serving view regarding the sunk investment I (Babcock et al., 1995). That is, while player 1, who does not invest, thinks that player 2, who is supposed to invest, is to incur his sunk investment, player 2 believes that his sunk cost is to be compensated. Formally, player 1 (resp. player 2) believes that player 1’s outside option is 0 and player 2’s outside option is $-I$ (resp. 0). Such a bias results in a divergence of reference points between the players, and hence causes delay in reaching agreement.

From these assumptions, player i’s reference point under governance structure g, which is denoted by r_i^g, is given as follows: under non-integration,

$$r_1^m = \left(\frac{\pi}{2}, \frac{\pi}{2} - I\right) \quad \text{and} \quad r_2^m = \left(\frac{\pi - I}{2}, \frac{\pi - I}{2}\right),$$

and under integration,

$$r_1^h = (\pi, -I) \quad \text{and} \quad r_2^h = (\pi - I, 0)\,.$$

Player 1’s (resp. player 2’s) payoff is listed first (resp. second).

Adaptation Process. The *ex post* adaptation process consists of player 1’s division offer $x = (x_1, x_2)$, where x_i represents player i’s share of the value, and player 2’s acceptance decision. If player 2 accepts the offer, the value is divided as the accepted offer specifies; otherwise, the adaptation continues.[3] We assume that if player 2 rejects player 1’s offer, player 2 (resp.

[3]To facilitate the comparison between governance structures, we assume that under integration, an employer

player 1) obtains a continuation payoff P (resp. $\pi - I - P$) regardless of the choice of the governance structure where P satisfies $\pi/2 - I < P \leq (\pi - I)/2$. This assumption reflects Barnard's (1938) arguments about authority: subordinates' disobedience to orders terminates authority relationship.

Utility Function (Reference-Dependent Preference and Shading). We combine Köszegi and Rabin's reference-dependent utility and the utility function of the contracts-as-reference-points approach (Hart and Moore, 2008 and Hart, 2009). Let $r_i = (r_{ii}, r_{ij})$ denote player i's reference point (r_{ij} represents i's belief about player j's reference point payoff). Player i's utility when an adaptation outcome is $y = (y_i, y_j)$ is then given by

$$U_i(y \mid r_i, r_j) = y_i + n(y_i \mid r_{ii}) + \theta \min\{n(y_j \mid r_{jj}), 0\}$$

where

$$n(y_i \mid r_{ii}) = \begin{cases} \eta(y_i - r_{ii}) & \text{if } y_i \geq r_{ii} \\ \eta\lambda(y_i - r_{ii}) & \text{if } y_i < r_{ii}. \end{cases}$$

η represents weight on gain-loss payoff, $\lambda (>1)$ is sensitivity of loss aversion and $\theta (>0)$ denotes an exogenous common shading parameter. The first term of the utility function denotes player i's intrinsic payoff, the second term represents his gain-loss utility, and the third term is the loss caused by player j's shading. Shading can be considered a punishment for unfair treatment and, as in Hart and Moore 2008, does not inflict any cost on those who shade.[4] It is worth noting that the first and second terms (resp. third terms) constitute a utility function that corresponds to the utility function of Köszegi and Rabin's approach (resp. the contracts-as-reference-points approach). To show clearly the crucial effect of loss aversion on our result, diminishing sensitivity, which is one of the features of gain-loss utility, is ruled out.

3 Result

Our model shows that integration indeed achieves immediate settlement of *ex post* adaptation more easily than non-integration even under the possibility of employees' disobedience to their

does not fire an employee who disobeys an order. Intuitively, this assumption suggests that dismissal is not always costless: a fired employee can engage in actions that inflict damage on his ex-boss in revenge (e.g., sabotage, leakage, and theft).

[4] We can extend our model to consider altruism by assuming $U_i(y \mid r_i, r_j) = y_i + n(y_i \mid r_{ii}) + \theta n(y_j \mid r_{jj})$. Our main message (i.e., integration can achieve immediate agreement more easily than non-integration) continues to emerge under the altruism case.

boss's orders. There are two reasons. First, a rejection of an offer under integration (i.e., an order) provokes a severer punishment than a rejection of an offer under non-integration. As mentioned above, under integration, a person who has authority (a boss) determines how to divide the trade value and a subordinate is supposed to obey the boss's orders. The boss's reference point payoff is thus quite large. Under non-integration, on the other hand, trading parties are autonomous, and hence they are entitled to reject any offer that their partners make as they please (namely, their reference point payoffs are balanced). Hence, player 2's rejection, which yields the continuation $\pi - I - P$ to player 1 under both governance structures, results in player 1's larger sense of loss under integration than under non-integration. Since player 1's larger loss leads to severer retaliation against player 2, player 2 has lower incentive to reject the offer under integration than under non-integration.

The second reason is that under integration, the utility improvement for player 2 from rejecting player 1's offer is not sufficient to offset the loss from player 1's severe punishment. As mentioned above, the players' reference points under integration are the expected outcome of an ultimatum game, and hence, the subordinate, who has no decision right, (i.e., player 2) does not expect a large adaptation payoff. Given that the subordinate expects a small adaptation payoff, the payoff improvement from rejecting the order is "too much" for him (i.e., the rejection of the order does not lead to a large utility improvement), which makes him less eager to reject the order.

We use this result to analyze firm boundaries and point out a trade-off between immediate agreement and the aggregate sense of loss. That is, while integration can economize inefficiencies due to delay in reaching agreement, it incurs larger shading costs than non-integration. The reason for this is explained as follows. As mentioned above, player 2 who invests believes that his sunk investment will be compensated regardless of the choice of the governance structure. Nevertheless, under non-integration, each player receives a positive share of a trade surplus (namely, the trade value minus the investment cost) from bargaining, and thus, player 2 expects to incur some portion of the investment cost. Under integration, on the other hand, a player who receives an order from his boss (player 2) expects that the entire surplus will be taken by the boss, and hence, he does not take the investment costs into account when he sets his reference point. This discussion suggests that the divergence between the players' reference points because of the self-serving view regarding who is to incur the investment costs is larger under integration than under non-integration, which makes the aggregate sense of loss and shading costs under integration larger than those under non-integration.

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