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Maverick Buying: Eliminate, Participate, Leverage?

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Abstract

Companies have consolidated purchasing volumes that were scattered across organizational units to lower purchasing prices. To realize these benefits companies frequently opt for a hybrid organizational structure that is conducive to a specific form of non-compliant behavior, referred to as maverick buying: local business units bypass official processes and source from suppliers other than the designated supplier. This non-compliant action counteracts companies’ efforts to benefit from volume consolidation. We consider maverick buying as a form of hidden action in a principal-agent framework and provide a formal analysis of strategies that companies employ to avoid maverick buying or remedy its negative consequences. Our results suggest that the conventional strategy of monitoring and penalizing agents in case of non-compliance not only has clear limitations but may be ineffective: rather than trying to eliminate maverick buying through monitoring, companies should, under some conditions, participate in agents’ superior market knowledge. We propose a self-selection model: the principal offers contract menus, termed participation menus, tailored to agents with attractive outside options and agents without incentives to "buy maverick". We demonstrate that participation menus perform particularly well when conventional monitoring fails and that in some situations they can be employed to leverage the agents’ purchasing capabilities.

Keywords. Maverick Buying, Non-Compliant Purchasing, Purchasing Organizations, Volume Consolidation.
1 Introduction

Recent years have brought a tendency for companies to consolidate into a central department the purchasing volumes that had once been scattered across organizational units (e.g. Karjalainen et al., 2009). Such consolidation promises substantial benefits, such as lower purchasing prices through volume leverage during negotiations and quantity discounts, lower transaction and administrative costs, economies of information, learning effects, and so on. These benefits are particularly attractive for companies that have multiple business units that enjoy high levels of autonomy and companies with globally dispersed operations. As Faes et al. (2000) state (p. 539), "In multiplant and multinational corporations, the quest for global efficiency and effectiveness has led to increased centralization and coordination of the purchasing function."

Most companies, however, opt for a hybrid organizational setup: on the one hand a central purchasing department manages the supplier base, negotiates frame contracts for the entire company, and is responsible for consolidation and for achieving its positive effects. On the other hand the central department delegates the ordering rights to individual organizational (business) units. These units (are expected to) order from the frame contracts and are responsible for all remaining operational procurement activities (Munson and Hu, 2010; Karjalainen, 2011).

It is clear that consolidation benefits in such a hybrid organizational setting will be (fully) realized only if the local managers of business units follow the official purchasing processes and order from the frame contract. However, there is substantial evidence that such is often not the case, as so-called maverick buying—"off-contract buying of goods and services for which an established procurement process is in place based on pre-negotiated contracts with selected suppliers" (Karjalainen et al., 2009, p. 248)—perserves in many firms. Estimates of the relative number of transactions that can be classified as maverick buying range from 35-50 percent for private companies (Patel, 2006; Bartolini, 2012) to 40-50 percent for public administration (Dwyer, 2011b; Lonsdale and Watson, 2005). Maverick buying increases administrative and transaction costs (Karjalainen et al., 2009; Roy, 2003; Johnson, 1999) and leads to lost savings because of economies of information and scale foregone (Karjalainen, 2011; Trautmann et al., 2009; Faes et al., 2000). Kulp et al. (2006), for example, state that GlaxoSmithKline lost 20-30 percent ($80-$120 million) of its potential savings from volume consolidation because of maverick buying.

Maverick buying can be considered as hidden action in a principal-agent framework, as the principal (the firm) delegates certain tasks (purchasing activities) to an agent (local managers) but cannot—without taking additional costly measures—observe whether or not the agent acts compliant, i.e., orders from the frame contract. The agent has an incentive to bypass official
purchasing processes and to buy outside the frame contract if he obtains higher utility from choosing an alternative source instead of a designated supplier. Such action causes a disadvantage on the principal’s side because it diminishes the benefits of volume consolidation. Kauppi and van Raaij (2014) argue that maverick buying stems from goal incongruence: the agent prefers buying at the lowest price obtainable for himself, while the principal wants to minimize the total cost of ownership, sometimes even at the sacrifice of a higher local price. Section 2 provides a more concise description of the agent’s motives to "buy maverick".

Common strategies to avoid hidden action are to monitor agents’ actions to constrain their opportunity to act non-compliant without being detected, and to structure incentives so the goals of the principal and the agent are aligned (Kauppi and van Raaij, 2014; Lassar and Kerr, 1996). In the case of maverick buying, companies typically resort to the former; they implement monitoring systems to detect and penalize maverick buying. Whether monitoring is successful in avoiding or even eliminating maverick buying depends on the effort the principal exerts to monitor the agents, as the greater the principal’s effort, the greater the probability that maverick buying will be detected. The agents’ expected utility from buying maverick decreases as it becomes more likely that their non-compliant action will be detected and penalized. However, monitoring comes at a cost that increases with the principal’s monitoring effort, so the principal must balance the costs of monitoring with the benefits of lower levels of maverick buying. Achieving this balance is challenging because the principal does not know the agents’ utility from buying maverick.

Technical solutions such as e-procurement or purchasing cards allow, in theory, full visibility into the agents’ spend, as all transactions could potentially be monitored electronically. It is surprising to see that significant levels of maverick buying persist despite these technical solutions, which have been employed for more than a decade (Gunasekaran and Ngai, 2008; Gunasekaran et al., 2009). This prompts the question why companies are not more rigorous in using technological means to detect and eliminate maverick buying. First, in large multinational companies, agents face very heterogeneous local needs that may be changing rapidly. The principal, however, can only establish frame contracts for limited options and with limited reach. Trying to establish and enforce frame contracts company wide and across all categories will likely stifle the organization and lead to adverse effects (Toktas-Palut et al., 2014). To avoid this, the principal provides the agents with some leeway in some categories and does not implement a completely rigid system. However, agents make use of this leeway, thereby diminishing the global benefits of the frame contract. Providing this leeway also explains the effort a principal incurs to monitor the agents. In a multinational company millions of transactions per year have to be reviewed, categorized into compliant, not fully compliant but within some tolerance, and non-compliant, i.e. maverick. This results in tremendous transactional
efforts on the principal’s as well as the agents’ side and leads to high costs of monitoring. Also, frame contracts cannot be established and kept up to date for all relevant categories while at the same time fulfilling all the needs of local purchasing departments; these needs are subject to constant changes and updates, and it is difficult to link every purchase to one of thousands of frame contracts that may exist in a large organization. Inspecting each transaction would lead to many "false positive" results, each one requiring a manual follow-up, i.e., someone from the central purchasing department has to scrutinize each transaction that cannot be linked immediately to some frame contract and will, inevitably, have to involve staff from the local purchasing departments to resolve open issues. It is straightforward to see that the corresponding effort and strain on the organization can be prohibitively high, especially in multinational companies with a hybrid organizational setup. In this paper we provide a formal analysis of the maverick buying problem and focus on settings in which full spend control through technological solutions fails or is infeasible.

Our first contribution is to explain—in a formal manner—under which conditions monitoring does not eliminate maverick buying. To this end we develop a model that captures the effects of monitoring. More specifically, we identify optimal monitoring levels and derive conditions under which monitoring is economically feasible. If monitoring is costly, difficult to implement, and—as we will show—sometimes not even the right way to eliminate maverick buying, it may be attractive to pursue another approach to dealing with the maverick-buying problem, such as extracting some of the agent’s benefits from buying from an outside source (i.e., participating) rather than exerting a costly effort for monitoring to prevent the agent from acting non-compliant. The principal can only participate in the agent’s ability to identify and contract an attractive outside option if the principal removes the "hidden action" element of maverick buying by not outlawing the choice of an outside option. Instead she would have to empower successful agents with superior market knowledge to choose outside options and to incentivize them to report truthfully about their choice. Our second contribution to theory is therefore a novel incentive scheme that allows the principal to participate in the agent’s superior market knowledge. To this end, we propose a self-selection model in which the principal offers contract menus tailored to agents with attractive outside options and to agents without an incentive to buy maverick. We derive the parameters of such participation menus and identify conditions under which they outperform conventional monitoring. Our third contribution is more of a practical nature. The results of our formal analysis give rise to several strategic questions regarding the effort companies make to reap the potential benefits of consolidation. For example, one may question the common notion that consolidation benefits increase with the volume managed centrally if one also considers the negative effects of maverick buying, the costs of enforcing compliance, and the lost benefits that could have been achieved given the superior purchasing capabilities of some local organizational units (agents). Based on the results of our formal analysis, we derive
a number of practical implications and recommendations for hybrid purchasing organizations that are confronted with non-compliant agents.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature on maverick buying and positions our research relative to previous work. Section 3 is dedicated to the formal analysis of the maverick buying problem in a principal-agent setting. In this section we outline our modeling approach, analyze the effects of monitoring, and develop and study a self selection-model that allows the principal to participate in the agent’s superior market knowledge. Section 4 extends our previous results to practical settings and discusses their implications for hybrid purchasing organizations. Finally, Section 5 summarizes our findings and highlights suggestions for future research.

2 Literature Review

Maverick buying, a persistent phenomenon in hybrid purchasing organizations, can have a substantially negative impact on firm performance. Numerous publications and studies indicate that maverick buying has been a matter of concern for some time (e.g. Patel, 2006; Kulp et al., 2006) and still remains a challenging topic (e.g. Pezza, 2011; Dwyer, 2011b,a; Bartolini, 2012) despite the advancements in technology (e.g., e-procurement) that have been assumed to alleviate the maverick-buying problem. However, academic research on maverick buying is comparatively sparse and usually conceptual. In the next section we build on past research to outline reasons for the existence of maverick buying. Thereupon, we summarize those approaches to deal with maverick buying that have been proposed and described in prior research. This will help us in developing our formal analysis of the maverick buying problem.

2.1 Reasons for Maverick Buying

A number of researchers have recognized that maverick buying may be fostered by the hybrid organizational set-up of purchasing departments (Munson and Hu, 2010; Trautmann et al., 2009; Karjalainen, 2011), arguing that centralization of strategic tasks (i.e., negotiation of frame contracts) and decentralized decisions by local agents on the operational level make firms vulnerable to organizational misbehavior. In particular, unobservable actions of local agents and the fact that most of the consolidation benefits are realized on the central level are seen as joint drivers of non-compliance. Kauppi and van Raaij (2014), the first to characterize maverick buying as a principal-agent problem, discuss reasons for maverick buying, approaches to remedying the maverick-buying problem, and suggest factors that may impact agents’ compliance. Our formal analysis builds on some of Kauppi
and van Raaij (2014)’s conceptual notions.

Clearly, any effort to remedy non-compliance must include an effort to understand the agents’ motivation. Vardi and Wiener (1996) propose three categories of such organizational misbehavior: (i) misbehavior intended to benefit oneself, (ii) misbehavior intended to inflict damage, and (iii) misbehavior intended to benefit the organization.

Based on the categories of Vardi and Wiener (1996), Karjalainen et al. (2009) suggest five motives for maverick buying: (i) the agent is not aware of the frame contract (unintentional maverick buying); (ii) the agent has no alternative but to buy maverick, although he knows about the frame contract, such as when the designated supplier does not offer the required product or cannot supply the product in time (forced maverick buying) (Karjalainen et al., 2009); (iii) the purchasing agent knows about the frame contract but chooses to buy from an outside source because, for example, he wishes to reduce his personal effort, lacks incentives to do otherwise, or lacks insight about the total cost of ownership (casual maverick buying) (Karjalainen et al., 2009); (iv) the agent knows about the frame contract and has a suitable product but still chooses to buy from an outside source because of perceived benefits for the organization, such as perceived superiority of prices, product quality, or service (well-intentioned maverick buying); and (v) it is in the agent’s own or his or her sub-unit’s interest to choose an outside option (ill-intentioned maverick buying).

Our formal analysis focuses on Karjalainen et al. (2009)’s well-intentioned agent, although the structure and insights of our analysis can easily be extended to casual and ill-intentioned agents (see Section 4.3). We consider these three categories particularly relevant because they are directly related to agency misbehavior, and they may be reinforced by the hybrid organizational set-up: the agent knows about the frame contract and could use the supplier associated with this contract but, unobserved by the principal, chooses to buy from another source in order to increase either his own or (in his belief) the company’s utility. We do not consider Karjalainen et al. (2009)’s categories (i) and (ii)—unintentional and forced maverick buying—because either (i) the agent acts involuntary because he does not know about the frame contract, or (ii) the agent has no choice other than the outside option. The two cases have different root causes and are not caused by the hybrid organizational setup or by agent disincentives.

2.2 Reduction and Mitigation of Maverick Buying

Academics and practitioners have proposed measures to reduce the extent of maverick buying, the most common of which is monitoring, a specific form of ex-post process control, in combination with penalties for misconduct (Karjalainen et al., 2009). Practitioners typically refer to this as
"spend analysis" (Karjalainen et al., 2009). Studies indicate that spend analysis improves contract compliance, at least to some extent (Minahan and Degnan, 2004; Dwyer, 2011b). Monitoring concepts studied in the literature assume that a principal puts agent-specific monitoring into place (see for example Lafont and Martimort, 2001; Mitesch, 2006; Bohn, 1987). However, in many practical settings such as maverick buying agents experience the same rates of being controlled. As we will show this has dire consequences to the monitoring success but at the same time presents an explanation why maverick buying prevails in practice. To the best of our knowledge, no studies have analyzed this "one-size-fits-all"-mechanism typically applied in practice, under which conditions the costly effort put into monitoring is successful in preventing maverick buying, whether it is economically feasible, or how much effort should be exerted to monitor the agents’ actions.

New technologies, such as electronic procurement (Angeles and Nath, 2007; de Boer et al., 2002) and purchasing cards (Roy, 2003), have been proposed as measures to forestall maverick buying. Although this is not their main objective, lower levels of maverick buying may come as a positive side effect of these solutions: on the one hand, they can reduce the agent’s effort to procure from the frame contract. Thus, it may make the compliant option relatively more attractive than the outside option (Angeles and Nath, 2007). On the other hand, these solutions increase spend visibility and make it more difficult for the agent to buy from an outside source without being detected. Croom and Brandon-Jones (2007), Teo and Kee-hung (2009), and Sanders (2007) analyze the consequences of introducing e-procurement, identify significant per-order cost reductions, and elaborate on how to facilitate easy procurement processes. Similar results are reported by Angeles and Nath (2007) and Dwyer and Gupta (2008), as well as in Pezza (2011) who studies the effect of purchasing card programs.

There is little empirical evidence on how new technologies like e-procurement and purchasing cards impact the extent of maverick buying. However, given Bartolini (2012)’s finding that, on average, half of purchasing spending is non-compliant and that even best-in-class organizations with established e-procurement systems can only reach about 69 percent contract compliance, there is reason to believe that maverick buying remains a serious issue despite the new technologies. Some empirical studies aim to capture the benefits and drawbacks of implementing an e-procurement system such as Toktas-Palut et al. (2014) who also provide a good literature overview. One empirical study finds that practitioners with experience in adopting an e-procurement system are not convinced about its ability to reduce maverick buying (Gunasekaran and Ngai, 2008). Gunasekaran et al. (2009) also show that many practitioners doubt that after the introduction of an e-procurement system a substantial reduction in non-contractual buying materializes.
Groetsch et al. (2012) develop a formal model to analyze the effect of monitoring and purchasing technologies on how much maverick buying a company experiences. They find that the two measures can be complementary but that they will not necessarily lead to full compliance. They also suggest that employing both measures in an uncoordinated fashion may lead to monitoring levels that are not economically feasible. Groetsch et al. (2012) are the first to provide a formal theoretical analysis of maverick buying, so their work is that most closely related to the research presented in this paper. They consider a setting in which a principal has multiple purchasing agents with incentives to buy maverick. The principal is assumed to have complete information regarding the costs and benefits of maverick buying on the agents' side—this implies that the hidden action element of maverick buying is not explicitly captured in their analysis. The authors derive optimal levels of monitoring and technology implementation and study the effects on the extent of maverick buying.

In contrast, we consider information asymmetry, that is, that the agent has private information about the costs of an outside option, and the principal does not know whether she faces a maverick buyer, nor does she know the utility the agent obtains from buying maverick. Thus, we explicitly incorporate the possibility of hidden action into our model, enabling us to provide a concise analysis of the effects of monitoring and the difficulties in setting the appropriate monitoring level. More importantly, however, our set-up facilitates the development of a new approach to dealing with maverick buying as we develop a self-selection model that allows the principal to participate in the agent’s information rent if the agent chooses an outside option.

For this paper we build on prior research on mechanism design. Mechanism design models can capture the hierarchical relationship between a higher organizational level represented by the principal and a lower organizational level represented by the agents and allow to characterize how the principal and the agent should work together in order to avoid misaligned incentives. Different classes of misaligned incentives have been identified. For our setting we choose a hidden action model in which—simply speaking—the agent may choose to do something but hides this action from the principal in order to gain an advantage. This approach is well documented in the literature. Exhaustive presentations on mechanism design models to which we refer the reader can be found by Laffont and Martimort (2001) and Laffont and Tirole (1993) including hidden action models.

3 Model

Our discussion in Section 1 makes apparent that maverick buying is a problem if a company can achieve lower unit purchasing prices and lower overhead costs by consolidating purchasing volumes and assigning these to a designated supplier within a framework contract. At least some of these consolidation benefits may be lost if purchasing activities are delegated to purchasing agents (local
managers or organizational sub-units) whose choices of suppliers cannot be observed and who may have incentives to buy from suppliers that are not the designated suppliers. This section provides a formal analysis of the maverick-buying problem and approaches to overcoming the negative impact of maverick buying.

3.1 Reference Cases

To facilitate our analysis, we introduce two reference cases: the integrated organization and what we call the laissez-faire case. In the integrated organization maverick buying does not occur because purchasing activities are not delegated to an agent. The integrated organization provides us with a first-best solution that serves as an upper bound benchmark with which to evaluate other strategies for coping with maverick buying. The solution of the laissez-faire case, which serves as a lower bound benchmark, concerns a hybrid organization in which maverick buying may occur and in which the principal takes no measures to avoid it. That is, purchasing activities are delegated to an agent who can choose an outside option, the principal is not able to observe the agent’s choice, and the principal accepts that maverick buying may happen. Beyond serving as a lower bound benchmark, the laissez-faire case also provides a basic principal-agent framework that can be used as a starting point for the development of alternative strategies.

3.1.1 Integrated Organization

In the integrated organization a central decision-maker performs all activities related to producing and selling products, including purchasing the required input material. Essentially our integrated organization captures the situation where a firm can remove the principal-agent problem at zero cost. We assume that the decision-maker has negotiated a frame contract with a designated supplier that is based on consolidated purchasing volumes across multiple business units. To simplify our analysis, we focus only on a single output product that requires one unit of some input. The decision-maker buys $Q$ units of the input from the designated supplier at price $p_D$ (which is specified through the frame contract) and sells $Q$ units of the finished product at market price. We assume that the decision-maker faces a linear inverse demand curve of the form $p(Q) = a - bQ$, where $a$ and $b$ are positive constants. To avoid trivial solutions we require $a > p_D$. The integrated organization’s profit is $\Pi_{IN} = aQ - bQ^2 - p_D Q$. 

8
Proposition 1.

Let $Q^*_IN$ denote the purchasing and sales quantity that solves $\max_Q \Pi_{IN} = aQ - bQ^2 - p_D Q$ and let $\Pi^*_IN$ denote the integrated organization's optimal profit.

a) $Q^*_IN = \frac{1}{2b}(a - p_D)$,

b) $\Pi^*_IN = b(Q^*_IN)^2$.

Proof. All proofs are in the appendix.

3.1.2 Laissez-faire Case

Now we analyze the case of a hybrid organization in which the principal delegates the ordering rights to multiple purchasing agents. We analyze the relationship between the principal and one of these agents (in Section 4.2 we discuss our findings with respect to the case of multiple agents). Apart from day-to-day purchasing activities, the principal retains all other (strategic and tactical) activities, such as negotiating frame contracts and determining aggregate (e.g., yearly) purchasing quantities. Most importantly, this implies that the principal still determines the optimal quantity $Q^*_IN$ to be purchased and sold based on her knowledge about the frame contract price and market demand. However, the agent orders the product and receives financial compensation in return. We assume that this compensation payment amounts to $w(Q^*_IN)$. The payment $w(Q^*_IN)$, or short $w^*_IN$, can be divided into a fixed payment—for example, the agent's salary—and a purchasing budget $p_D Q^*_IN$ that covers the cost of purchasing $Q^*_IN$ units of the product at the frame contract price $p_D$. We model only the purchasing budget, because the fixed payment is not relevant to our analysis. Realize that we imply a typical hierarchical planning scheme in which aggregated sales and procurement quantities are determined on a higher level (in our case, the principal) before being passed on to the lower-level purchasing department (the agent) for execution.

Maverick buying comes into play if the agent has an option to buy outside the frame contract (i.e., from a supplier other than the designated supplier) and the principal is not able to observe this action. Our analysis assumes that, if such an outside option exists, it offers the same product features and product quality that the designated supplier offers. In this sense, maverick buying can be interpreted as a hidden action, where the purchasing agent receives the budget $w^*_IN$, pretends to buy $Q^*_IN$ compliant—that is, from the designated supplier—but chooses the outside option.

The purchasing agent will buy maverick if he finds an outside option that yields a lower purchasing price $\gamma_L p_D$ with $0 < \gamma_L < 1$. In the laissez-faire case, the purchasing agent is able to obtain
from buying maverick. Clearly, with the outside option’s increasing cost advantage—that is, decreasing $\gamma_L$—the agent retrieves a higher information rent (budget savings) from buying maverick.\footnote{We assume that the agent has no incentive to buy more or less than what is required by the internal customers (e.g., the production department). Ordering less would lead to a shortage within the organization that would most likely be detected. Ordering more without a corresponding need would probably also be detected.}

In line with previous research (e.g., Antle and Eppen (1985)), we consider the maverick-buying information rent to constitute some slack, which is used for non-essentials that do not create value for the principal. Note that we choose to model the utility of the agent as a price effect that turns into local budget savings. Of course, there are many different reasons for why an agent decides to buy maverick such as, for example, a better suited project, less effort to handle an existing business relationship, etc. (see also our literature review and especially Karjalainen et al. (2009) who provide many examples). In Section 4.3 we conduct a discussion to which cases of maverick buying our model findings also apply to.

If the purchasing agent does not order from the frame contract, the principal will not achieve the full benefits of volume consolidation. We denote by $B > 0$ the principal’s foregone benefits if the purchasing agent chooses to buy maverick, and interpret it as a maverick-buying penalty incurred by the principal. The parameter $B$ may entail higher purchasing prices, higher transaction cost, lost quantity discounts and rebates, etc. Therefore, the penalty essentially captures the total cost of ownership considerations of the principal that the agent does not take into account. In this sense, it can also be interpreted as the principal’s inability to obtain a better outcome from negotiations with the supplier. For now, we assume that the benefits are sufficiently high to justify the volume consolidation—that is, $B > U_{LA}$. We elaborate further on this condition in Section 3.3 and Section 3.4. In theory, one could argue that, in our single-agent setting, the principal should be able to infer the agent’s action by observing whether $B$ is realized. In reality, however, the principal cannot link $B$ to an individual agent’s action. She will, ex post, simply incur the disadvantage without being able to attribute it to a specific agent. Therefore, we assume that the principal cannot infer information from the agent’s action even if the principal incurs $B$. Figure 1 illustrates the sequence of events that can occur if the agent has the ability to buy maverick.

Assume that the principal takes no active measures to avoid maverick buying but simply communicates the volume $Q_{IN}^*$ and transfers the compensation $w_{IN}^* = p_D Q_{IN}^*$. The principal does not know ex-ante whether the agent will buy compliant or maverick, i.e. if the agent is of type $L$, with a specific $\gamma_L < 1$, or of type $H$, with $\gamma_H \geq 1$—this is only dependent on the price of alternative suppliers, for which the principal does not have complete information. We assume that the principal...
Figure 1: Sequence of events in the laissez-faire case

The principal has some prior expectations regarding the agent’s choice. To facilitate our analyses, we assume that the agent can be of the maverick-buying type (i.e. the L-type) or of the compliant type (i.e. H-type). We denote by $\rho$ ($0 < \rho < 1$) the probability that the agent is of the H-type and by $1 - \rho$ the probability that he is of the L-type. Based on these assumptions, we can determine the expected profit associated with the laissez-faire case.

**Proposition 2.**

Let $\Pi_{LA}$ denote the principal’s expected profit in the laissez-faire case.

\[ a) \quad \Pi_{LA} = b(Q_{IN}^*)^2 - (1 - \rho)B, \]
\[ b) \quad \Pi_{LA} - \Pi_{IN} = -(1 - \rho)B < 0. \]

From Proposition 2 it is straightforward to observe that the expected profit in the case of potential maverick buying is always lower than the expected profit in the case of the integrated organization, where maverick buying does not occur. The principal’s expected loss from maverick buying, $(1 - \rho)B$, obviously depends on the probability that the agent is of the maverick buying type and the losses associated with maverick buying. Clearly, the expected loss from maverick buying increases as the probability of maverick buying $(1 - \rho)$ increases and consolidation benefits $(B)$ increase.

### 3.2 Eliminating Maverick Buying: Monitoring and Penalties

We observed that simply contracting the purchasing agent on $Q_{IN}^*$ and $w_{IN}^*$ inevitably results in maverick buying if the agent can identify an attractive outside option. In fact, if the principal undertakes no measures, this kind of relationship between the principal and the agent encourages
maverick buying. Therefore, in most practical settings the principal will try to enforce compliance by employing another agent to monitor some or all of the agent’s transactions and introducing a threat in the form of penalties if maverick buying is detected. In order for the threat of monitoring to be credible the principal announces his monitoring activities prior to the agent’s observation of types (see Figure 1). The principal’s level of monitoring effort can be defined as the relative number of transactions monitored, and higher monitoring efforts increase the probability that maverick buying, if it exists, will be detected ex post. We model the monitoring effort by \( \nu \) and interpret it as the probability of detecting maverick buying. The principal incurs a cost \( c(\nu) \), which depends on the monitoring effort. We assume that monitoring costs are increasing and convex in \( \nu \) (with \( c(\nu = 0) = 0 \)). If maverick buying is detected ex post, the principal imposes a penalty, denoted by \( P \), on the agent. The penalty \( P \) can be thought of as a non-monetary punishment that leads to a disutility on the agent’s side but does not allow the principal to extract the agent’s information rent. The level of \( P \) can be context dependent (e.g., depending on the type of offense) and may include termination of the labor relationship. In many settings (depending on specific regulations), however, such drastic measures will not be feasible and there will be some upper bound on the penalty that leads to punishment with a lower disutility on the agent’s side than termination of the contract. The level of \( P \) also depends on the company’s ability to enforce a punishment.

Monitoring is effective if \( \nu P \) creates a disutility that is at least as high as the agent’s utility in equation (1) from maverick buying. We denote by \( \tilde{\nu} \) the monitoring effort that makes the agent indifferent between compliance and the outside option:

\[
\tilde{\nu} = \frac{U_{LA}}{P}
\]  

(2)

We term \( \tilde{\nu} \) the efficient monitoring effort and assume that, at \( \tilde{\nu} \), the agent will choose to buy compliant.

**Proposition 3.**

Let \( \Pi_{MO}(\nu) \) denote the principal’s expected profit, dependent on the monitoring effort \( \nu \). Let \( \Pi^* \) denote the profit associated with the optimal monitoring level \( \nu^* \).

\(a\) \( \nu^* \in \{0, \tilde{\nu}\} \).

\(b\) \( \Pi^* = \begin{cases} 
\Pi_{MO}(\tilde{\nu}) = \Pi_{IN} - c(\tilde{\nu}) & \text{for } c(\tilde{\nu}) < (1 - \rho)B \\
\Pi_{LA} = \Pi_{MO}(\nu = 0) & \text{for } c(\tilde{\nu}) > (1 - \rho)B.
\end{cases} \)

Proposition 3a shows that it is optimal for the principal to choose between the two monitoring efforts \( \nu = 0 \) and \( \nu = \tilde{\nu} \) (the efficient monitoring effort). On the one hand, the principal can implement monitoring at a level of effort that eliminates the agent’s maverick buying utility. The
efficient monitoring effort \( \bar{\nu} \) prevents maverick buying but causes additional costs \( c(\bar{\nu}) \) that lower the principal’s overall profit. It is difficult for the principal to set the efficient monitoring effort \( \bar{\nu} \) because the principal cannot observe \( U_{LA} \). On the other hand, the principal can implement a monitoring effort \( \nu = 0 \) and accept that maverick buying occurs, in which case the profit equals \( \Pi_{LA} \). The principal should choose to implement the monitoring effort \( \bar{\nu} \) if \( c(\bar{\nu}) < (1 - \rho) B \), and should implement the monitoring effort \( \nu = 0 \) otherwise. The corresponding profits are stated in Proposition 3b.\(^2\)

Despite the comparatively straightforward results, Proposition 3 has several useful implications. First, if the principal implements a monitoring effort \( \nu < \bar{\nu} \), she will not prevent the agent from buying maverick and will not only incur the monitoring cost but will also forego the consolidation benefits \( B \). Clearly, this strategy is inferior to either imposing the efficient monitoring effort \( \bar{\nu} \) or not monitoring at all. Since the principal does not know \( \bar{\nu} \) a priori, there is a considerable likelihood that she will choose a suboptimal monitoring effort. In the following Section 3.3 we will show that a different approach can lead to more favorable results for the principal, even if we assume that the principal is able to set \( \nu \) correctly.

The second useful implication of Proposition 3 is that the efficient monitoring effort \( \bar{\nu} = \frac{U_{LA}}{B} \) depends on the agent’s maverick-buying utility \( U_{LA} = (1 - \gamma_L) p_D Q_{IN}^* \): lower \( \gamma_L \) imply higher cost advantages of the outside option and, as a consequence, higher \( \bar{\nu} \); that is, the principal has to invest more in monitoring to avoid \( B \). Figure 2 depicts the profits \( \Pi_{MO} \) if the principal chooses the optimal monitoring level \( \nu^* \) depending on \( \gamma_L \). We observe that the principal is never able to reach the level of profits of the integrated organization (\( \Pi_{IN}^* \)) if she employs monitoring: \( \Pi_{MO} < \Pi_{IN}^* \) for \( 0 < \gamma_L < 1 \).

We also see in Figure 2 that monitoring does not always improve profits compared to the laissez-faire case. To clarify when to apply which strategy, we rewrite Proposition 3b. In order to keep our results tractable, we assume a quadratic monitoring cost function, \( c(\nu) = \nu^2 \) (\( \nu \in (0, 1) \)).

**Proposition 4.**

*Assume \( c(\nu) = \nu^2 \) (\( \nu \in (0, 1) \)). Let \( \gamma_{MO} \) denote the value of \( \gamma_L \) at which \( \Pi_{MO} = \Pi_{LA} \):

\[
\Pi^* = \begin{cases} 
\Pi_{MO}(\bar{\nu}) & \text{for } \gamma_L \geq \gamma_{MO} \\
\Pi_{LA} & \text{for } \gamma_L < \gamma_{MO}
\end{cases}
\]

with \( \gamma_{MO} = 1 - \frac{2bP}{(a - p_D) p_D} \sqrt{(1 - \rho) B}. \)

Proposition 4 provides a threshold \( \gamma_{MO} \) for the cost advantage of the outside option that de-

\(^2\)For \( c(\bar{\nu}) = (1 - \rho) B \) the principal is indifferent between the strategies.
Figure 2: Expected profits depending on $\gamma_L$

determines whether it is optimal to employ monitoring. If the cost advantage of the outside option is rather low, i.e., $\gamma_L > \gamma_{MO}$, monitoring leads to an increase in profits. Otherwise, if $\gamma_L < \gamma_{MO}$, the principal should accept maverick buying and accept to forgo consolidation benefits. We also observe that $\gamma_{MO}$ decreases in $P$ and $B$, which indicates that monitoring becomes more attractive as the principal’s ability to set the penalty increases and the benefits of consolidation increase. Clearly, under certain conditions $\gamma_{MO} < 0$; then the principal should always implement the efficient monitoring effort (as $c(\bar{\nu}) < (1 - \rho)B$ holds for all $\bar{\nu} \in (0, 1)$). To simplify our explanations going forward, we refer to an agent with $\gamma_L < \gamma_{MO}$ as a successful maverick buyer and to an agent with $\gamma_L > \gamma_{MO}$ as an unsuccessful maverick buyer.

The third useful implication of Proposition 3, with regard to the imposed penalty $P$, is that the penalty must be set sufficiently high. Equation (2) shows that $P$ must be higher than the agent’s maverick-buying utility or the principal will not be able to discourage maverick buying for any $\nu \in [0, 1]$. As discussed before, $P$ may, however, have a natural upper limit, for example because drastic measures are not feasible or enforceable by the company. Therefore, the principal may not be able to force an agent with a low-price outside option to buy compliant, no matter which monitoring effort the principal chooses. The relationship of $\gamma_{MO}$ and $P$ yields an explanation for the existence of maverick buying levels: We showed that the trade-off in monitoring lets the principal forgo consolidation benefits if the agent is a successful maverick buyer. If values for $P$ are rather low and close to the maverick buying utility, $\gamma_{MO}$ will take on values close to 1. In this case, an agent becomes a successful maverick buyer even for an outside option price that is close to 1, and
it becomes efficient for the principal to accept maverick buying even if the agent’s outside option does not have a high cost advantage. The restrictions on \( P \) and its relationship with \( \gamma_{MO} \) may be another explanation for practitioners’ not seeing significant improvements in compliance levels.

In summary, monitoring has significant drawbacks: (i) Monitoring efforts must be set correctly, i.e., corresponding to the agent’s utility from maverick buying, which the principal cannot observe. (ii) Enforcement of compliance via monitoring is particularly challenging when maverick buyers are highly successful. Our results indicate that, in some situations, it may be better to accept the maverick-buying penalty, \( B \) (i.e., if \( \gamma_L < \gamma_{MO} \)) and that, in other situations, monitoring could be ineffective in enforcing compliance (i.e. if \( P < U_{LA} \)). (iii) If the principal employs monitoring, she will always incur an additional cost and can never reach the first-best solution’s level of profit.

These drawbacks indicate that the comparatively low compliance levels seen in practice may be optimal because higher compliance levels can be reached only at significantly higher cost. Therefore, firms may more or less intuitively choose the "right" monitoring effort and maverick-buying levels based on the trade-off we demonstrated in Proposition 4. Clearly, these results are not very satisfying from the principal’s perspective: in any practical setting, the principal is likely to choose a suboptimal monitoring effort (as the principal cannot observe \( U_{LA} \)), to incur the costs of monitoring, and/or to suffer from the negative consequences of maverick buying. Depending on the specific parameter setting, the result may be a substantial gap between the outcome (\( \Pi^* \)) and the profits associated with the first-best solution (\( \Pi^*_{LN} \)). The next section explores a different approach that may enable the principal to reduce this gap through participation in the agent’s ability to identify an attractive outside option.

### 3.3 Participating in the Outside Option

The previous section addressed maverick buying as it is usually perceived: a compliance problem that should be eliminated. However, we showed that eliminating the problem will be costly – possibly prohibitively costly. Another way of interpreting the maverick-buying phenomenon is to see it as a symptom caused by ineffective negotiations of the frame contract and/or inferior market knowledge of the organizational unit responsible for negotiating the frame contract.

This reasoning can be explained as follows: our analysis highlighted that maverick buying is more likely to prevail if the agent can identify attractive outside options (i.e., is of type \( L \) with \( \gamma_L < 1 \)). If the company has good market knowledge and can translate consolidation effects into lower prices, it should be able to negotiate attractive frame contracts, making the relative attractiveness of the outside option low and giving the agent limited or no incentives to buy maverick even at low levels
of monitoring. If maverick buying remains an issue despite monitoring, the company may consider using the agent’s superior market knowledge and participating in better purchasing opportunities, rather than undertaking a costly effort to eliminate maverick buying.

Recall from our previous analysis that maverick buying involves two actions of the agent: choosing the outside option and reporting incorrectly about the choice of supplier. While the first action, which is difficult to avoid, causes a disadvantage on the principal’s side (i.e., \( B \)), the second action prevents the principal from detecting maverick buying and extracting some of the agent’s benefits. For the principal to participate in maverick buying, she must induce the agent to reveal the choice of supplier.

In line with this reasoning, we propose a mechanism in which the principal offers the agent two menus, called participation menus (PM), each of which consists of a combination of the purchasing volume \( Q \) and the transfer payment \( w \). One menu is attractive for an agent who always chooses the designated supplier (i.e., is of type \( H \)), whereas the other menu is tailored to an agent who finds the outside option attractive (i.e., is of type \( L \)). The principal accepts that an agent may choose the outside option but wants to participate in the information rent. For this, the principal offers profit-maximizing menus so that the agent will report his supplier choice truthfully to the principal. These participation menus can be determined by solving the following program:

\[
\max_{(Q,w)} \Pi_{PM} = \rho \left( aQ_D - bQ_D^2 - w(Q_D) \right) + (1 - \rho) \left( aQ_O - bQ_O^2 - w(Q_O) - B \right),
\]

subject to

\[
\begin{align*}
U_D &= w(Q_D) - p_DQ_D \geq 0, \\
U_O &= w(Q_O) - \gamma LP_DQ_O \geq 0, \\
U_D &\geq w(Q_O) - p_DQ_O, \\
U_O &\geq w(Q_D) - \gamma LP_DQ_D.
\end{align*}
\]

The objective function (3a) captures the expected profits of the principal, depending on whether the agent buys from the designated source (subscript "\( D \)", first term in (3a)), or makes use of the outside option (subscript "\( O \)", second term in (3a)). The principal wants to design two menus \((Q_D, w_D)\) and \((Q_O, w_O)\) to maximize her expected profits. Equations (3b) and (3c) are individual rationality constraints that ensure that the agent obtains a non-negative utility from choosing menu \((Q_D, w_D)\) or \((Q_O, w_O)\). Equations (3d) and (3e) are incentive compatibility constraints that ensure that a maverick buyer chooses the \( O \)-menu and a compliant buyer the \( D \)-menu.
Proposition 5.

Let $\Pi^*_PM$ denote the principal’s optimal expected profit and $\{(Q^*_D, w^*_D), (Q^*_O, w^*_O)\}$ denote the corresponding set of participation menus.

a) \[
\left\{ \left( Q^*_D, w^*_D \right), \left( Q^*_O, w^*_O \right) \right\} = \left\{ \left( \frac{1}{2b} \left( a - \gamma_L p_D - \frac{(1 - \gamma_L)p_D}{\rho} \right), p_D Q^*_D \right), \left( \frac{1}{2b} (a - \gamma_L p_D), \gamma_L p_D Q^*_O + (1 - \gamma_L) p_D Q^*_D \right) \right\},
\]

b) $\Pi^*_PM = \Pi^*_IN - (1 - \rho) B + \frac{1}{4b} \frac{1 - \rho}{\rho} ((1 - \gamma_L) p_D)^2$,

c) $\Pi^*_PM > \Pi^*_LA$.

Proposition 5a states the two participation menus that maximize the principal’s profits. It can be directly read off the expression of $Q^*_D$ that the principal benefits from the menus if the agent’s information advantage $(1 - \gamma_L)$ is larger and if the fraction $\rho$ of agents not having this advantage is smaller. From Proposition 5c we observe that participation menus always yield higher profits than the laissez-faire case ($\Pi^*_PM > \Pi^*_LA$). Although the principal still incurs the negative consequences $B$ of not buying from the frame contract with probability $(1 - \rho)$, the principal can increase profits by extracting some portion of the agent’s information rent. The term $\frac{1}{4b} \frac{1 - \rho}{\rho} ((1 - \gamma_L) p_D)^2$ in Proposition 5b represents these benefits.

Clearly, participation menus allow both the principal and the agent to receive a share of the information rent. However, this rent is not equal to the maverick-buying rent, $U^*_LA$, obtained by the agent in the laissez-faire case. We denote by $U^*_PM$ the information rent if the agent picks the $O$-menu and chooses the outside option. The calculation of $U^*_PM$ is straightforward:

\[
U^*_PM = (1 - \gamma_L) p_D Q^*_O = \frac{1}{2b} (1 - \gamma_L) p_D (a - \gamma_L p_D). \tag{4}
\]

Subtracting $U^*_LA$ from equation (4) yields:

\[
U^*_PM - U^*_LA = \frac{1}{2b} ((1 - \gamma_L) p_D)^2 > 0. \tag{5}
\]

The information rent from choosing the outside option when there are participation menus is higher than the maverick-buying rent in the laissez-faire case because of a volume effect. Based on the expressions provided in Proposition 5a, we can determine how the purchasing/sales volumes differ for the $D$-Menu and the $O$-Menu relative to the integrated organization’s optimal quantities:

\[
Q^*_D - Q^*_IN = -\frac{1 - \rho}{\rho} \frac{1}{2b} (1 - \gamma_L) p_D < 0 \tag{6}
\]
\[
Q^*_O - Q^*_IN = \frac{1}{2b} (1 - \gamma_L) p_D > 0. \tag{7}
\]
From equations (6) and (7) we observe that the principal assigns a lower volume to an agent who buys from the designated supplier, while the principal increases the volume for an agent who buys from the outside option. These changes to volumes are what drive the principal’s benefit: the optimal sales quantity increases when the agent buys at a lower price from the outside option. With a higher volume \((Q^*_O > Q^*_IN)\), the information rent increases \((U_{PM} > U_{LA})\).

In exploring how \(U_{PM}\) is shared between the principal and the agent, we find that the principal not only receives the increment in information rent \((U_{PM} - U_{LA})\) but also extracts an even larger portion, suggesting that the agent sacrifices some part of \(U_{LA}\) that he would have obtained in the laissez-faire case. We denote by \(U^*_O\) the information rent that the agent receives if there are participation menus. Inserting \(Q^*_O\) (from Proposition 5a) into equation (3c) yields \(U^*_O\):

\[
U^*_O = \frac{1}{2b} (1 - \gamma_L)p_D(a - \gamma_Lp_D - \frac{(1 - \gamma_L)p_D}{\rho})
\]  

(8)

Subtracting \(U^*_O\) from \(U_{LA}\) yields:

\[
U_{LA} - U^*_O = \frac{1}{\rho} \frac{1}{2b} ((1 - \gamma_L)p_D)^2 \geq 0
\]  

(9)

Figure 3 illustrates how the information rent changes and how it is shared between the principal and the agent. The agent’s share of the information rent decreases compared to his utility in the laissez-faire case, while the principal receives not only the full benefits of the volume effect \((U_{PM} - U_{LA})\) but also the agent’s reduction, \(U_{LA} - U^*_O\). Clearly, both parts of the principal’s share increase in the attractiveness of the outside option. In addition, \(U_{LA} - U^*_O\) decreases with the probability that the agent is of the compliant type. The changes to the information rent are important because they show that, in addition to improving profits \((U_{PM} - U_{LA})\), the principal also reduces slack \((U_{LA} - U^*_O)\) when participation menus are applied, as less money is spent on non-essential activities.
It is also interesting to understand how $\gamma_L$ influences the principal’s profits. The results presented in Proposition 5b highlight that, with decreasing $\gamma_L$ (i.e., increasing attractiveness of the outside option), the principal’s benefits from extracting some of the agent’s rent increase (see Figure 4). As the cost disadvantage of the laissez-faire case (i.e., $(1 - \rho)B$) is independent of $\gamma_L$, the participation menus are superior to the laissez-faire case, with the benefits increasing with the attractiveness of the outside option. In addition, for very low consolidation benefits, $B$, and/or a high maverick-buying information rent, the principal could increase profits above the integrated case (i.e., $\Pi^*_P > \Pi^*_IN$). We consider this special case in Section 3.4.

Figure 4: Principal’s profits depending on $\gamma_L$

Of course, we are also interested in how the participation menus perform relative to monitoring, as discussed in Section 3.2. From Proposition 4 we know that successful monitoring depends on the attractiveness of the outside option (i.e., $\gamma_L$), so the performance of both mechanisms—monitoring and participation menus—depends on $\gamma_L$, although their functional relationships with $\gamma_L$ differ. To illustrate this relationship, Figure 4 plots the profits associated with monitoring and those associated with participation menus dependent on $\gamma_L$. Figure 4 shows that, below a certain threshold of $\gamma_L$ (denoted by $\gamma_{PM}$), participation menus perform better than monitoring does, but beyond $\gamma_{PM}$ monitoring leads to higher profits than participation menus do. Proposition 6 formalizes this relationship.
Proposition 6.

Let \( \gamma_{PM} \) denote the threshold value of \( \gamma_L \) at which \( \Pi^*_{PM} = \Pi_{MO} \), and let \( \Pi^* \) denote the profit of the optimal strategy.

\[ a) \quad \gamma_{PM} = 1 - \frac{2b_p}{p_D} \sqrt{\frac{a(1-p)}{(1-p)p^2 + p(s-p_D)}} B. \]

\[ b) \quad \Pi^* = \begin{cases} \Pi_{MO} & \text{for } \gamma_L > \gamma_{PM} \\ \Pi_{PM} & \text{for } \gamma_L < \gamma_{PM}. \end{cases} \]

\[ c) \quad \gamma_{MO} < \gamma_{PM}. \]

The threshold \( \gamma_{PM} \) indicates at which level of \( \gamma_L \) it is better to employ participation menus instead of monitoring. If the outside option is attractive (i.e., for lower values of \( \gamma_L < \gamma_{PM} \)), it is better for the principal to participate in the agent’s information rent than to exert costly monitoring efforts, as the information rent extracted by the principal is high and compensates for some of the losses, \( B \). For higher values of \( \gamma_L > \gamma_{PM} \), the principal should employ monitoring, as the principal cannot extract a sufficiently high information rent to compensate for \( B \) and offset the cost of monitoring.\(^3\)

The results provided in Proposition 6 have two implications for the principal’s strategy for dealing with maverick buying. First, applying participation menus can be a complementary strategy to monitoring: Section 3.2 showed that monitoring fails when the principal is faced with a highly successful maverick buyer (i.e., when \( \gamma_L < \gamma_{MO} \)). It is interesting to note that our participation menus perform particularly well in these cases. Because \( \Pi_{PM} \) increases as the attractiveness of the outside option increases (see Proposition 5) and \( \gamma_{MO} < \gamma_{PM} \), we can conclude that participation menus have the largest potential when monitoring fails to deliver additional value to the principal. The second implication for the principal’s strategy is that participation menus can also substitute for monitoring: when \( \gamma_{MO} < \gamma_L < \gamma_{PM} \), both monitoring and participation menus increase performance over performance in the laissez-faire case. However, the results presented in Proposition 6 demonstrate that in these instances the principal will realize higher profits with participation menus than with monitoring. Therefore, for \( \gamma_{MO} < \gamma_L < \gamma_{PM} \), the principal should employ participation menus rather than monitoring the agent. Recall from Proposition 4 that, if only monitoring was available as a mitigation strategy, the principal would monitor if \( \gamma_L > \gamma_{MO} \). However, if we also consider participation menus as a way to cope with maverick buying, the principal should employ monitoring only if \( \gamma_L > \gamma_{PM} \) (see Proposition 6b). Because \( \gamma_{PM} > \gamma_{MO} \) (see Proposition 6c), the maximum monitoring effort that the principal is willing to exert to force an agent to buy compliant decreases. Therefore, if it is optimal for the principal to monitor, she will incur lower maximum

\(^3\)For \( \gamma_L = \gamma_{PM} \), the principal is indifferent between both strategies.
monitoring costs.

In summary, participation is superior to simply accepting the agent’s non-compliance, and participation menus can be a strategic complement or a substitute for monitoring. Participation menus perform particularly well when there are highly attractive outside options and when monitoring fails.

3.4 Leveraging the Outside Option

The previous analyses assumed that the benefits of consolidation, $B$, are high because the principal’s initial motivation to establish a frame contract with a designated supplier was the benefits of doing so on an aggregate level. If the principal negotiates a superior frame contract, the disadvantages of not being able to comply with the frame contract, $B$, should be higher than the benefits from the outside option. However, we indicated (in conjunction with Figure 4) that, when $B$ is low and/or information rent from the outside option is high, the principal may be able to increase profits beyond the integrated case. We now explore this particular situation in detail.

From Proposition 6 we know that profits from the participation menus depend on $\gamma_L$. We relax the assumption that the benefits of consolidation are higher than the maverick buying utility and only assume $B > 0$. Figure 5 presents the profits, depending on $\gamma_L$, if $B$ is low. (We are more specific regarding the notion of "low" later on.) We observe that, when $\gamma_L$ is high, the profits of participation menus ($\Pi_{PM}^*$) remain lower than the profits of the integrated organization ($\Pi_{IN}^*$). However, participation menus outperform the integrated case for $\gamma_L$ below a certain threshold. We formalize this relationship in Proposition 7.

Proposition 7.

Let $\gamma_{LE}$ denote the threshold value $\gamma_L$ at which $\Pi_{PM}^* = \Pi_{IN}^*$, and let $\Pi^*$ denote the profit of the optimal strategy:

a) $\gamma_{LE} = 1 - \sqrt{4\rho B p^2 D}$.

b) $\Pi^* = \begin{cases} 
\Pi_{PM}^* < \Pi_{IN}^* & \text{for } \gamma_{PM} > \gamma_L > \gamma_{LE} \\
\Pi_{PM}^* > \Pi_{IN}^* & \text{for } \gamma_L < \gamma_{LE}.
\end{cases}$

c) $\gamma_{LE} < \gamma_{PM}$.
When $\gamma_L < \gamma_{LE}$, participation menus yield a higher profit than the integrated organization does. The initial premise of the principal to implement a frame contract with a designated supplier was to reap consolidation benefits, but the success of this strategy depends on the level of these consolidation benefits $B$ and the attractiveness of the outside option $\gamma_L$. Our results suggest that, rather than strictly enforcing compliance, for certain parameter settings (captured by $\gamma_{LE}$) the principal should take advantage of the agent’s superior market knowledge.

From Proposition 7a we see that $\gamma_{LE}$ decreases in $B$, such that, as the consolidation benefits increase, $\gamma_{LE}$ decreases. Consequently, in order to leverage the agent’s knowledge, the attractiveness of the outside option must be high (i.e., $\gamma_L < \gamma_{LE}$). The relationship between consolidation benefits and the attractiveness of the outside option therefore determines whether the principal can participate in the information rent or even leverage the agent’s superior market knowledge. If $\gamma_{LE} \leq 0$, the integrated case is strictly superior to the participation menus. Rearranging terms in Proposition 7a yields the minimum consolidation benefits: $B_{min} = \frac{2}{\delta b}$. If negotiating a frame contract yields higher benefits than these minimum consolidation savings (i.e., $B > B_{min}$), the integrated case is strictly superior to the participation menus. Even if there is a highly attractive outside option, the principal cannot extract a sufficiently high information rent. However, if the consolidation savings are lower than these minimum consolidation savings (i.e., $B < B_{min}$), the outcome depends on the attractiveness of the outside option. If $B < B_{min}$ and $\gamma_L < \gamma_{LE}$, participation menus yield higher profits than the integrated organization does (see Proposition 7b). Therefore, if the benefits from
consolidation $B$ are smaller than the aggregate maverick buying utility, maverick buying is efficient and the firm should not conclude a framework contract in the first place.

In summary, in some cases the principal can not only participate in maverick buying but can also leverage the outside option with participation menus. In these cases, instead of enforcing a frame contract (with its additional monitoring costs) that yields low consolidation benefits, the principal should enable the agent to buy from the outside source, participate in the superior purchasing opportunities, and reduce overall purchasing costs.

4 Discussion & Practical Implications

4.1 Practical Implementation of Participation Menus

In the previous section we developed a formal and somewhat stylized model to study how the principal can participate in the agent’s superior purchasing capabilities and alleviate at least some of the negative effects associated with maverick buying. We now aim to explain how this approach may be implemented and put into practice. Our results suggest that firms must depart from their typical hierarchical planning principle in which purchasing budgets are defined on a higher level of the organizational hierarchy—based on planned sales volumes and frame contract prices—and then passed down to a local department for execution. Instead of setting, top-down, a fixed budget for the local agent, firms should take a more differentiated approach. The participation menus suggest that the budget should be determined by negotiations between the principal (central purchasing department or higher-level management) and the agent (purchasing manager responsible for procurement in a department). These negotiations also include an information exchange about the feasibility and attractiveness of the frame contract and the outside option. More specifically, the agent not only has the opportunity, but also an incentive to inform the principal about attractive outside options. The principal acknowledges the outside option and re-evaluates the budgets. Similar to Yang et al. (2012) and Li (2013) who apply mechanism design to capture the outcome of a negotiation between a buyer and its supplier, our participation menus can be interpreted as a negotiation between the central purchasing department and its local counterpart. In practice, the negotiations allow the principal and the agent to exchange information, resulting in different outcomes depending on whether the agent chooses the frame contract or has an attractive outside option. The crucial component of a successful implementation of this approach is the opportunity to obtain and share benefits depending on the attractiveness of an outside option. In case of a lower price outside option budget savings are shared between the principal and the agent. In our modelling section we highlighted that the principal is able to partake in a volume effect and to re-
duce slack in the organization. The volume effect reflects the benefits of a low-price outside option in which the principal can now participate. The notion of slack, however, is very interesting from a central planner’s perspective. Slack typically captures resources that are used for non-essentials and that do not create value to the principal (e.g. Antle and Eppen, 1985). In case of budget savings this may be non-essential projects on the local department’s level. In lowering the slack and rededicating it to other projects, the principal benefits on his own terms.

Our base model assumed that the firm transforms a single input into a single output. This is a standard assumption to ensure tractability and comprehensiveness of the analysis. The question is, however, whether this simplification has any practical implications in terms of the applicability of our results—especially because maverick buying is most prevalent in the context of indirect spend where a direct relationship between input and output does not exist. For indirect spend categories, such as travel, mobility, IT, tools etc., our notion to implement a negotiation between the principal and the agent prevails. Both parties exchange information and agree on two different budgets for choosing either the outside option or the frame contract. In case the agent chooses the outside option the principal can reduce the slack and participate in the benefits of the outside option. Since there is no direct input-output-relationship, however, the principal will—in the short term—not be able to participate in the volume effect. In consequence, applying our participation menus to these categories will not result in an immediate additional benefit from the volume effect. However, the volume effect can be expected to materialize in the medium term. Lower procurement costs for indirect material will reduce the total landed costs of the finished products—more specifically, they will lead to lower allocations of indirect costs. In consequence, if costs decline it will—in the medium term—make it optimal for the company to sell a larger quantity at lower prices. Therefore, decision makers can expect to see a volume effect if participation menus are applied to indirect spend categories. Due to the indirect nature, it will, however, materialize later in time. Thus, the rationale of our participation menus is also valid for indirect materials. Independent of the type of category, our menus are especially beneficial if there is an attractive outside option, there is bound to be a high level of maverick buying, and conventional monitoring fails to prohibit maverick buying.

Also, note that our model does not only apply to a situation where the local benefit stems from procurement cost savings. Our model captures any situation where there is a local utility that can be shared among the principal and the agent. For example, in instances where the agent is able to significantly lower his effort, the local utility may come from a lower capacity utilization in the procurement process. Freed up capacity may be dedicated to other tasks the agent and the principal agree on. We discuss this extension of our model in Section 4.3 where we transfer the findings to different maverick buyer types that were previously identified by Karjalainen et al. (2009).
4.2 Participation Menus with Multiple Agents

In Section 3 we provided a formal analysis of the maverick-buying problem, assessed the feasibility and success of conventional approaches to mitigating maverick buying (monitoring), and proposed a mechanism that allows the principal to participate in or even leverage the purchasing agent’s ability to identify attractive outside options. For reasons of analytical tractability, we addressed the maverick-buying problem in a comparatively simplistic and stylized setting, focusing on the relationship between the principal and a single agent. However, as highlighted in Section 1, maverick buying is particularly relevant in hybrid purchasing organizations with many business units (multiple agents) that purchase the same or similar inputs (Faes et al., 2000; Munson and Hu, 2010). Inevitably, the question arises whether our analytical results also provide insights and guidance for more complex business situations with multiple agents.

We consider monitoring first, as it is the conventional and probably the most common way to deal with maverick buying. Section 3.2 showed that the principal has two levers that determine the extent to which monitoring is successful in eliminating maverick buying: the monitoring effort $\nu$ and the penalty $P$. It is reasonable to assume that constant $\nu$ and $P$ would apply to multiple business units (purchasing agents): the penalty for non-compliant behavior will not depend on which agent is non-compliant, and monitoring is carried out by a separate department that chooses transactions to be monitored randomly. For the single-agent case we determined an efficient monitoring effort, $\bar{\nu} = \frac{P}{U_{LA}}$, that induced the agent to buy compliant. However, in the multi-agent case, it is significantly more difficult to set the "right" monitoring effort because each agent can have a different efficient monitoring effort, depending on his or her maverick-buying utility, which is unknown to the principal. To eliminate maverick buying completely, the principal would have to set the monitoring effort according to $U_{LA}$ of the agent who obtains the highest information rent, as a lower monitoring effort would inevitably fail to eliminate maverick buying. In theory, it is possible to determine an optimal monitoring effort (see Groetsch et al., 2012); because of the trade-off between the positive impact of monitoring (dependent on $B$) and the cost of monitoring, it may not be optimal to eliminate maverick buying completely, a result we also found for the single-agent case. This leads to a rather positive explanation for why organizations face substantial maverick-buying levels (Patel, 2006; Bartolini, 2012; Dwyer, 2011b; Lonsdale and Watson, 2005) even though they have implemented monitoring: they chose the optimal monitoring level based on the aforementioned cost trade-offs, but this level is not sufficient to completely eliminate maverick buying. If this notion holds true they deliberately accept maverick buying, at least to some extent.

As we demonstrated in conjunction with Proposition 4, the success of monitoring largely depends
on the agents’ success in identifying attractive outside options, and we saw that there are situations in which a company can be worse off by implementing monitoring compared to the laissez-faire case. The results demonstrated in Proposition 4 can be directly applied to the multi-agent case: if a company has agents who are highly successful maverick buyers (i.e., who exhibit low agent-specific $\gamma_L$), it may be more costly to monitor than to accept maverick buying. Finally, our results also point towards a rather negative explanation for the persistence of high maverick-buying levels in practice: when faced with many agents that obtain varying and unknown information rents from "buying maverick", the principal may fail to set the right monitoring level and, even worse, choose costly monitoring even when it is largely ineffective.

Our results for the single-agent case suggest that participation menus are particularly beneficial if the principal has a highly successful agent (i.e., with a low $\gamma_L$) and less favorable if the agent is less successful (with $\gamma_L$ close to 1) (see Proposition 6 and Figure 3). Therefore, the performance of monitoring and the performance of participation menus are inversely related to $\gamma_L$ and can be considered complementary measures.

These results can be extended easily to the multiple-agent case: clearly, a principal who has only highly successful maverick buyers should employ participation menus instead of monitoring and vice versa. More interestingly, however, we can also extend our results to the case of heterogeneous agents, i.e., the principal faces both successful and unsuccessful agents. In such instances, the company should resort to a combination of low monitoring effort and participation menus, as a low monitoring effort would be sufficient to incentivize compliant behavior of the agents who have less attractive outside options, while the participation menus would allow the principal to participate when agents identify attractive outside options. Depending on the characteristics of the agents, it may even be optimal for the company to lower its costly monitoring effort when it combines monitoring with participation menus (see our results in conjunction with Proposition 6c.) This combination of strategies would then yield three advantages: (1) extraction of some portion of the agents’ information rent, (2) reduction of slack and exploitation of the quantity effect, and (3) reduction of the monitoring costs.

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4For reasons of tractability, we proposed a two-type setting that can be extended easily to a continuous-type setting with the same results (Laffont and Martimort, 2001). As the functional forms that reflect our business scenario for the two-type setting (and by extension of the continuous-type setting) are highly intuitive, the continuous-type solution offers a more concise solution that reflects all potential types. However, as Laffont and Martimort (2001) show, the continuous-type setting does not change the intuition.
4.3 Participation Menus for Other Types of Maverick Buyers

Based on the categories of maverick buying presented by Karjalainen et al. (2009), we developed our model for the so-called well-intentioned agent. Clearly, the question arises whether the insights derived for this type of maverick buyer can also be applied to other agent types, especially the casual and the ill-intentioned maverick buyer. In this section we discuss our model and insights in light of the casual and the ill-intentioned maverick buyer. We then also briefly explain effects on those forms of maverick buying that are not primarily caused by a hybrid organizational set-up, i.e. unintentional and forced maverick buying.

Both in practical terms and with respect to our model the main difference between the well-intentioned and the casual and ill-intentioned maverick buyer lies in the source of the agent’s utility from buying maverick. In our model, the well-intentioned maverick buyer has a utility \( U_{LA} = (1 - \gamma_L)p_DQ^*_IN \) in the form of an information rent (budget savings) that stems from a lower price outside option. Consider now a casual maverick buyer. Despite the fact that he knows about the frame contract, this type of maverick buyer procures from the outside option because he benefits himself with no intention to inflict damage on the organization (see Karjalainen et al., 2009, p. 253). In practice this may, for example, occur if the agent lacks total cost of ownership insight and perceives a higher effort for complying with the frame contract instead of buying from his well-known supplier. In this case, maverick buying induces a positive utility that is determined by the effort levels associated with buying maverick vs. buying compliant. In our model we can capture this as follows: let \( e_D \) denote the per unit effort (measured, for example, in dollars per unit ordered) to procure from the designated supplier. Then, \( \gamma_L \) reflects the relative reduction in effort for procuring from the outside option. The agent’s utility from choosing the lower effort source is similar to our original formulation and now amounts to \( U_{LA} = (1 - \gamma_L)e_DQ^*_IN \). Applying the participation menu to this situation results in the principal and the agent negotiating over different capacity levels to order different volumes. The principal participates if the capacity freed up by the lower effort of the agent is dedicated to other value-creating projects. With an outside option that induces a lower effort, the overall utility amounts to \( U_{PM} = \frac{1}{2}(1 - \gamma_L)e_D(a - \gamma_LP_D) \) (see equation (4)) to be shared among the principal and the agent (as discussed in Section 3.4). In line with our model, the principal can again reduce slack as he reduces the utility for the agent and participate in the volume effect.

Similarly, we can apply the participation menus to an ill-intentioned agent. This agent has his own or his department’s best interest at heart, but is willing to accept that his actions have a negative overall effect on the company (principal) (see Karjalainen et al., 2009, p. 253). Note the
difference to our previous situation of the casual maverick buyer. The ill-intentioned agent knows that maverick buying induces higher total costs of ownership but is willing to accept this in order to reduce the purchasing effort of his department. Again, there is a positive utility from buying maverick that can, once again, be expressed as $U_{LA} = (1 - \gamma_L) e_D Q^*_N$, resulting in the same logic as for the casual maverick buyer.

Notice that for the casual and the ill-intentioned maverick buyer our participation approach is feasible and leads to an overall improvement. However, these cases have one feature in common that is crucial for our insights and implications to hold: there is a utility from maverick buying that can be shared among the principal and the agent. Consider the case of an ill-intentioned agent who receives a private reward for buying maverick (e.g. a personal kick-back or even a bribe). Obviously, this reward cannot be shared with the principal. When offered different menus, the agent will always choose the frame contract; he will pretend to buy compliant and collect his private reward. Thus, participation menus will not change the behavior of an agent who receives a private reward that cannot be shared with the principal.

From this discussion we conclude that the applicability of our participation approach does not hinge on the type of maverick buyer, but on the type of utility (benefit) the agent obtains from behaving non-compliant. Participation menus will fail if an agent benefits from maverick buying because he receives a private reward, e.g. in the form of a private kick-back or a bribe. To a certain extent this limits the results of our analysis and the applicability of our model. However, the main purpose of our approach was to remedy incentive issues inherent to hybrid purchasing organizations. It is not surprising that these approaches fail when there is intentional wrong doing that may even be illegal.

Although this does not lie at the heart of our study, we briefly discuss the effect of participation menus on those forms of maverick buying that are not primarily caused by a hybrid organizational set-up, i.e., unintentional (agent does not know about the available frame contract) and forced (agent cannot use the frame contract product) maverick buying (Karjalainen et al., 2009). Presenting participation menus to an unintentional maverick buyer will eliminate this form of maverick buying as the participation menus necessarily make the agent aware of the frame contract. Not only would the participation menus create awareness about the existence of the frame contract on the agent’s side. Our participation menus would also allow the agent to choose if he wants to procure from the frame contract or select his outside option and share benefits with the principal. Thus, offering participation menus will likely prevent the unintentional maverick buyer from becoming casual, well-intentioned, or ill-intentioned without sharing benefits with the principal. Our participation menus would not have any effect on forced maverick buying. In this case the agent simply has no
frame contract to choose from, independent of any incentives.

5 Conclusions

Maverick buying is a serious problem in hybrid purchasing organizations because it diminishes the benefits associated with the consolidation of purchasing volumes. This paper provides a formal analysis of the maverick-buying problem under incomplete information. Based on a principal-agent type of setting we demonstrate why the typical mitigation mechanism, monitoring, fails to eliminate maverick buying. Our analysis reveals that full compliance is impeded by highly successful maverick buyers (i.e., agents who retrieve high rent from maverick buying) and that traditional mitigation techniques structurally fail to enforce compliance because they cannot eliminate the agent’s rent. These insights help to explain why companies continue to face considerable levels of maverick buying, a fact supported by extensive empirical evidence.

We propose that, instead of making a costly effort to enforce compliance, the company (principal) should try to participate in the rents that agents obtain from buying outside a frame contract. Our results indicate that the principal can improve her profits by applying participation menus. Designed correctly, participation menus allow an agent to report his supplier choice truthfully so the principal can participate in the agent’s information rent. We demonstrate how the principal should structure the participation menus, explain their sensitivity to relevant parameters, and show that they are especially effective with a successful maverick buyer whose opportunistic behavior would otherwise impair consolidation benefits. Participation menus complement the traditional mitigation techniques: while monitoring can be an effective measure when agents cannot identify attractive outside options, participation menus are particularly suitable when the principal has highly successful maverick buyers. Combining both approaches when the principal has both successful and less successful maverick buyers enables the principal to extract some of the information rent and to lower his or her costly monitoring effort.

Our results indicate that, as long as the consolidation benefits are high, participation menus improve the principal’s profits over those seen with a laissez-faire approach, where the principal undertakes no measures to avoid maverick buying, but that the principal cannot achieve the same profits as in the reference case of the integrated organization. However, we also derived conditions under which this does not hold true: Our results suggest that, if consolidation benefits are comparatively low and an agent has an attractive outside option, the principal can leverage the agent’s superior market knowledge and achieve benefits that go beyond those of the integrated organization. Under these circumstances, a principal should offer menus in order to participate in the agent’s superior market knowledge, rather than trying to eliminate/reduce maverick buying.
The results of our formal analyses were obtained in a simplified and somewhat stylized single-agent setting. In particular, we assume that the principal can identify a distribution of types which may be difficult to realize in practice. However, the principal should be able to provide estimates if there is only a small or a large chance of an agent having an outside option and if that outside option is particularly valuable (low priced) or not. These estimates should be sufficient to provide menus and induce an agent to reveal the outside option. Moreover, while we generated some insights and suggestions concerning how these results may extend to the more realistic case of multiple autonomous agents, they were not based on rigorous formal analysis. Exploring strategies to cope with maverick buying in a setting with multiple successful and unsuccessful agents in a more formal way would be a useful area for future research.
References


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Appendix

Proof to Proposition 1

\[
\frac{d\Pi^*_N}{dQ} = 0 \iff Q^*_N = \frac{1}{2b}(a - p_D),
\]

\[
\frac{d^2\Pi^*_N}{dQ^2} < 0,
\]

\[\Pi^*_N = aQ^*_N - b(Q^*_N)^2 - p_DQ^*_N = b(Q^*_N)^2.\]

\[\square\]

Proof to Proposition 2

A formal proof is omitted; the formulation of a) is a direct result of the functional form and the result in b) can be obtained by simple algebraic manipulation.

Proof to Proposition 3

a) A formal proof is omitted; the formulation is a direct result of the functional form and the result in b).

b) Principal’s profit with effective monitoring: \(\Pi_{MO}(\bar{\nu}) = aQ^*_N - b(Q^*_N)^2 - p_DQ^*_N - c(\bar{\nu})\). Algebraic manipulation of the profit functions yields: \(\Pi_{MO} > \Pi_{LA} \iff c(\bar{\nu}) < (1 - \rho)B \) and \(\Pi_{MO} < \Pi_{LA} \iff c(\bar{\nu}) > (1 - \rho)B\)

\[\square\]

Proof to Proposition 4

a) \(\Pi_{MO}(\bar{\nu}) = \Pi_{LA}\) yields \(\gamma_{MO} = 1 - \frac{2b\rho}{(a - p_D)p_D} \sqrt{(1 - \rho)B}\).

b) Proof of part a) yields the intersection. For \(0 < \gamma_L < 1\) the derivatives \(\frac{\partial \Pi_{MO}}{\partial \gamma_L} > 0, \frac{\partial^2 \Pi_{MO}}{\partial \gamma^2_L} < 0\), \(\frac{\partial \Pi_{LA}}{\partial \gamma_L} = 0, \frac{\partial^2 \Pi_{LA}}{\partial \gamma^2_L} = 0\) hold. This allows us to conclude Proposition 4b.

\[\square\]

Proof to Proposition 5

a) Assume (3b) and (3e) are binding. Substituting \(w(Q_D)\) and \(w(Q_O)\) in (3a) and setting differentials w.r.t. \(Q_D\) and \(Q_O\) equal to zero yields after algebraic manipulation \(Q_D^*\) and \(Q_O^*\). \(\frac{d^2\Pi_{PM}}{dQ^2_D} < 0\) and \(\frac{d^2\Pi_{PM}}{dQ^2_O} < 0\) confirm maximum. Substituting \(Q_D^*\) and \(Q_O^*\) show that (3c) and (3d) hold.

b) A formal proof is omitted; the results can be obtained by simple algebraic manipulation.

c) A formal proof is omitted; the results can be obtained by simple algebraic manipulation.
Proof to Proposition 6

a) $\Pi_{MO}(\bar{\rho}) = \Pi^*_{PM}$ yields $\gamma_{PM} = 1 - \frac{2bP}{\rho D} \sqrt{\frac{\rho(1-\rho)}{(1-\rho)bP^2 + \rho(a-p_D)^2}} B$. □

b) Proof of part a) yields the intersection. For $0 < \gamma_L < 1$ the derivatives $\frac{\partial \Pi_{MO}}{\partial \gamma_L} > 0$, $\frac{\partial^2 \Pi_{MO}}{\partial \gamma^2_L} < 0$, $\frac{\partial \Pi^*_{PM}}{\partial \gamma_L} < 0$, $\frac{\partial^2 \Pi^*_{PM}}{\partial \gamma^2_L} > 0$ hold. This allows us to conclude Proposition 6b. □

c) $\gamma_{MO} < \gamma_{PM}$ simplifies to $(1 - \rho) bP^2 > 0$ which strictly holds. □

Proof to Proposition 7

a) $\Pi_{PM}^* = \Pi_{IN}^*$ yields $\gamma_{LE} = 1 - \sqrt{\frac{\rho D}{B}}$. □

b) Proof of part a) yields the intersection. For $0 < \gamma_L < 1$ the derivatives $\frac{\partial \Pi_{PM}}{\partial \gamma_L} < 0$, $\frac{\partial^2 \Pi_{PM}}{\partial \gamma^2_L} > 0$ hold. This allows us to conclude Proposition 7b. □

c) $\gamma_{LE} < \gamma_{PM}$ simplifies to $\rho (a - p_D)^2 > 0$ which strictly holds. □