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Abstract

Information about environments and customers is often localized such that, salespeople are likely to be more informed and knowledgeable about the environment than their supervisors. Under such information asymmetry between the firm and the salesperson, theory suggests that, optimally, the firm should leverage the information and secure value from it by delegating decision-making authorities to the salesperson. We use insights from the sales management literature and practice to suggest that firms can choose to delegate (or not) decision authorities to salespeople along two broad sets of activities– those that prospect, target, and cultivate customers and those that negotiate price and close sales. We term the delegation decision on the first set of activities as task delegation and for the second set of activities as price delegation, and then, we explore the relationship between these two types of delegation and how their interaction impacts the salesperson's productivity. Using proprietary data on salespeople selling industrial equipment, we find that consistent with theory, firms delegate both pricing and task-related activities when the salesperson has significant information advantage over the firm (his sales manager); otherwise they centralize (i.e. the firm decides the task and price related activities). We also find complementarity between these two decision rights; that is, the sales person achieves higher level of productivity only when the task and price decisions are both either delegated to him or decided upon by the firm (his manager) but not when one decision is delegated and the other is centralized. Finally, we find that a salesperson's experience enhances their complementary effect. Our results provide theoretical insights and managerial guidance on when, how, and to whom should firms allocate sales-related decision rights.

Key words: Price Delegation, Task Delegation, Incentives, Commissions, Information Asymmetry, Decision Rights, Salesforce Management

Organizational design involves the important issue of decision rights allocation between the firm and its employees; that is, the issue of centralization versus delegation (Brickley et al. 2009; Jensen and Heckling 1995; Jensen and Meckling 1976; Prendergast 2002). Theory suggests that the firm can enable the employee by delegating decision rights when the agent has information advantage (Lal 1986; Aghion and Tirole 1997); otherwise, performance may suffer (e.g., Homburg et al. 2012). Empirical work has found salesforce a futile ground to examine the issue of allocating decision rights and shown that delegating authority incentivizes effort, motivates customer servicing (e.g., Lo et al. 2016; Martin and Bush 2006; Rapp et al. 2006; Schmitz et al. 2014; Spreitzer 1995), and can facilitate sales outcomes (Homburg et al. 2012). At the same time, empirical studies on salesforce delegation looks at *either* agents' discretion to adjusting price—namely "pricing authority" (Stephenson et al. 1979) *or* agents' capability to approaching prospective customers, adopting sales activities, and customizing product offering – namely "tasking authority" as if the two kinds of decisions were independent (Aghion and Tirole 1997; Schmitz et al. 2014; Spiro and Weitz 1990; Sujan et al. 1994; Weitz et al. 1986). This is contrast to what recently work on organizational governance suggests and what firms practice: companies often decide on how to allocate decision rights as a coherent governance system in terms of *both* pricing and tasking authorities (Zoltners et al., 2004; Brickley et al. 2009; Brynjolfsson and Milgrom 2012).

To understand how such governance works as a system, our paper examines three inter-related issues on delegation versus centralization of authorities in the context of industrial equipment salesforce. These three issues are: (i) the environmental and firm factors that determine the extent of salespeople's pricing and tasking authorities, (ii) the

interdependence of the two authorities and their interaction effect on productivity in terms of sales growth, and (iii) how salesperson's experience moderates the effect of the two kinds of sales authority on productivity.

Industrial sales are an appealing context to investigate these issues for several reasons. First, the industrial equipment sold by these salespeople is complex: sales approaches, product offering, and services are often tailored to fit customer preferences (Ghosh et al. 2006). Routinely interacting with customers in the field, salespeople are in the best position to collect customers' information and assess their idiosyncratic needs and willingness to pay (Morgan and Hunt 1994; Weinberg 1975). Indeed, allocating pricing and sales-task authorities to salespeople seems to be a common industrial practice. Second, given field requests of price flexibility and product customization in industrial equipment sales, sales managers often confront the question on control and hence the extent of delegations they should provide to salespeople to optimize sales outcomes. Third, when industrial equipment manufacturers decide to delegate sales-related decision rights, it is almost always at the individual salesperson's level (Lo et al. 2016). Since knowledge and competence accumulated by salespeople are crucial in industrial products, it is important to examine how salesperson's experience interacts with pricing and tasking authorities and impacts sales productivity.

Our empirical framework is based on what the literature has conceptualized on how salespeople accomplish their work through a series of activities in an integrated sales process (Dubinsky 1981; Moncrief and Marshall 2005). This sales process is also known as the "sales funnel" (Mantrala et al. 2010), which typically consists of several stages: a salesperson identifies clients and opportunities in the prospecting stage; he uncovers

client needs in the cultivating stage; in the positioning stage, the salesperson demonstrates value and develops product offerings; and finally, he delivers a compelling proposal, including the price, in the sale-closing stage. Figure 1[1] concisely illustrates this process.

[Insert Figure 1 about here]

Based on managerial practices (Zoltners et al. 2004, pp.78-82), we posit that tasking and pricing authorities correspond to enabling salespeople effort in the initial stages of prospecting, targeting, and cultivating customers and the last stage of closing the sale, respectively. Specifically in our context, tasking authority involves a salesperson's discretion to decide on call plans, customer acquisition and servicing, and product offering whereas pricing authority takes the form that the salesperson may unilaterally discount up to a certain percentage off the list price without getting approval from his superior. Under the framework of sales funnel, the decisions to centralize or delegate the two kinds of authority are interdependent decisions embedded in a process of information flow and interpretation (Homburg et al. 2012).

Consistent with theoretical predictions and most empirical studies, we find factors related to salesperson's information advantage – in particular monitoring difficulty and competitive intensity – are associated with high levels of price and task delegations. In other words, firms centralize both authorities when salespeople have no or little information advantages in the field. More importantly, comparing to not aligning the levels of both authorities, our data show that only when either centralizing *or* delegating pricing and tasking authorities as a bundle, a salesperson is able to generate high sales

[1] We adopt Figure 1 from http://optimalwebservices.com/sales-funnel-optimization. Accessed on March 5, 2017.

growth. To the best of our knowledge, this is the first evidence that show these two sales-related decision rights are complementary.

The last result is consistent with the idea that discretionary or centralized actions toward customer acquisition and price decisions are interdependent components in the sales funnel and should be considered as a bundle. Specifically, having task authority enables salespeople to familiarize customers, adapt their selling activities, and tailor their product offering (Weitz et al. 1986). These discretions are crucial for a salesperson to understand and match customer's needs and hence effectively utilize their price authority to close the sale (Homburg et al. 2012. Conversely, providing salespeople with pricing authority enables them to customize the price to buyers' willingness to pay, which in turn motivates them to prospect and cultivate the right customers by their own choice in the first place. However, according both authorities to the salesperson instead of centralizing them at the firm may backfire when the former has little information advantage since he would abuse his authorities by working with convenient but not necessarily the right customers and/or substituting price discounts for selling efforts. One may think the downsides as the "cost of delegation." Finally, we find that salespeople's experience strengthens the complementary effect between pricing and tasking authorities. This is consistent with the notion that experienced (unexperienced, respectively) salespeople have (do not have) sophisticated knowledge structure that can (cannot) help them to utilize their authorities to generate sales growth (Leigh and McGraw 1989).

Our paper proceeds as follows. We review the literature in next section. Afterward, we develop our hypotheses and describe the empirical context and data. Then

we present our econometric models and estimation results. Lastly, we conclude with managerial implications.

Conceptual Background and Literature Review

Marketing scholars have long suggested that firms should delegate decision rights to salespeople to enhance performance when the latter have information advantage on customer knowledge (Homburg et al. 2012; Lal 1986; Weinberg 1978); otherwise, firms should centralize to prevent abuse of using the authorities. To situate our study within the literature, we delineate the key concepts of pricing and tasking authorities and review related studies that inform our research question and empirical analysis.

Pricing Authority

Price is critical to close a sale since it directly corresponds to a customer's willingness to pay. When salespeople closely interact with their customers in the field, they can be more informative about a customer's reservation price. Indeed, theoretical work using agency models such as Lal (1986) has shown the benefits of delegating *under* asymmetric information. Empirically, Frenzen et al. (2010) show that price delegation in industrial firms increases in information asymmetry between the salesperson and his manager. Phillips et al. (2015) show that in the auto-loan market, price delegation dominates centralized pricing when customers are highly heterogeneous. Recently, Lo et al. (2016) also show that the more heterogeneous customer needs are, the more pricing authority is delegated to salespeople. In other words, these studies show that the existence

of information asymmetry or not, respectively, is key to firms' decision to delegate or centralize pricing authority.[2]

At the same time, Gallo (2012) and Dessein (2002) suggest that price delegation may induce a loss of control due to the transfer of the decision right; therefore, the firm should consider the extent of centralization by trading off the incentive conflict between the principal and employees and the severity of information asymmetry. To alleviate the potential loss of control, Holmstrom (1977, 1984) proposal that it can be optimal for the principal to constrain the actions of a better-informed agent. This theoretical perspective matches well to our context of price delegation: the common practice industrial companies use is indeed to constrain a lower bound of price below which field salespeople must seek approval from their superiors (Lo et al. 2016).

Another mechanism to mitigate potential loss of control noted in the organizational governance literature is to associate delegation of authority with performance pay (e.g., Jensen and Meckling 1976, 1992; Prendergast 2002; Brickley, Smith, and Zimmerman 2009). For example, Weinberg (1975) theoretically shows that salespeople receiving commissions based on gross margin set prices simultaneously to maximize their income and firms' profits when they are delegated with pricing authority. This type of optimal commission plan and pricing authority also works for salespeople whose focus is to minimize effort to reach an income goal (Weinberg 1978). Joseph (2001) proposes a counterintuitive relation in which commission rate based on margins

[2] Separately, Bhardwaj (2001) finds a strategic effect of price delegation in competitive situations: when price competition is intense, firms benefit from price delegation because it can soften inter-firm price competition. Moreover, instead of delegating authorities to salespeople to leverage their private information, firms may be able to induce salespeople to reveal their private information via a menu of incentive contracts as shown by Mishra and Prasad (2004). These authors further show the robustness of this result with multiple competing companies (Mishra and Prasad 2005).

paid to salespeople should be lower with higher price delegation. In his model, this relation is mostly determined by the setting in which prospecting high-quality customers is costly and high price delegation motivates salespeople to approach low-quality customers to save their effort, and thus, commission rate should be lower for higher price delegation.

Margin-based commissions are less common than sales-revenue-based incentives, especially in industrial selling (Coughlan and Narasimhan 1992; John and Weitz 1989; Lo et al. 2012; Misra and Nair 2011). Nonetheless, sales-based incentives give rise to an incentive conflict between salespeople and the firm: a salesperson would set a price that is lower than the level the firm prefers because he does not consider the costs of production and selling. With this mind, Lo et al. (2016) show that not only price delegation and commission rate are positively related but also the level of sales commissions, which is structured at the company or sales group level – causally determines the extent of price delegation, which is accorded at the individual salesperson's level.

Lastly, scholars have linked pricing authority to sales performance and outcomes. For example, Stephenson et al. (1979) assert that the rationale for price delegation is to maximize the probability of closing a sale; hence, an important empirical question is how a salesperson's pricing authority relates to productivity. Their survey finds that the highest level of price delegation is associated with the lowest level of sales and profit performances. They suspect that salespeople's substitution of price discount for selling effort causes the inferior outcomes under high price delegation. In contrast, Frenzen et al. (2010) report a positive association between price delegation and sales performance.

They explain that price delegation gives rise to flexibilities, which in turn promotes sales performance. Yet, Homburg et al. (2012) show a nonlinear, inverted U-shaped, relationship between price delegation and sales performance, supporting the argument that the loss from reduced sales effort overcomes the gain of pricing flexibility after price delegation is beyond a certain level.

The inconclusive evidence on how pricing authority influences sales performance motivates us to look at this question from a more nuanced view of the typical sales process in industrial firms. In particular, to take the full benefit of salespeople's information advantage, allocation of sales-related authority involves not only pricing decisions, which corresponds to only to the closing stage of the sales funnel, but also decisions on task allocation, which corresponds to the customer acquisition and product proposal stages of the funnel. As such, we turn to review what the literature has learned on tasking authority.

Tasking Authority

We refer tasking authority as salespeople's discretion – or firms' centralization – to arrange the activities in the initial stages of the sales funnel such as customer prospecting, cultivating and product positioning (Figure 1). Studies closely related to tasking authority in marketing also includes empowerment for salespeople (Ahearne et al. 2005), adaptive selling (Weitz et al. 1986), and sales managers' leadership style (Schmitz et al. 2014).

In their influential theoretical paper, Aghion and Tirole (1997, p.27) argue that delegating authority to a subordinate facilitate agent's effort to acquire information about his field activities. This implies that tasking authority accorded under the right sales conditions – in particular under asymmetric information – can motivate salespeople to

acquire information. This in turn helps them to decide on which customers to focus, what sales activities to arrange, and what product offerings to fit idiosyncratic needs (Ahearne et al. 2012). The sense of empowerment, at the same time, further motivates selling effort (Spreitzer 1995). For instance, Martin and Bush (2006) show that empowered salespeople are more likely to orient their sales activities towards customer needs.[3] On the other hand, when the salesperson has no information advantage, one can argue that he may abuse his taking authority by prospecting easy-to-convert but not necessarily customers who best fit with the company's offerings.

In the context of industrial sales, activities on customer acquisition and servicing and making product proposals may compete for limited time and costly effort (Homburg et al. 2008). To facilitate internal coordination, firms are more likely to delegate tasking authorities when selling situations are more complex (Dong et al. 2011). This allows salespeople to better coordinate activities in terms of choosing the right customers and arranging subsequent sales activities that compete for their time and resources. Along this line, Prendergast (2002) proposes that, in an environment with which the firm is unfamiliar, she should authorize her workers decision-making power over how they spend their time rather than simply assign actions to them. Weitz et al. (1986) also suggest that, with tasking authorities, salespeople can adjust sales-related decisions during customer interactions based on perceived evolving customer needs. Given that a typical sales process in industrial equipment sales may take several months to several years to complete (Lo et al. 2016), salespeople need to adapt their sales strategies based

[3] Rapp et al. (2006) find that empowering less experienced salespeople makes them work harder than their non-empowered counterparts. However, these authors focus more on psychological aspects of empowering (e.g., salespeople feel self-efficacy and control) — salespeople's perception, which differs from our notion of task delegation which measures the behavior aspect ("activity") of decision rights.

on updated information acquired in the sales process. As such, one may view that task delegation is an enabler of "adaptive selling," where adaptive selling is "the altering of sales behaviors during a customer interaction or across customer interactions based on perceived information about the nature of selling situation" (Weitz et al. 1986, pp. 175). Indeed, Schmitz et al. (2014) find that, in complex selling contexts (e.g., industrial sales), sales managers' transformational leadership style promotes sales performance by allowing salespeople to have discretionary power over identifying attractive sales opportunities, recognizing special customer needs, and satisfying those needs with the company's product offerings.

Nonetheless, the studies reviewed above simply look at tasking authority, omitting its potential inter-dependent role with pricing authority. To link the two kinds of decision rights in a coherent way, we outline a logic below that is based on the flow and interpretation of acquired information in the sales funnel (e.g., Homburg et al. 2012) to generate testable hypotheses.

Hypotheses

In this section, we generate two hypotheses related to how price and task authorities jointly enhance sales performance and how salesperson's experience – a key agent characteristic – moderates that relationship on sales outcomes.

Milgrom and Roberts (1990) define a pair of activities as complements if doing more of one activity enhances the returns from doing more of the other activity. Following this definition, to validate the complementarity between pricing and tasking authorities, we discuss below in hypothetical scenarios how price delegation improves the return form task delegation, and vice versa. Similar arguments can be applicable as well

to the case where centralizing one decision right by the firm increases the return of the centralizing the other decision right. We nonetheless mostly omit it in the following discussion for the sake of brevity.

Consider first the case when asymmetric information leads the firm to accord a high level of task delegation, but somehow the firm fails to delegate any pricing authority to the salesperson. In this scenario, the salesperson can coordinate among his own selling activities related to prospecting customers, cultivate relationships, and determine optimal product offerings. Even though the information collected in the process would enable a salesperson to assess customer demand and thus respond to product requirements, this information would be of less value without the authority to match the price to customer's willingness to pay. Put it differently, without price delegation, the salesperson cannot judiciously "monetize" his superior customer information, which is in turn benefited from his flexibility in task coordination In fact, when the salesperson anticipates his *in*ability to adjust price to reflect his to-be-acquired information on customer's willingness to pay, he would be less motivated to utilize his task delegation to win over and understand the customer in the first place (Aghion and Tirole 1997).

Now suppose the alternate scenario in which the firm gives the salesperson price discretions but grants no flexibility in task decisions. The salesperson then has to follow his sales manager's instructions to prospect pre-determined customers and conduct subsequent sales activities. Since it is the manager who presumably has less information in the field yet makes all the decisions in the initial stages in the sales funnel, the salesperson would be less motivated to work with the imposed sales activities and product offering for those pre-selected customers (Aghion and Tirole 1997; see also

Ahearne et al. 2012). These also inevitably generate a suboptimal level of customer information and thus hamper his ability to use his pricing authority to convert leads into sales.

Notice that specific to our industrial sales context, sensible price decisions require complex and intensive information (Dutta et al. 2003). Industrial firms often audit and track prior price decisions as part of salespeople's overall evaluations. This implies that delegating pricing authority may not automatically transform into price discounts (Lo et al. 2016), as some studies suggest (e.g., Stephenson et al. 1979; Dessein 2002; Homburg et al. 2012). In other words, a salesperson may be reluctant to utilize his pricing authority by selling at a discount when customer information is lacking or of low quality because in that case the salesperson may have difficulty in justifying discounts to his sales manager later. In addition, the salesperson is hard to adapt his effort in the field without task delegation, and due to this inflexibility, prospects that could be converted with proper price discount might drop out in the sale process before the salespeople have a chance to utilize his pricing authority. Both reasons would result in a loss of valuable prospects and lower sales productivity (Weitz et al. 1986).

Under asymmetric information, governance structures then should support decision making by enhancing wholesome information flow and interpretation (Galbraith 1974) and hence, delegating both pricing and tasking authorities as a bundle. The other side of the same argument is that, if instead the firm has information advantage over the salesperson, then the firm should centralize the two decision rights as a bundle to maintain control (Dessein 2002). In other words, tasking and pricing authorities are complementary. An incoherent system (i.e., delegating pricing authority but centralizing

sales task arrangement authority, or vice versa) weakens sales productivity. Hence, we hypothesize that:

H_1: Pricing and tasking authorities are complements in promoting sales performance.

Experience of salespeople determines their knowledge structures. These knowledge structures include situational cues, customer attributes, and behavioral routines that fit heterogeneous selling situations and customer profiles (Leigh and McGraw 1989). The knowledge accumulated from experience enhances salespeople's efficiency of managing their existing customers and following-up and closing leads (Sabnis et al. 2013). In selling complex industrial equipment, experience is particularly useful when pricing and tasking authorities are also present. Being capable to recognize, describe, and classify different sales situations and customer types, experienced salespeople can adapt selling techniques and activities to acquire customer information and to price accordingly (Leigh and McGraw 1989; Sujan et al. 1988). In contrast, inexperienced salespeople do not possess such refined sales "scripts" and knowledge structures (Kohli et al. 1998), so they are less effective to optimize their sales activities and price. Therefore, we have our second hypothesis that specifies the moderation effect of salesperson's experience:

H_2: The complementarity effect between pricing and tasking authorities in enhancing sales performance is stronger for more experienced salespeople.

Empirical Context and Data Collection

The empirical context for testing our hypotheses is industrial equipment sales. Industrial equipment manufacturers sell capital equipment and machines to their customers for

latter's own production, operations, or administrative processes. In our sample, industrial equipment manufacturers are classified into four Standard Industrial Classification (SIC) sectors: computer equipment (SIC 35), electrical and electronic machinery (SIC 36), transportation equipment (SIC 37), and instruments (SIC 38).

To examine how price delegation and task delegation jointly influence sales performance and how the joint effect is moderated by salesperson's experience, we need data on characteristics of the firm, the salesperson, and sales tasks. These data are unlikely to be available in secondary sources; as a result, we acquired our data through a mail survey to sales managers who are in charge of industrial equipment salesforce.

We started our data collection effort by conducting a series of pilot interviews with sales managers to ensure our research questions are relevant to their practices. We interviewed sales managers from 16 firms. All interviewees were responsible to salesforce management at the national or regional level. The average length of those interviews was three hours. We also pre-tested our survey instruments in some interviews and refined them with the insights gained from those interviews.

To ensure the quality of our survey, we carefully selected our survey participants. First, we obtained a list of sales managers of industrial equipment manufacturing firms from two list brokers—the American list council and Dunn and Bradstreet. We retained firms with at least $100 million revenue and obtained 1470 informants. Second, we contacted those informants by phone with two qualifying questions: (1) whether the informants primarily engage in the management of salesforce for their divisions or firms in a well-defined customer, product, or geographic market; (2) whether their firms use direct salesforces instead of contract dealers in those markets. On average, four phone

calls are required to qualify the two questions. Of all informants, 869 indicated their firms using direct salesforce. Third, to elicit cooperation, we promised to offer each informant a customized report summarizing the main findings of our survey and comparing their firms with the average patterns in our survey. Fourth, we mailed our survey questionnaires to those qualified informants, and after two reminders, we got 264 responses. Three returned questionnaires are discarded for missing data, and thus the final samples are 261, with a response rate of about 30%.

From sales managers' perspective, both pricing and tasking authorities are conferred at the individual salesperson level. Thus, we tailor our survey questions to one salesperson per firm and the salesperson should be under the direct supervision of the informant sales manager. Notice that each sample indicates one salesperson per firm and our data cover 261 firms. To eliminate the sales managers' potential selection bias on the salesperson, we first asked those sales managers to identify one customer that procured their products in previous fiscal year (2005) and then identify the salesperson who was responsible to that sale.

Measures

In this section, we describe the measures used in our analyses and Table 1 shows their descriptions.

[Insert Table 1 about here]

Price delegation: we asked the sales manager to report the percentage of price discount off the list price that the salesperson could offer to customers without having to get further approval from the manager. The higher (lower, respectively) the discount level is accorded, the higher the level of price delegation (price centralization) is. In contrast to

perceptual or categorical measures on delegation of authority in many previous studies (e.g., Frenzen et al. 2010), our cardinal measure is able to capture the exact degree of price delegation — the extent to which the salesperson could make pricing decision (Lo et al. 2016).

Task delegation: the informant sales manager reported three items on a 7-point Likert scale the discretion of the salesperson to prospect which customers he wants to focus on (prospecting), cultivate relationship by managing his own call plan (cultivating), and make decisions on product offering (positioning). Higher ratings reflect more delegation whereas lower ratings correspond to more centralization. We created this measure de novo for our context. Given its high internal validity (see Table 1 and next sub-section on measurement validity), the three items are influenced by one latent variable. We posit that this latent variable substantially correspond to the salesperson's authority on customer-oriented tasks in the front-end of the sales funnel.

Annual sales growth: we measure the identified salesperson's performance by the average annual growth in unit sales accomplished in his sales region or territory in the previous three years. This measure accurately represents the salesperson's performance in our context for the following two reasons. First, in our sample, each individual salesperson has his own exclusive territory or customer accounts so effort and performance are fully internalized. Second, given the complexity and customization of industrial equipment and machinery, potential buyers specify detailed project specifications and required quantities in their "request for quotations" (RFQs) and send them to equipment manufacturers. This implies that, if the salesperson offers more price discounts, customers would be *more likely* to procure the pre-specified number of units of

the product but not necessarily to procure more units of the product. Since the salesperson can only influence customer's procurement probability but not the quantity, higher unit sales reflect a higher number of prospects or leads are converted to actual sales and/or customers. Therefore, annual growth in terms of unit sales truthfully reflects the salesperson's productivity in terms of customer acquisition and retention.

Firm reputation: on a three-item scale, the sales manager rated product and service quality and customers' willingness to pay price premium for it. We adapted this from Mishra et al. (1998). As we discuss in our econometric specifications below, this variable serves as an instrumental variable for task delegation. Reputable firms often delegate more authorities to enable their agents to better cater to customer needs. At the same time, firm reputation is a stock asset accumulated from long periods of time at the company level so should not correlate with the annual *growth* in a short-run, three-year window at the individual salesperson's level.

Monitoring difficulty: this three-item scale measures sales manager's difficulty in monitoring and evaluating the salesperson's activities. Adapted from John and Weitz (1989), we use this variable as an instrumental variable for price delegation. Monitoring difficulty is a measure of asymmetric information and hence it should positively correlate with price delegation. Yet by the nature of long cycles of industrial equipment sales, monitoring technology and thus its difficulty does not dramatically change year over year so should not relate to salesperson's short-term sales growth. This is particularly true when web- or wireless-based tracking systems were non-existing at the time of our data collection (2005-6).

Salesperson's experience: we use the number of years that the salesperson has worked for the focal firm as a surrogate of his experience. This measure may reflect both the salesperson's generic knowledge about the market and specific knowledge about customers and sales processes within the firm.

Commission rate: we collected information on each salesperson's total compensation, fixed salary, and sales revenue of last year (2005). Studies have shown correlations between performance pay and delegation (Prendergast 2000), so we include commission rate as a control variable. As a measure of ex-ante incentive power to agent effort rather than mixing with ex post realization of exogenous uncertainties or random shocks (Lo et al. 2011), the commission rate is calculated as: *Commission rate* = (Total compensation-Fixed salary)/sales revenue generated by salesperson. We use sales revenue as the base for compensation instead of using gross margin because industrial firms often view that gross margin is vulnerable to the manipulation that hurts the salesperson's perception of fairness (Lo et al. 2011). In practice, industrial equipment manufacturers indeed adopt the compensation schema with revenue as the denominator. We became aware of this common practice in our context from our interviews with sales managers, and this is consistent with Coughlan and Narasimhan (1992), John and Weitz (1989), and Misra and Nair (2011). In our sample, the mean proportion of performance-based compensation to total compensation is 28.8%, similar to the 29% ratio identified in John and Weitz (1989).

We further include a set of control variables as described below.

Customer heterogeneity: when customers and their needs are heterogamous, the salesperson may have information advantage over his sales manager (Lal 1986), and thus

more sales-related authorities would be delegated to salespeople. This three-term scale focuses on the range of the firms' customers and the usage of their products.

Product complexity: our three-item scale represents the complexity of design, usage, and interface of the product. When the product is complex, the salesperson is at better position to access fit of the product to individual customer's preference and specifications (Weinberg 1975). This scale is adapted from John and Weitz (1989).

Rapid technological change: our three-item scale measures the speed and predictability of technological change associated with the focal product category. We argue that rapid technological change requires more customer services, which in turn justifies more task delegation to salespeople.

Demand uncertainty: the two-item scale measures the unpredictability and volatility of product demand. We adapted the scale also from John and Weitz (1989).

Competition intensity: this ground measure records the number of direct competitors that the manufacturer faces for the focal product.

Other control variables include *Firm size*, measured by the firms' total revenue of last fiscal year (2005), and industrial fixed effects, captured by SIC codes.

Measurement Validity

To ensure measurement validity, we conduct two separate confirmatory factor analyses (CFA) for the six constructs measured by multiple items. More specifically, the main independent variable (*Task delegation*) and the two instrument variables (*Firm reputation* and *Monitoring difficulty*) fit the main variable model; three control variables (*Product complexity*, *Demand uncertainty*, and *Customer heterogeneity*) fit the control variable model. Both models meet standard measures of goodness of fit. For the main variable

model, χ^2 (24) = 76.80 comparative fit index (CFI) = .97, normed fit index (NFI) = .95, and root squared error of approximation (RMSEA) = .092. For the control variable model, χ^2 (38) = 101.85, comparative fit index (CFI) = .96, normed fit index (NFI) = .94, and root squared error of approximation (RMSEA) = .08. All factor loadings are significantly positive and substantial (.65 and above), indicating good convergent validity.

The composite reliabilities (CRs) range from .80 to .93, all greater than the .6 threshold suggested by Fornell and Larcker (1981) as an indicator of high level validity. Averaged variance extracted (AVE) of each construct ranges from .58 to .83, greater than the .5 threshold suggested by Fornell and Larcker (1981), and the AVE of each construct is greater than the square of the latent correlation between the construct with other constructs (Fornell and Larcker 1981), demonstrating good discriminant validity.

Table 2 summarizes pairwise correlations among all the measures and their descriptive statistics. It is soothing to know that the correlations between all independent variables are all lower than .8 (highest being .52), which in turn indicates that multi-collinearity is not a concern in our data (Judge et al. 1988).

[Insert Table 2 about here]

Notice that the minimum level of price delegation is 5%, meaning that all salespersons in our sample can offer some discounts off the list price without conferring to their sales managers. This suggests that price delegation is a common practice in industrial equipment sales. Furthermore, it is interesting to see that price delegation and task delegation have a significantly positive correlation .52 ($p < .01$), indicating that pricing and task-allocation authorities are *either* delegated to salespeople *or* centralized in

the hands of sales managers as a bundle. This hints that the two decisions may be complementary.

Common method variance. In our study, the measures of some variables such as annual sales growth and price delegation are cardinal, and other variables are measured by multi-item, reducing the potential of common method variance. Further, we follow the method suggested by Lindell and Whitney (2001) to adjust all significant correlations between constructs by the smallest correlation between two constructs (in this case *Rapid technological change* and *Demand uncertainty*, correlation = .02). All significant correlations remain significant after the adjustment; thus, common method bias should not a concern in our measures either.

Empirical Model and Results

Complementarity between a pair of activities presents if doing more of one activity increases the productivity of doing more of the other activity (Milgrom and Roberts 1995; Milgrom and Roberts 1990). Put if differently, if a pair of practices is complementary, theory predicts that these practices will "bundle" together — adopting one of the practices leads to the adoption of the other (Brynjolfsson and Milgrom 2012). The literature proposes two ways of testing complementarity, correlation and performance difference (Brynjolfsson and Milgrom 2012). The correlation approach indirectly identifies complementarity by looking at the correlation between two decisions or practices since firms should adopt them as a bundle. The performance difference approach is to directly assess whether increasing the usage of one practice enhances the marginal productivity of the other practice. To take advantage of the contextual heterogeneity in our cross-sectional data, we first use the model-free correlation approach

to indirectly show complementarity between price and task delegations, followed by the performance-difference approach in which we directly assess their interdependent effect on sales growth.

Evidence from Model-free Correlation

To show that firms tend to bundle the two types of authorities, we split both price delegation and task delegation into low versus high categories by their mean values in our samples. Table 3 summarizes the number of firms falling into each of the four combinations of pricing and tasking authority. The table shows that 42.1% of our sample firms are in the "low-low" combination— firms centralize both the two authorities whereas 38.3% are in the "high-high" combination—firms delegate both authorities to salespeople. In total, the decisions on pricing and tasking authorities are "aligned" in 80.4% of the cases in our sample. On the other hand, firms in off-diagonal cells, or "mismatched" cases, merely make up the rest of the 19.6% cases where salespeople and their sales managers separately hold the two decision rights. Further, partial correlation—the correlation between two variables after removing the effects of other variables—between price delegation and task delegation is .46 ($p < .01$), a quite significant number.

[Insert Table 3 about here]

Thus, we conclude that, firms tend to bundle the decision rights on price and tasks. We emphasize that the model-free correlation approach of showing complementarity is about aligning the two decision rights in the sales funnel. Both should be retained by sales managers (i.e. "low-low" combination in Table 3) or delegated to salespeople (i.e. "high-high" combination in Table 3) as a bundle, depending on key environmental factors such as information asymmetry. When the environment and task characteristics

favor conferring (or not, respectively) one decision right, they also favor (or not) the conferring the other decision right (Brynjolfsson and Milgrom 2012). Having established results by correlations, we now turn to our analysis on their complementarity by using the performance difference approach, which provides direct evidence on this conjecture (see Figure 2 below).

Performance Difference Approach

To provide direct evidence of the complementarity between the two authorities, we examine what environmental factors correlate to price delegation and task delegation and whether their complementarity generates superior sales growth.

In our context, price and task delegations to salespeople – or their centralization at the hands of sales managers – are decisions that companies make to enhance sales productivity, and thus are not randomly chosen. To mitigate the endogeneity problem in firms' choice of the delegation decisions, we estimate our regressions following the two-step approached suggested in Angrist and Pischke (2008, pp.142-144) and Wooldridge (2010, p.246). In the first step, we estimate equations (1) and (2) below to obtain the predicted values of the two delegation decisions. In the second step, by constructing a set of instrumental variables from those predicted values to correct for endogeneity, we use two-stage least squares (2SLS) regressions to assess the complementarity of price and task delegations.

Determinants of delegations. Specifically, we first examine the determinants of the two delegations by running the following seemingly unrelated regressions (SURs):

(1) $\text{Log}(\textit{Price delegation}_i) = \beta_{11}\textit{Monitoring difficulty}_i + \beta_{12}\textit{Firm reputation}_i + \beta_{13}X_i + u_{i1}$, and

(2) $Task\ delegation_i = \beta_{21} Firm\ reputation_i + \beta_{22} Monitoring\ difficulty_i + \beta_{23} X_i + u_{i2}$.

Since the firm confronts with a same set of factors unobservable to researches when choosing delegation levels, the error items in equations (1) and (2) are likely to be correlated. In this case, we adopt seemingly unrelated regressions (SURs) to achieve estimation efficiency (Greene 2012).

In equations (1) and (2), *i* denotes the salesperson working for firm *i*, and X_i is a set of control variables including *Customer heterogeneity*, *Demand uncertainty*, *Product complexity*, *rapid technological change*, *Commission rate*, log(*Firm size*), log(*Competition intensity*), SICs, and the constant. Recall that *Firm reputation* and *Monitoring difficulty* are the instrumental variables for the two delegation variables.

Table 4 summarizes our estimation results of equations (1) and (2). The partial model includes all variables except the two instrumental variables while the full model has them all. The two models show qualitatively similar results so we focus our discussion on the full model. Our data show that large firms delegate more pricing authority ($\beta = .053$, $p < .05$), since large firms are prone to have more hierarchies and broader span that exacerbate the information asymmetry between salespeople and sales managers. Decentralization thus helps agents to take advantage of local information. Firm size also has a positive influence on task delegation even though the influence is not statistically significant ($\beta = .0453$, $p > .1$). Higher commission rates help to align the incentive between firm and salespeople on customer pricing (Lo et al. 2016), so it is not surprising to have *Commission rate* being positively related to price delegation ($\beta = .153$, $p < .01$). *Competition intensity* is positively related to both price delegation ($\beta = .162$, $p < .01$) and task delegation ($\beta = 1.160$, $p < .01$), potentially because more delegation to

salesforce enables fast and flexible responses to local market conditions (Homburg et al. 2012). *Task delegation* enables salespeople to better handle complex customer needs in a timely manner and thus is increasing in *Rapid technological change* ($\beta = .297$, $p < .01$) (Mishra and Prasad 2004). *Demand uncertainty* and *Customer heterogeneity* have little association with either type of delegation in our data. Finally, firms in SICs 36 and 37 delegate more authorities than other sectors.

[Insert Table 4 about here]

Moreover, as one would expect, *Monitoring difficulty* has significant positive influence on both price delegation ($\beta = .101$, $p < .01$) and task delegation ($\beta = .460$, $p < .01$), indicating that firms tend to delegate under asymmetric information (Frenzen et al. 2010; Lal 1986). Firms with high reputation are correlated with higher levels of task delegation ($\beta = .193$, $p < .1$), which is also consistent with our prediction. As such, both instrumental variables show significant influence on their corresponding decision variables in the expected directions.

In sum, we learn from Table 4 that price and task delegations are managerial responses to environmental and task factors, e.g., monitoring difficulty and competition intensity. Hence, one should *not* evaluate whether delegation is inherently better or worse than centralization per se. In other words, low levels of delegation and high levels of delegation are not directly comparable in terms of performance influence without considering their determinants in the first place. In other words, low price delegation is not a "subset" of high price delegation since either can be optimal under its respective, different environmental conditions (Masten et al. 1991).

Complementarity between price delegation and task delegation. Once we obtained the predicted values from estimating equations (1) and (2), we are ready to conduct our second-stage analysis on sales performance. The recent empirical literature on organizational governance has adopt what Milgrom and Roberts (1990) propose (see Brynjolfsson and Milgram 2012 for a review): for a supermodular function *f*, complementarity between two practices is defined as:

(3) $[f(x) - f(\min(x, x'))] + [f(x') - f(\min(x, x'))] \leq f[\max(x, x')] - f[\min(x, x')]$, for $x, x' \in R^2$.

In equation (3), x and x' are two vectors of management practices. The levels of those practices are quantified by corresponding values in the two vectors, and function f is mapping different sets of practices to different levels of performance. Equation (3) illustrates that complementarity exists between the two practices if and only if the sum of returns of separately applying each practice is no more than the return of applying the two simultaneously.[4] Further, if function f is twice differentiable, the complementarity effect between two practices j and k exists if and only if its cross derivatives $\partial^2 f / \partial x_j \partial x_k \geq 0$. Following this operationalization (e.g., Brynjolfsson and Milgrom 2012 and references therein), we use an interaction item between the price delegation and task delegation to capture the complementary effect between the two in enhancing sales growth:

(4) $$\begin{aligned} \textit{Annual growth}_i = {} & \beta_{41}\textit{Price delegation}_i + \beta_{42}\textit{Task Delegation}_i \\ & + \beta_{43}\textit{Price delegation}_i \times \textit{Task Delegation}_i + \beta_{44}X_i + \varepsilon_i. \end{aligned}$$

A positive coefficient of the interaction item ($\beta_{43} > 0$) indicates the existence of complementarity between price and task delegations.

[4] The notation of equation (3) is worthy of more explanation. According to Milgrom and Roberts (1990, p. 516), x and x' are two vectors representing the firm's strategy or practice, for example, x is (high price delegation, low task delegation) and x' is (low price delegation, high task delegation). Min (x, x') (or Max (x, x'), respectively) represents a vector whose value in each dimension equals to the smaller (or bigger) one of the two corresponding values in x and x. Following the example, min (x, x') is (low price delegation, low task delegation), and max (x, x') is (high price delegation, high task delegation).

Technically, price delegation, task delegation, and their interaction term in equation (4) are company choices and, thus, all endogenous. Therefore, directly "*plugging in*" the product of the linearly predicted values of price delegation and task delegation in equations (1) and (2) for the product of their original values generates *erroneous* estimated coefficients. As Angrist and Pischke (2008) and Wooldridge (2010) both explain in their econometrics textbooks, the product of two linearly projected values is *not* equivalent to the linear projection of the product of the two original values. To generate valid, statistically consistent coefficients, Wooldridge (2010, pp.267-268) recommends using the product of the predicted values of the two delegations in equations (1) and (2) as a third and legitimate instrumental variable, in addition to our other two instruments – *Monitoring difficulty* and *Firm reputation*. In this way, we have constructed three instrumental variables to match three endogenous variables, which enables us to use 2SLS (two-stage least squares) regressions to estimate (4).

In Table 5, we regress *Annual sales growth* on our control variables in column (1). We include the predicted values of price and task delegations in column (2) and further add their interaction term in column (3). None of the main effects of the *Price delegation* and *Task delegation* in column 2 is statistically significant. However, after we include their interaction term in column (3), both main effects become statistically significant ($\beta = -13.862$, $p < .05$ and $\beta = -10.201$, $p < .01$ respectively). Importantly, their interaction term is positive and highly significant ($\beta = 4.325$, $p < .01$). The latter result satisfies the necessary and sufficient conditions for showing the complementary effect between price delegation and task delegation in generating sales growth (Milgrom and Roberts 1990).

[Insert Table 5 about here]

To see the economic interpretation of the main coefficients in column (3), especially that on the impact from their complementarity, we further examine the marginal effect of the two delegations. Our analyses below assume that the values of all control variables are *always* taken at their means and the value of the other delegation variable is selected at its mean, one standard deviation above the mean, or one standard deviation below the mean.[5] First, when the other delegation variable is set at its mean, the marginal effects of log(*Price Delegation*) and *Task Delegation* are 3.928 (p = .142) and 0.764 (p = .352) respectively. That is, they are positive but not statistically significant. These collaborate with the statistically not significant results on the two delegation variables in column 2. Second, when we fix the value of *Task Delegation* at one standard deviation above its mean, the marginal effect of log(*Price Delegation*) becomes 10.05 (p < .001). That is, when an *average* salesperson is accorded with the high-level tasking authority, a one percentage point increase in his pricing authority generates .751 percentage point increase in sales growth.[6] When we fix the value of the value of log(*Price Delegation*) at one standard deviation above its mean, the marginal effect of *Task Delegation* also turns to be statistically significant with a magnitude of 2.806 (p < .05). That is, every unit – in terms of our 1-7 scale – increase in tasking authority

[5] Specially, and with respect to equation (4) on p.28, the marginal effect of log(*Price Delegation*) ≡ d(*Annual Sales Growth*)/d(log(*Price Delegation*) = $\beta_{41} + \beta_{43}$•*Task Delegation*, with the values of all control variables taken at their means and that of *Task Delegation* taken at its mean, one standard deviation above, and one standard deviation below the mean. Similarly, the marginal effect of *Task Delegation* ≡ d(*Annual Sales Growth*)/d(*Task Delegation*) = $\beta_{42} + \beta_{43}$•log(*Price Delegation*), with the values of all control variables taken at their means and that of log(*Price Delegation*) taken at its mean, one standard deviation above, and one standard deviation below the mean. These calculations on marginal effects can be obtained from us upon request.

[6] d(*Annual Sales Growth*)/d(log(*Price Delegation*)) = 10.05 implies that one unit increase in log(*Price Delegation*) leads to an 10.05 percentage-point increase in *Annual Sales Growth*. Since price delegation is in natural logarithm, and d(*Annual Sales Growth*)/d(log(*Price Delegation*)) = d(*Annual Sales Growth*)/d(*Price Delegation*)) ÷ (1/ *Price Delegation*), the marginal of effect of *Price Delegation* itself, d(*Annual Sales Growth*)/d(*Price Delegation*)), is 10.05/*Price Delegation.* For an average salesperson, the mean value of *Price Delegation* is 13.98. Hence the marginal effect of price delegation for the average salesperson is simply 10.05/13.98 = .751.

pushes up 2.806 percentage points in sales growth. These two results show the strong effect on delegations derived from complementarity. Third, when the other delegation variable is set at one standard deviation below its mean and hence results in low complementarity effect, the marginal effect of *Task Delegation* turns to be negative at -1.278 ($p < .10$), although the negative marginal effect of log(*Price Delegation*) at -2.192 ($p > .50$) is not statistically significant.

To further visualize their complementarity from the perspective of bundling the two kinds of delegations either as "high-high" or "low-low," where high and low refer to one standard deviation above and below their means respectively, we illustrate the interaction effect in Figure 2. In the figure, "matching" pricing and tasking authorities either in the "high-high" bundle *or* the low- low" bundle generates more sales growth than those under the two "mis-matched" "high-low" combinations. In fact, *only* the two matched combinations generates positive sales growth rate: 7.380 for "high-high" and 1.506 for "low-low"; whereas the two mis-matched pairs lead to negative sales growth: -2.110 and .563.[7] In other words, one kind of delegation or centralization only promotes sales growth with the other kind when firms accord it with the equivalent level. This result not only confirms our H_1 but also shows the effect of allocating authorities on sales growth *only* acts through their interdependent usage: higher sales growth is achieve by either centralizing or delegating the two decisions as bundle. Therefore, focusing

[7] One can further impute the slopes of the two lines in Figure 2. For example, the slope of the dotted line — 10.05 — is the marginal effect of log(*Price Delegation*) when *Task Delegation* is one standard deviation higher than its mean value. To reach this number, notice that the vertical displacement of sales growth for the dotted line is (7.380 – (-2.110)) = 9.490 while its horizontal displacement is two standard deviations of log(*Price Delegation*), or .472 x 2 = .944; hence its slope is 9.490/.944 = 10.05. Similarly, the slope of the solid line equals (1.506 – (-.563)) / .944 = -2.192.

independently on price delegation or task delegation or misaligning their levels are prone to suboptimal sales performance and draw inaccurate conclusions.

[Insert Figure 2 about here]

Given these novel results, we would like to re-emphasize that there are both benefits and costs associated with according pricing and tasking authorities to salespeople: delegations enable flexibility and customized selling approaches to customers, but may give rise to loss of control through salespeople's shirking and targeting wrong prospects (e.g., Gallo 2002; Holmburg 2012). And the opposite can be said about centralization. Complementarity between the two decision rights then implies that the dual authorities are enablers of each other. When their levels are matched, they reinforce each other to enhance sales growth. In the mis-matched cases, the benefits of the high level of accorded authority cannot be fully realized due to the low authority of its dual, but the costs of high level authority are nonetheless fully induced. This explains why, for instance, high price delegation is worse than low price delegation when environmental factors prescribe low task delegation. As such, one should not regard low delegation from a salesperson's perspective (low centralization, from the firm's perspective, respectively) is a subset of high delegation (high centralization) and therefore the former is always dominated by the latter. Instead, only when the bundles of authorities are structured at their aligned levels, they become optimal given their underlying market, firm, or task characteristics.

On other variables, *Product complexity* ($\beta = .469$, $p < .1$) and *Competition intensity* ($\beta = 1.851$, $p < .05$) have a negative correlation with sales performance, indicating that it is harder for salespeople to achieve sales growth when facing with complex product offerings and intense competition. Lastly, and as expected, *Commission*

rate correlates with incentivizing sales growth (column 1: $\beta = .473$, $p < .05$; column 2: $\beta = .959$, $p < .1$). Its incentive effect diminishes after the delegation variables are included. This is not surprising because prior studies have found they are positively associated (Nagar 2002; Wulf 2007). Moreover, this mediating effect of incentive pay through delegations on sales performance is also suggested in Lo et al. (2016), but we are the first to directly show it in a salesforce context.

Endogeneity test and strength of instrument variables. To ensure the quality of our analyses, we test the endogeneity of the three endogenous variables in equation (4). Both the Wooldridge score test ($\chi^2(3) = 7.462$, $p = .0585$) and its extended regression-based Hausman test ($F(3,244) = 3.060$, $p = .0289$; Wooldridge 2010) are suitable for the heteroskedasticity-robust standard errors estimation in our analyses. Their test statistics shown above reject the null hypothesis that the specifications with and without endogeneity correction are not different so *Price delegation, Task delegation*, and their interaction term should be treated as endogenous.

Further, we need to test the strength of our three instrumental variables—*Monitoring difficulty*, *Firm reputation*, and the product of predicted values of price and task delegations in equations (1) and (2). Sanderson and Windmeijer (2016)[8] propose an F-test (hereafter SW F-test) that examines the identification of each endogenous variable (and the strength of instrumental variables) by controlling for the influence of other endogenous variables. The SW F-tests for *Price delegation*, *Task delegation*, and their interaction term are respectively $F(1, 247) = 11.88$ ($p < 0.01$), $F(1, 247) = 20.26$ ($p <$

[8] With multiple endogenous variables, the traditional way of identifying weak instrument problem by checking the first-stage F-statistics is not proper (Sanderson and Windmeijer 2016). For example in this case of two endogenous variables, a strong IV that predicts both the two endogenous variables well and a weak IV may generate high F-statistics (e.g., higher than 10) for the two first-stage regressions, but the model is not identified (Angrist and Pischke 2008, p.159).

0.01), and F(1, 247) = 15.58 ($p < 0.01$), indicating that all endogenous variables are strongly identified by our instrumental variables and thus week instruments are not a concern.

Moderation role of salesperson's experience.

Our last analysis is to examine the moderation effect of salesperson's experience on the complementarity between price and task delegations on sales growth. To do so, we use (i) a three-way interaction among price delegation, task delegation, and salesperson's experience, and (ii) split samples based on the mean value of salesperson's experience. The results are shown in Table 6. First, the regression in column (1) includes the three-way interaction term and its lower-order terms as well. Notably, the three-way interaction term is significant and positive ($\beta = 5.200$, $p < .1$), meaning that complementary effect between price and task delegation on sales growth is stronger for more experienced salespeople. By supporting H_2, our result is consistent with the notion that experienced salespeople are more capable to utilize delegated authorities to collect and interpret customer information and adapt their prospecting, product, and pricing decisions. Column (2) and (3) report the complementarity effect for low and high experience salespeople, respectively. Consistent with H_2, complementarity between price and task delegations is positive only for the more experienced group in column (3) ($\beta = 4.515$, $p < .1$) but not for the less experienced group in column (2). We illustrate these results respectively in panels A and B in Figure 3. As shown in those figures, only the high experienced group (Panel A) shows the complementary effect of both delegations but not the low group (Panel B).

[Insert Table 4 about here]

A couple of prior studies find that it is the less experienced salespeople who benefit more from sales managers' empowering their subordinates (Ahearne et al. 2005; Rapp et al. 2006). These seemingly contradict our finding. Recall that previous research on empowerment focuses on its psychological effect on salespeople such as the feeling of trust (Ahearne et al. 2005). In contrast, we measure delegations in terms of behavior and actions; thus more experienced salespeople can benefit more from such delegations to plan and execute their decisions. Putting the two perspectives together, prior work and our research jointly offer a more comprehensive guideline for managers on allocation of sales decision rights based on salesperson's experience: it depends on whether the empowerment aims to motivate from a psychological or behavioral perspective of their salesforce.

[Insert Figure 3 about here]

Discussion

Using data from industrial sales, our study shows the key result on the complementary effect between price delegation and task delegation on enhancing sales performance. This complementarity effect is derived from the interdependency among sales activities in the multi-stage sales funnel. While proper pricing decision in the closing stage requires refined customer information, salespeople's effectiveness in collecting customer information also relies on their task-allocation authorities in prospecting, cultivating, and positioning stages, and vice versa. Thus, according to the arguments on the complementarity between price delegation and task delegation, if environmental conditions such as monitoring difficulty and intense competition require sales mangers' delegating one decision right, they should also delegate the other as a bundle at the same

time (Brynjolfsson and Milgrom 2012); otherwise, they should be centralized as a bundle. "Mis-bundling" of delegation decisions hurt sales performance. For example, sales leads may be lost if salespeople do not have the authority to adjust the price according to potential customers' willingness to pay (i.e., a lack of price delegation), or if they can adjust price but have no discretion in deciding which customers to work on (i.e., a lack of task delegation). Our study also finds that the complementarity between price and task delegations is stronger for more experienced salespeople.

Our paper helps to reconcile conflicting empirical evidence on the effect price delegation on sales performance (e.g., Frenzen et al. 2010; Stephenson et al. 1979) by revealing that the degree of price delegation depends on environment factors and its effect on sales performance is contingent on the degree of task delegation. Thus, a more comprehensive investigation of the effect of pricing authority on sales performance should probe on determinants of other decision choices such as tasking authority and whether other complementary practices also present.

Many firms invest in technologies such as salesforce automation (SFA) and customer relationship management (CRM) (Hunter and Perreault Jr. 2007). Salesforce technologies automate and digitalize the collection, assimilation, analysis, sharing, and tracking of information through the sales funnel. Those technologies may alleviate the problem of asymmetric information and hence a more centralized approach may seem necessary. However, It is very challenging to design and implement those sales technology systems to be compatible with the local sales conditions and enhance the information collection, flow, and interpretation, especially in complex environments (Ahearne et al. 2012). Moreover, those technology systems mainly aim to enhance sales

productivity by consolidating information rather than generating the information in the first place. This can become a particularly acute problem when salespeople concern about their informational value and hence may strategically withhold or mis-feed field and customer information into companies' sales technology and customer relationship management systems. As such, information gap between salespeople and sales managers can still exist and delegation of authorities would still be a one prominent solution in complex and strategic sales contexts (Schmitz et al. 2014).

Managerial Implications

Our study provides a comprehensive framework containing market- , firm-, and individual-level factors for sales managers to formulate their delegation decisions on when, how, and to whom. More specifically, market- and firm-level factors determine *when* to delegate decision authorities to salespeople in industrial sales. For example, firms should delegate more pricing and tasking authorities to salespeople when the firms confront intense competition and have difficulty in monitoring salesperson's effort. The firms can also delegate more pricing decision authority when they pay high commission rate and are of large size, and delegate more tasking authority when the firms have high reputation and face rapid technological changes. The complementarity between price delegation and task delegation determines *how* to delegate. That is, conditional on the market and firm level factors, pricing and tasking authorities should be either delegated to salespeople or withheld by the firm as a *bundle*. Splitting these authorities will break salespeople's – or the firm's – integrated flow of information collection, interpretation, and exploitation in the sales funnel and thus hurt sales performance. The moderation effect of salespeople's experience shows to *whom* the firms should delegate decision

authorities. Our finding is consistent with the idea that more experienced salespeople have more sophisticated knowledge structures (Sujan et al. 1988), helping them to make better use of delegated decision authorities to identify sales clues, classify customers, collect customer information, and adopt sales activities and decisions. In sum, our analysis provides a comprehensive, step-by-step guideline for firms to make salespeople delegation decisions.

Limitation and Future Study Direction

Like other studies, our study has its limitations. First, some studies on organizational behavior suggest that managers are reluctantly to delegate tasking authority because of the fear of a loss of control by transferring limited power to subordinates (Gallo 2012). Future studies should then look at the effect of managerial style and personal traits on decision rights issues. Second, as Levy and Sharma (1994) mention that it is the accumulated experience in the profession, rather than the sales experience acquired in the focal firm, that influences adaptive selling. Although the low turnover rates of salespeople in our context and high correlation between measures of experience in current job and overall experience (Schmitz et al. 2014) may validate our measure of experience, having the broader measure would extend our understanding of the role of salespeople's experience.

Firms operating in enterprise markets increasingly take advantage of more available data and analytics methods to generate sales performance. For example, firms can use predictive analytics to track and forecast the conversion probability of sales leads (Lilien 2016). When predictive analytics' prediction becomes sufficiently accurate, firms could limit task delegation by centralizing customer selection decisions while enabling

salespeople to focus on working with sales leads with the highest conversion rate. Therefore, examining the interaction between evolving technologies such as predictive analytics and delegations as a form of organizational design will help to resolve some coordination problems arising out of information asymmetry between the firm and its agents.

A firm might organize the sales funnel such that the marketing department is in charge of early stages of the funnel while the sales department focuses on the later stages of closing the sale (Kotler et al. 2006). This division may give rises to conflicts between the two departments; for example, the sales department complains the low quality of leads generated by marketing department whereas market department may also blame sales department's poor follow-up (Sabnis et al. 2013). Partially integrating some activities across the departments by granting more tasking authority in the customer prospecting and lead qualification stages would reduce those conflicts and ease inter-departmental tensions (Homburg et al. 2008). We believe that investigating the impact of salesforce delegation decisions on the relationship of sales-marketing interface is worth pursuing.

Finally, salespeople as boundary spanner often have more autonomy than their colleagues employed in other functions. As such, salespeople tend to identify themselves with their profession rather than their organizations (Speier and Venkatesh 2002). Future research could investigate how delegations influence salespeople's perception of their association with their companies (Wieseke et al. 2012) and with their superiors (Ahearne et al. 2013) and hence performance or loyalty issues.

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Table 1 Variables and Measures

Constructs	Measures	
Main Variable Model (CFI = .97, NFI = .95, RMSEA = .092)		
Task delegation	(1) our company permits this salesperson to develop his/her own call-plan; (2) to the extent possible, we let this salesperson make product and pricing decisions that suit customer-side circumstances; (3) this salesperson has complete control over deciding on which customers he/she should focus on.	Developed from definition Cronbach's Alpha .90 Averaged variance extracted (AVE) .76 Composite reliabilities (CR) .90
Monitoring difficulty	(1) it is difficult for us to evaluate how much effort this salesperson really puts into her/his work; (2) it is relatively easy for this salesperson to turn in falsified sales call reports; (3) our evaluation of this salesperson cannot be based on his/her activity and sales call reports.	Adopted from John and Weitz (1989) Cronbach's Alpha .79 Averaged variance extracted (AVE) .58 Composite reliabilities (CR) .80
Firm reputation	(1) Our organization has a good standing in the business world for providing quality products and services; (2) customers are willing to pay a high premium for our products and services; (3) our company is held in high esteem for being able to provide products that mirror customer needs and specifications.	Adopted from Mishra, Heide, and Cort (1988) Cronbach's Alpha .92 Averaged variance extracted (AVE) .81 Composite reliabilities (CR) .93
Control Variable Model (CFI = .96, NFI = .94, RMSEA = .08)		
Customer heterogeneity	(1) Our product can be used in manufacturing/ administrative/ operational activities that vary widely from customer to customer; (2) Customers of this product themselves operate in a wide variety of industry sectors; (3) Our product is most useful for a narrow range of operational tasks.	Cronbach's Alpha .87 Averaged variance extracted (AVE) .77 Composite reliabilities (CR) .90
Product complexity	(1) our product is primarily composed of state-of-art engineering content; (2) deriving quality output from our machines requires precise understanding of engineering technologies; (3) the configuration of our product necessitates frequent adjustments in accordance with the specific task requirements.	Adopted from John and Weitz (1989) Cronbach's Alpha .89 Averaged variance extracted (AVE) .73 Composite reliabilities (CR) .89
Demand uncertainty	(1) the demand for our company's products in this market is very predictable; (2) the sales volume for our products has been very predictable in this market.	Adopted from John and Weitz (1989) Cronbach's Alpha .92
Rapid technological change	(1) significant technological advances in this product category are very unpredictable and fast (2) there are frequent and significant changes in the technical features of machines in this product category (3) in this product category new technologies follow each other very quickly	Cronbach's Alpha .93 Averaged variance extracted (AVE) .0.83 Composite reliabilities (CR) .93
Price delegation	salespeople might be provided discretion in offering price discounts to their customers. What percentage discount off the list price can this salesperson unilaterally offer his/her customers without conferring with the sales manager, i.e. your?___ % off the list price.	
Annual sales growth	Over the past three years, what would be your estimate on the year-to-year change in the unit demand for your company's products/services in this sales region/territory? The average year-to-year change in unit sales was__%.	
Sale person's experience	Please provide your estimate on the number of years this salesperson has been working in your company. ___ years.	
Competition intensity	What is the number of potential competitors for this family of product-lines/equipment? ___suppliers?	
Commission rate	(1) what was the total fixed compensation (i.e. base salary) that was received by this salesperson in the last fiscal year? (2) What was the total compensation (base salary plus performance based compensation—e.g., commissions, quotas etc.) received by this salesperson in the last fiscal year? (3) What was the total revenue, in dollars, generated by this salesperson in the last fiscal year? $___?	
Firm size	During the last fiscal year (2004/2005), what was your business unit's sales revenue for this particular type of product (or related products)?	
SICs	computer equipment (SIC 35), electrical and electronic machinery (SIC 36), transportation equipment (SIC 37), and instruments (SIC 38).	

Table 2 Correlation Matrix and Descriptive Statistics

	1	2	3	4	5	6	7	8	9	10	11	12	13	Mean	Std. Dev.	Min	Max
1. Annual growth	1.00													3.05	3.03	-4.00	9.00
2. Price delegation	.15	1.00												13.98	6.05	5.00	30.00
3. Task delegation	.15	.52*	1.00											4.11	1.42	1.33	6.67
4. Firm reputation	.05	-.20*	-.15	1.00										4.21	1.41	1.00	7.00
5. Monitoring difficulty	.00	.22*	.41*	-.24*	1.00									3.67	1.19	1.00	6.33
6. Product complexity	-.03	.04	.17*	-.08	.30*	1.00								4.16	1.45	1.00	6.67
7. Rapid technological change	.19*	.03	.33*	-.23*	.23*	.19*	1.00							3.97	1.49	1.00	7.00
8. Customer heterogeneity	-.22*	.17*	.09	-.05	.16*	.05	-.11	1.00						3.65	1.39	1.00	6.67
9. Demand uncertainty	-.04	.11	.02	-.04	.27*	.37*	.02	-.07	1.00					4.00	1.61	1.00	7.00
1. Firm size[a]	.01	-.05	-.07	.00	-.10	.14	.02	-.07	.12	1.00				1.63	5.92	0.1	83
11. Commission rate	.15	.47*	.14	-.14	.06	-.02	.06	.12	.10	-.02	1.00			2.39	0.97	0.00	5.16
12. Competition intensity	-.01	.29*	.33*	-.23*	.01	-.08	-.07	-.01	-.16	.01	.15	1.00		8.96	4.84	2.00	40.00
13. Salesperson tenure	.04	.14	.07	.03	-.08	-.04	.13	.12	-.07	-.04	.00	.07	1.00	4.07	2.66	1.00	15.00

[a] Firm size is measured in billion dollars of revenue in fiscal year of 2005

* $p < .01$

Table 3 Numbers of Companies within Each Combination of Price and Task Delegations

# of Firms (% of total firms)	Low *Task delegation*	High *Task delegation*	Total
Low *Price delegation*	110 (42.1%)	20 (7.7%)	130 (49.8%)
High *Price delegation*	31 (11.9%)	100 (38.3%)	131 (5.2%)
Total	141 (54.0%)	120 (46%)	261 (100%)

Note: Mean value of price delegation is 14.0. Mean value of task delegation is 4.1.

Table 4. The Determinants of Price Delegation and Task Delegation

	Partial Model (SUR)		Full Model (SUR)	
	Price delegation	*Task delegation*	*Price delegation*	*Task delegation*
Firm reputation			-.008 (.020)	.193*** (.055)
Monitor difficulty			.101*** (.024)	.460*** (.066)
Product complexity	.004 (.020)	.127** (.059)	-.011 (.020)	.077 (.055)
Rapid technological change	-.009 (.018)	.331*** (.054)	-.030 (.019)	.297*** (.052)
Customer heterogeneity	.030 (.020)	.113** (.057)	.011 (.019)	.035 (.054)
Demand uncertainty	.016 (.018)	.050 (.052)	-.0001 (.018)	-.004 (.049)
Log(Firm size)	.034 (.024)	-.042 (.070)	.053** (.024)	.045 (.065)
Commission rate	.158*** (.028)	.061 (.081)	.153*** (.027)	.068 (.074)
Log (Competition intensity)	.192*** (.050)	1.069*** (.145)	.162*** (.052)	1.160*** (.143)
SIC35	.041 (.073)	-.130 (.213)	.013 (.071)	-.274 (.195)
SIC36	.252*** (.073)	.317 (.214)	.257*** (.072)	.447** (.197)
SIC37	.172* (.090)	.223 (.261)	.167* (.089)	.434* (.245)
Constant	1.266*** (.227)	-.513 (.662)	1.165*** (.288)	-2.960*** (.793)
N	261	261	261	261
R-squared	.259	.301	.310	.419
F-statistics	9.139***	11.23***	9.779***	15.710***

Standard errors in parentheses. * $p < .10$,** $p < .05$, *** $p < .01$.

Table 5. Complementarity between Price Delegation and Task Delegation

Dependent Variable: Annual Sales Growth

	(1) OLS	(2) 2SLS	(3) 2SLS
Main Variables			
Price delegation		-3.553 (3.401)	-13.862** (6.731)
Task delegation		1.188 (.744)	-10.201*** (3.248)
*Price delegation*Task delegation*			4.325*** (1.451)
Control Variables			
Product complexity	-.046 (.145)	-.182 (.201)	-.469* (.282)
Rapid technological change	.268* (.141)	-.158 (.287)	-.391 (.375)
Customer heterogeneity	-.526*** (.134)	-.553*** (.163)	-.296 (.237)
Demand uncertainty	-.097 (.131)	-.0996 (.145)	-.241 (.179)
Log (Size)	.121 (.149)	.291 (.221)	-.225 (.216)
Commission rate	.473** (.202)	.959* (.521)	-.631 (.465)
Log (Competition intensity)	-.240 (.333)	-.827 (.540)	-1.851** (.722)
SIC35	-.481 (.537)	-.180 (.628)	1.038 (.942)
SIC36	.379 (.537)	.898 (.842)	.720 (.914)
SIC37	-.689 (.607)	-.341 (.760)	-.890 (.770)
Constant	3.192** (1.569)	8.301* (4.827)	45.458*** (16.361)
N	261	261	261
R-squared	.129	-[a]	-[a]
F-Statistic	4.235***	2.770[b]***	2.697[b]***

Standard errors in parentheses. * p < .10,**p < .05, *** p < .01.
a: R-squared in two-stage-least-square approach could be negative because the second stage regression is minimizing residuals with the predicted values of endogenous variables whereas R-squared is calculated with another set of residuals obtained with original values of those endogenous variables.
b. We calculate the F-statistic with formula suggested by Wooldridge (2010, p 105: formula 5.31) that is suitable for two-stage-least-square approach.

Table 6. Moderation Effect of Salespeople Experience on Complementarity between Price Delegation and Task Delegation

Dependent Variable: Annual Sales Growth

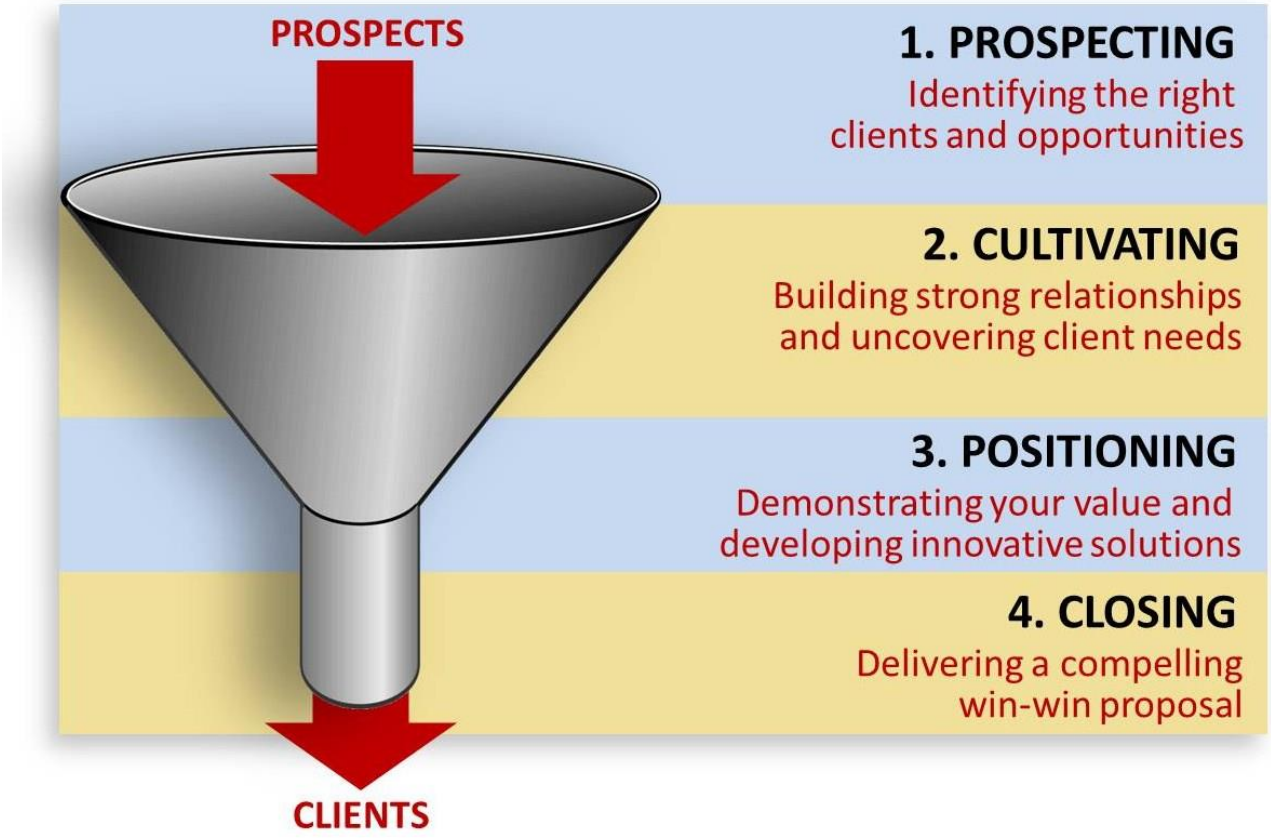
	(1) 2SLS Full sample	(2) 2SLS Low experience group	(3) 2SLS High experience group
Main variables			
Price delegation	17.290 (12.242)	-13.924 (8.837)	-14.128 (1.625)
Task delegation	5.731 (4.885)	-5.812 (5.098)	-1.540** (5.235)
*Price delegation*Task delegation*	-1.766 (1.803)	2.810 (2.039)	4.515* (2.329)
Log(experience)	59.660* (35.774)		
*Price delegation*Log(experience)*	-21.170 (13.301)		
*Task delegation*Log(experience)*	-15.040* (8.349)		
*Price delegation *Task delegation * Log(experience)*	5.200* (2.994)		
Other variables			
Product complexity	.412 (.342)	.027 (.344)	-.821** (.389)
Rapid technological change	-.261 (.454)	-.431 (.480)	-.294 (.587)
Customer heterogeneity	-1.027*** (.360)	-.305 (.240)	-.301 (.446)
Demand uncertainty	-.844** (.416)	-.248 (.234)	-.231 (.249)
Log (Size)	-.099 (.242)	-.227 (.318)	-.027 (.384)
Commission rate	-1.215 (.853)	.483 (.969)	-.609 (.707)
Log (Competition intensity)	-2.352* (1.210)	-1.269 (.921)	-2.025* (1.136)
SIC35	1.515 (1.520)	1.393 (1.048)	.638 (1.513)
SIC36	1.516 (1.200)	2.043* (1.163)	-.198 (1.684)
SIC37	1.310 (1.510)	1.318 (1.127)	-1.482 (1.331)
Constant	-32.39 (27.214)	37.055 (23.019)	46.225* (25.874)
N	261	127	134
R-Squared	-[a]	-[a]	-[a]
F-statistic	1.836[b]**	1.974[b]**	1.699[b]*

Standard errors in parentheses. * p < .10,**p < .05, *** p < .01.

a: R-squared in two-stage-least-square approach could be negative because the second stage regression is minimizing residuals with the predicted values of endogenous variables whereas R-squared is calculated with another set of residuals obtained with original values of those endogenous variables.

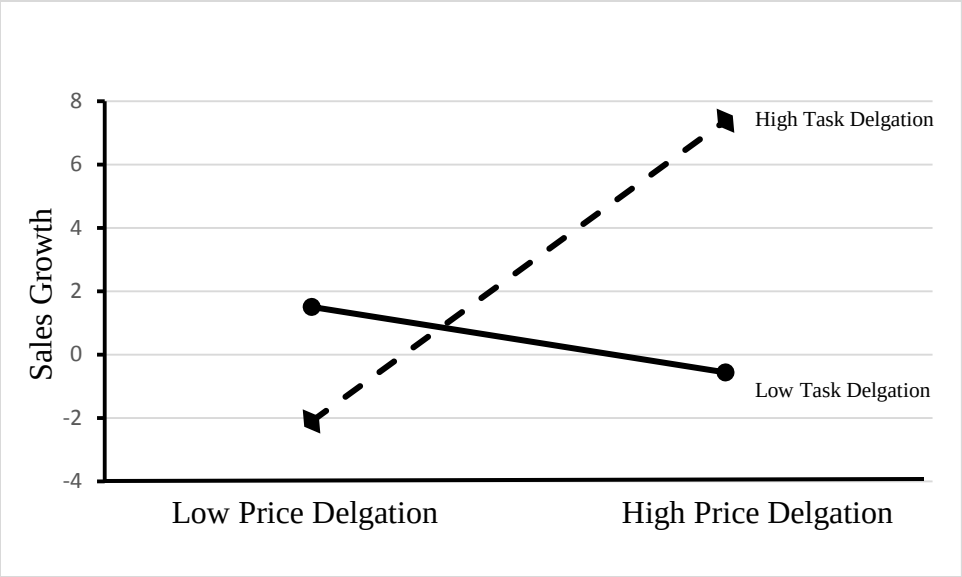
b. We calculate the F-statistic with formula suggested by Wooldridge (2010, p 105: formula 5.31) that is suitable for two-stage-least-square approach.

Figure 1. The Sales Funnel



Adopt the figure from: http://optimalwebservices.com/sales-funnel-optimization/

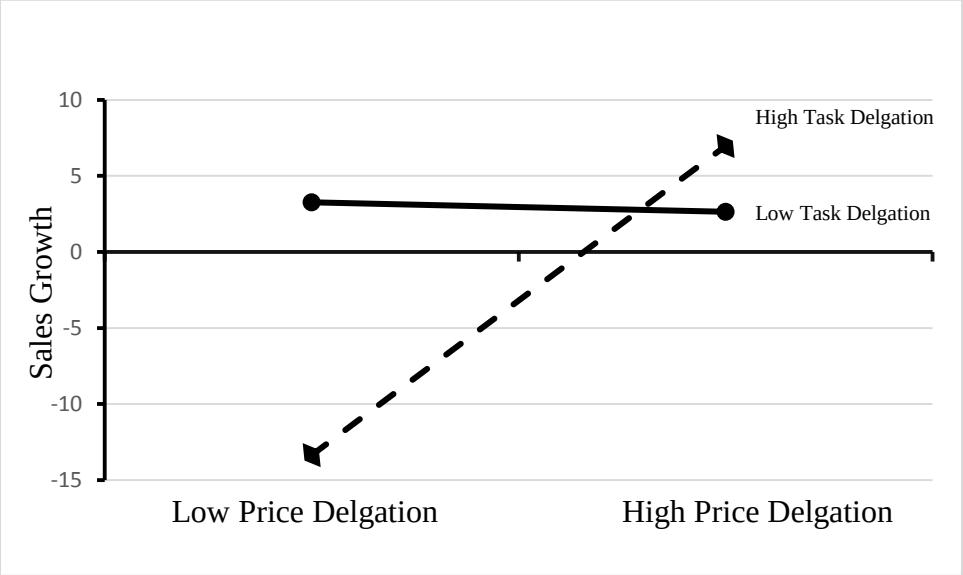
Figure 2. Complementarity Effect between Price and Task Delegations on Sales Growth



Note: High and low values of price and task delegation are set at one standard deviation above and lower than their sample mean values, and the values of other variables are fixed at their sample mean values.

Figure 3. Moderation Effect of Salesperson's Experience on Complementarity between Price and Task Delegations

Panel A. High Experience Group



Panel B. Low Experience Group

Note: High and low values of price delegation, task delegation, and salespeople experience are set at one standard deviation above and lower than their sample mean values, and the values of other variables are fixed at their sample mean values.