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Effort and Self-Selection Effects of Compensation Scheme Changes under a Multi-Output Setting

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Abstract

The analytical research from agency theory suggests that an output-based compensation can have effort effects and self-selection effects. This study extended Banker et al.'s recent study to a multi-output setting and investigated those two effects in an insurance firm using individual monthly sales data for multiple products as well as employment history data. We have demonstrated that these two effects exist under a multi-output setting. The results showed that compensation scheme changes could induce sales mix changes by the effort reallocation process. In addition sales performance of remaining employees is better aligned with the new compensation scheme that that of employees who had quit supporting the self-selection hypothesis.

I. Introduction

Productivity gains are perceived as providing long-term competitive advantages, particularly for firms operating in mature industries.Many companies have initiated new workforce strategies to motivate employees to focus on productivity improvements. A program that has recently been implemented at many firms involves the use of output-based incentive compensation plans. Such programs link compensation to measured performance for employees at various levels, not just for those at the top (Schlesinger and Heskett, 1991).

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A fundamental question in management accounting is how compensation contracts affect worker and organizational performance. Two main problems considered in compensation contracts are moral hazard and adverse selection. The moral hazard problem arises when agents have no incentive to expend high levels of effort. Because a performance-based contract provides incentives for the agent to increase his effort for higher reward, agency theory and sales force compensation literature suggest that, compared to a flat salary, a performance-based contract improves an agent's performance (Basu, Lal, Srinivasan, and Staelin, 1985). In addition to moral hazard effects, performance-based contracts offered in a labor market may induce more productive workers to select a firm that offers performance-based contracts.Both of these factors are expected to increase overall productivity (Milgrom and Roberts, 1992).

Although previous research provides empirical evidence on the impact of an incentive contract (Wagner, Rubin, and Callahan, 1998; Banker, Lee, and Potter, 1996), formal evidence has been lacking about which of these two factors leads to an overall increase in productivity.In a recent paper, Banker, Lee, Potter and Srinivasan (1997) provided empirical evidence on the adverse selection and moral hazard effects of performance compensation by examining the individual productivity of sales consultants in retail stores. While Banker, et al.'s paper examined changes in overall sales level after the adoption of output-based compensation, this paper investigates the impact of changes in output-based compensation schemes on the sales mix under a multi-output setting.

The research site of this paper is an insurance firm whose sales force sells various insurance products. The sample firm adopted a new incentive plan that emphasized a particular insurance product. According to the moral hazard hypothesis, we could expect an increase in sales of that particular product, resulting in a change in the sales mix.Empirical results of this study supported the above prediction and showed that after a compensation scheme change, the sales proportion of that particular product had significantly increased.

If the adverse selection effect exists, then we should be able to observe that remaining employees are better aligned with the new compensation scheme than quitting employees. The results

of this study showed that the sales performance of remaining employee group with respect to the particular product was better than that of quitting employee group. Although, in the short term, temporary workers showed a quick adjustment to the new compensation scheme, long term results provided evidence that productivity of remaining employees increases over time.

This study is structured as follows. Section 2 describes the research site and the compensation plan for the sample firm. Section 3 develops hypotheses based on the study. Section 4 presents research models to test these hypotheses. Empirical results are discussed in Section 5. Concluding remarks with qualifications are offered in the final section.

II. Research Site and Compensation Plan

Our research site is an actual life insurance company in Korea (labeled 'Eternlife') with a sales force of approximately 6,500 and 1,500 administrative personnel. The company's 6,500 personnel are located in 400 sales branches throughout the country. While sales branches are spread over a large geographic area, most branches are located in or near an urban area. The manager of each branch is assigned from company headquarters, and there are 10-30 sales representatives in each of the sales branches. Sales branches are regrouped into several sales divisions.

The product sold by various branches is the same among all branches. The two main categories of insurance products of Eternlife are 'savings type' product (SAP) and 'protection type' product (PRO). SAP earns interest while PRO serves a traditional insurance function. Historically the research site promoted the sales of SAP because the positive interest margin (interest revenue minus interest expense) was sizable as long as industry was regulated. Recent deregulation of the financial industry, however, has narrowed this margin significantly and decreased the attractiveness of SAP. Consequently, the company has changed the emphasis in its marketing strategy from SAP to PRO. To facilitate this change, the firm adopted new performance scoring system, which gave more weight to PRO.

A high turnover rate within the sales force and a relatively flat sales organization are typical characteristics of insurance

Table 1. Performance Scoring Weight Changes on October 1, 1993

Product Types	Before the Change	After the Change
SAP	100%	15%-80%
PRO	100%	160%-200%

companies. Sales representatives usually receive a commission on sales amounts of various products plus a modest base salary. Therefore output-based commission comprises the bulk of sales force compensation.

One of the main sales incentive strategies for insurance companies is to change the performance scoring system for supervisors (branch heads) and their frontline sales forces. Performance scores will determine the performance rating and corresponding operating expense budget available for supervisors, as well as monetary compensation (direct compensation) for the sales force. Supervisors will then use this allocated operating budget to maximize their branch's sales performance scores, which will determine their future compensation, especially non-monetary rewards such as promotion.

Table 1 shows the change in the performance scoring system targeted for supervisors, which occurred on October 1, 1993. We can observe that the scoring weights of SAP were significantly lowered from 100% to 15-80%. Conversely, higher scoring weights were given to PRO. This indicates a significant shift in marketing strategy.

III. Hypotheses Development

Agency theory requires that the principal choose the incentive contract which maximizes his or her own expected utility after taking into consideration the agent's utility-maximizing behavior. Once a compensation contract is given, agents will allocate their effort to maximize their utility. Chow (1983) and Waller and Chow (1985) provided evidence on the self-selection and effort effects of incentive compensation contracts in a controlled environment.Some empirical work reported on the factors that have significant impact on the compensation structure (John

and Weitz, 1989; Coughlan and Narashimhan, 1992). The intent of this paper is not to test the optimality of the compensation contract but to examine the effect of the exogenously given incentive contract on the performance and self-selection of employees.

Agency theory is one paradigm that suggests that performance-based compensation has value. Examples of agency theoretic models for examining sales force compensation include Basu, Lal, Srinivasan and Staelin (1985), Lal, and Staelin (1986), and Rao (1990). In a typical agency framework, a principal designs a contract to motivate a risk- and effort-averse agent to exert unobservable effort in a production process that is characterized by uncertainty. The principal receives the residual after compensating the agent.In this formulation, the optimal contract bases compensation for the agent on observed output, which the principal uses as an indicator of the effort expended by the agent. One of the problems considered in contract design is moral hazard which manifests itself when agents have an incentive not to exert high levels of effort. Because a performance-based compensation contract provides incentives for the agent to trade-off the cost of increased effort for a higher reward, agency theory and sales force compensation literature suggest that, compared to a straight salary, a performance-based contract improves agents' performance (Basu, Lal, Srinivasan, and Staelin, 1985).

Despite all these predictions from agency theory, empirical evidence on the impact of output-based compensation on productivity are quite limited (Banker et al., 1996). In fact, some research provides contradicting evidence. The study by Pearce, Stevenson, and Perry (1985) investigated the impact of output-based incentive schemes on performance and found no significant change in productivity. Similarly, Hogarth, et al. (1991) claim that compensation does not necessarily increase performance. Behavioral research in the management accounting area (Awasthi and Pratt, 1990) shows that monetary compensation is not linked to productivity improvement. This paper will provide field-based evidence on the effect of output-based compensation.

At our research site, compensation for the frontline sales force is mostly based on monetary compensation. This is because

other incentives such as promotion are rather unusual in a relatively flat sales force organization with an extremely high turnover rate. Individual sales performance is a major determinant of sales force compensation. If a particular product is given more weight in a new scoring method, this will induce the sales force to exert more effort on the sales of that product and the sales mix will change accordingly after the implementation of the new incentive contract.

> Hypothesis 1: If a new compensation scheme gives more weight to a particular product, then the sales proportion of that product will increase and a change in sales mix will occur accordingly (moral hazard and effort effect hypothesis).

Contract in an incomplete market setting brings adverse selection problem. Adverse selection becomes an issue in labor contracting when workers' skill levels are not observable. Although moral hazard and adverse selection usually seem quite distinct, it can be difficult to determine which is at work (Milgrom and Roberts, 1992). The adverse selection literature suggests that compared to a flat salary contract, an output-based incentive contract will attract skilled workers (Demski and Feltham, 1978).

While an output-based incentive system had already been adopted at the research site, a new incentive contract placed more weight on PRO. If adverse selection effect works, employees who are better skilled at selling newly emphasized products will remain at the firm while less-skilled employees will depart.The issue is not the sales level change in general but the sales mix change. To test this self-selection effect, we set up the following hypothesis.

> Hypothesis 2: If a new compensation scheme gives more weight to a particular product, then remaining employees will sell a higher proportion of that product than quitting employees did (adverse selection or self selection hypothesis).

IV. Research Design

The sample data used are individual monthly sales data for SAP and PRO over the period from January 1992 to June 1997. The research site changed the compensation scheme for its frontline sales force on October 1, 1993.

Unlike the researchers' data set used in Banker et al. (1996), we were able to obtain sales data for the period prior to the implementation of the plan. This made it possible to compare the performance after the compensation scheme changed.

To examine the adverse selection and moral hazard impact of compensation changes under a multi-output setting, we used sales mix rather than absolute sales amount as a dependent variable (Ahn and Lee, 1998). A sales mix variable is preferable to an absolute sales variable not only because sales mix represents the results of effort reallocation, but also because other influences such as economic cycles can be better controlled. To find out the relative performance of different employee groups, we included absolute sales level as an additional dependent variable. We defined the dependent variables in this analysis as follows:

> $PRATIO_{im}$: Ratio of the m-th monthly PRO sales to total sales for the i-th employee.

We classified the sales force into one of the following three types:

> TEMP: Sales employees who left the research site within 9 months after the implementation (6/30/1993) of the output-based compensation program.
>
> QUIT: Sales employees who left the research site after the implementation date but prior to the end of the sample period (6/30/1997).
>
> STAY: Sales employees who remained through the end of the sample period (6/30/1997).

To examine the impact of the compensation changes, we

constructed the variable POSTMON which measures the employment period in months after the compensation changes. If there exists effort effect (Hypothesis 1), we can expect the sales force to reallocate their effort following the announcement of the new compensation scheme. Then the coefficient of the POSTMON will be positive. The variable PREMON measures the employment period in months prior to the compensation changes. These variables are also used by Banker et al. (1996A).

To investigate adverse selection and moral hazard impacts, we performed the following regressions using ordinary least square (OLS) estimation methods. While equation 1 uses an intercept shift model, equation 2 uses a slope shift model.

According to the second hypothesis, we expect the coefficients of D^T and D^Q to be negative. Negative coefficients of D^T and D^Q imply that the performance of STAY group is greater than those of D^T and D^Q.

To examine the difference in performance before and after a compensation scheme change, we included the POSTMON and PREMON variables in the regression model. If an effort effect exists, we may then expect the coefficient of POSTMON to be greater than that of PREMON.

$$\text{PRATIO}_{im} = \alpha+\beta^T D^T+\beta^Q D^Q+\gamma\text{POSTMON}_{im}+\delta\text{PREMON}_{im}+\varepsilon_{im} \quad (1)$$

$$\text{PRATIO}_{im} = \alpha+\beta^T D^T\text{POSTMON}_{im}+\beta^Q D^Q\text{POSTMON}_{im} +\gamma\text{POSTMON}_{im}+\delta\text{PREMON}_{im}+\varepsilon_{im} \quad (2)$$

D^T: 1 for TEMP, 0 otherwise.
D^Q: 1 for QUIT, 0 otherwise.
POSTMON_{im}: Employment period in months after the change.

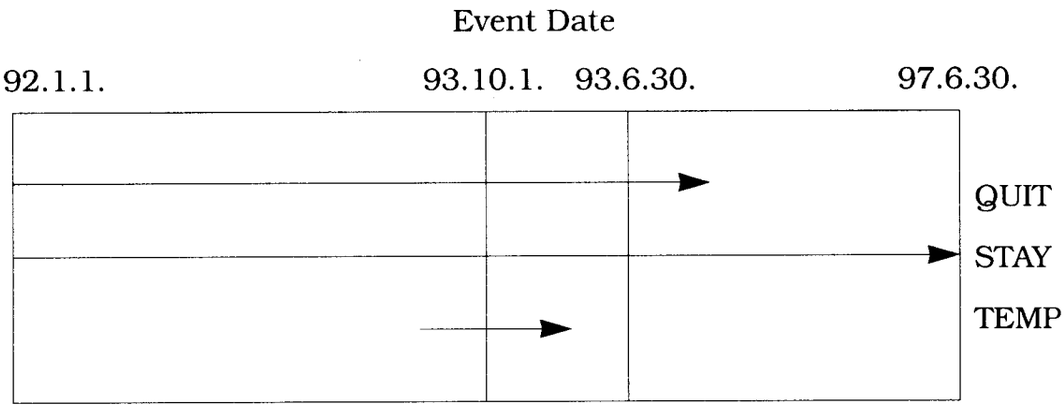

Figure 1. Event Date and Cut-off Dates for Employee Classification

$PREMON_{im}$: Employment period in months before the change.

V. Results and Analyses

5.1. Descriptive Statistics

Table 2 provides descriptive information for the sales force at the research site. The table shows that there were 4,324 front-line sales personnel at the research site during the sample period. A comparison of the number of observations (72,858) with the number of sales personnel (4,324) indicates that there are, on average, about seventeen months of observations for each individual.

Most of the sales force consists of temporary workers (62.5%), and about 37% of the sales force is classified as QUIT because they left the research site during the sample period (36.8%). The proportion of remaining workers (STAY) is only 0.7% of the sales force. However, the number of observations for STAY workers represents about 2.4% of the total observations.

Table 3 summarizes the descriptive statistics of the variables by sales force types. The mean sales proportion of PRO to total sales (PRATIO) is 39.1%. The absolute amount of monthly PRO sales (PSALE) and monthly total sales (TOTSALE) have the mean of 110,747 Won and 486,077 Won respectively. The average employment period for all subjects is only 18.5 months, suggesting a high turnover rate at the research site.

This table reports that the PRATIO for STAY (group of

Table 2. Descriptive Statistics by Sales Force Types

Types / Variables	QUIT		STAY		TEMP		TOTAL		
	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD	MEDIAN
SRATIO	0.385	0.380	0.468	0.396	0.401	0.394	0.391	0.385	0.241
SSALE	121,620	143,865	178,046	211,049	90,660	104,043	110,747	132,398	77,500
TOTSALE	531,296	629,959	573,234	617,779	406,492	478,625	486,077	582,380	331,500
POSTMON	7.549	9.299	16.518	14.562	- 0.697	1.534	5.117	8.279	0
PREMON	3.546	7.096	3.077	7.506	4.189	46.554	3.862	6.840	0
EMPERIOD*	32.920	14.593	61.400	12.615	11.262	7.946	18.551	13.689	0

*EMPERIOD: Employment period in months

Table 3. Sales Force Composition

Group	Sales force		Sales force-months	
	Number	Percent(%)	Number	Percent(%)
QUIT	1,590	36.8	44,545	61.1
STAY	31	0.7	1,772	2.4
TEMP	2,703	62.5	26,541	36.5
Total	4,324	100	72,858	100

remaining workers) is greater than that either for QUIT (group of workers who left) or TEMP (group of temporary workers) over the sample period.

5.2. Regression Results

Table 4 presents the estimation results for equations 1 and 2. As expected, the coefficients of POSTMON (γ) are positive and statistically significant in both equations. These results demonstrate that the relative ratio of PRO increased over time after the compensation changes. We can conclude that compensation changes, which gave more weight on PRO, have increased the sales ratio of PRO over time through the effort reallocation process, strongly supporting the hypothesis 1.

The coefficients of D^Q and D^T indicate how the quitted workers or temporary workers performed in comparison to the remaining workers.Because of adverse selection effects, the signs of β^Q and β^T are expected to be negative. The regression results show that the coefficients of β^Q are negative in both equations, although significant only in equation 2. This result implies that the performance of QUIT workers is not well aligned with the new marketing strategy of the firm which focuses on the sales of PRO.

Unexpectedly, however, the coefficient values for β^T are significantly negativein both equations. One explanation is that TEMP workers with less than 9 months of employment might be able to adjust their effort allocation more easily than STAY and QUIT workers because TEMP workers' absolute sales level is lower than for STAY workers. Moreover, unlike STAY, TEMP might be able to allocate their efforts mostly to new customer acquisition rather than customer retention because their

Table 4. Regression results of impact of compensation changes - I

Coefficients	Expected Sign	Equation 1	Equation 2
		Intercept shift	Slope shift
Intercept		0.384***	0.382***
β^T	-	0.043**	0.032***
β^Q	-	-0.023	-0.002***
γ	+	0.006***	0.007***
δ	-	-0.007***	-0.007***
Adj. R^2		0.044	0.046

***: significant at 1% level**: significant at 5% level

existing customer base is relatively small.

To find out the relative performance of TEMP and STAY, we used absolute sales *level* as an alternative to the sales *mix*. Note that since commissions are calculated based on absolute sales and the commission rate for each insurance product, absolute sales levels as well as sales mix are major determinants of compensation.

5.3. Revised Regression Results

The following regression equations 3 and 4 replace PRATIO (the ratio of PRO sales) with PSALE (the absolute level of PRO sales) as a dependent variable. While the coefficients for β^T were found to be positive in equations 1 and 2, they are negative in equations 3 and 4. Despite the large increase in sales proportion of PRO, temporary workers showed a relatively smaller increase in sales amount than remaining employees. Although temporary workers were able to adjust their sales-mixes rather quickly resulting in a higher PRATIO than other types of workers, they showed relatively low performance in terms of sales level. A fast response in terms of sales-mix changes might be due to this relatively small base amount. We can conclude that the new incentive plan successfully weakened the adverse selection problem in an incomplete market setting (Demski and Feltham, 1978). This conclusion supports our hypothesis 2.

$$PSALE_{im}=\alpha+\beta^T D^T+\beta^Q D^Q+\gamma POSTMON_{im}+\delta PREMON_{im}+\varepsilon_{im} \quad (3)$$

$$PSALE_{im}=\alpha+\beta^{T}D^{T}POSTMON_{im}+\beta^{Q}D^{Q}POSTMON_{im} +\gamma POSTMON_{im}+PREMON_{im}+\varepsilon_{im} \quad (4)$$

The coefficients for γ and δ are found to be positive. Because the dependent variable is the absolute sales level of PRO, length of experience should help the performance of sales employees whether it is before the change or after the change. Note, however, that the coefficients for γ are significantly greater than those for δ. This implies that the length of experience after the change had a greater impact on the sales of PRO than the length of experience before the change. This result is consistent with the previous result obtained in equations 1 and 2. All of our results support the first hypothesis that the sales force will reallocate their efforts to maximize their commission when given a new compensation scheme.

5.4. Sensitivity Analyses

If a worker remained until the end of the sample period (June 30, 1997), D^{S} will take the value of 1. We can change the cut-off date used in classification of STAY and TEMP. If we select February 28, 1997 as the cut-off date, then QUIT will be the employees who quit before March 1, 1997 but stayed after June 30, 1993. Note that for the following regression model 5 and 6 are based only on sample data after the compensation changes, therefore, the PREMON variable does not appear in the equations 5 and 6.

Table 5. Regression Results of Impact of Compensation Changes - II

Variables	Expected	Equation 3	Equation 4
		intercept shift	slope shift
Intercept		148,563***	97,718***
β^{T}	-	-60,662***	-6,409***
β^{Q}	-	-41,572***	-1,782***
γ	+	1,311***	3,280***
δ	-	243***	414***
Adj. R^2		0.023	0.020

$$PRATIO_{im}=\alpha+\beta^{T}D^{T}+\beta^{Q}D^{Q}+\gamma POSTMON_{im}+\varepsilon_{im} \quad (5)$$

$$PRATIO_{im}=\alpha+\beta^{T}D^{T}POSTMON_{im}+\beta^{Q}D^{Q}POSTMON_{im} +\gamma POSTMON_{im}+\varepsilon_{im} \quad (6)$$

Table 6 shows the composition of employee groups using four different cut-off dates. For example, when the cut-off date is April 30, 1996, the STAY group represents about 21% of the QUIT group.

Table 7 shows the sensitivity analysis results of four different cutoff dates. As the cutoff date moves away from the event date (October 1, 1993), the coefficient for β^{T} decreases monotonically from 0.161 to 0.089 in equation 5, and from 0.017 to 0.014 in

Table 6. Composition of Sales Force

Cutoff Dates	April 1996	October 1996	February 1997	June 1997
QUIT	1,336	1,460	1,536	1,590
	(30.9%)	(33.8%)	(36.3%)	(36.7%)
STAY	285	161	85	31
	(6.6%)	(3.7%)	(2.0%)	(0.7%)
TEMP	2,703	2,703	2,703	2,703
	(62.5%)	(62.5%)	(62.5%)	(62.5%)
Total	6,320	6,320	6,321	6,321

Table 7. Comparison of Regression Results between Sales Ratio and Sales Level

Cut-off Dates	April 96	October 96	February 97	June 97
5 Intercept	0.397***	0.420***	0.420***	0.471***
β^{T}	0.161***	0.139***	0.140***	0.089***
β^{Q}	0.026***	0.001	0.001	-0.050**
γ	0.004***	0.003***	0.003***	0.003***
Adj. R^2	0.017	0.016	0.016	0.017
6 Intercept	0.470***	0.473***	0.470***	0.467***
β^{T}	0.017***	0.015***	0.015***	0.014***
β^{Q}	-0.001***	-0.002***	-0.002***	-0.004***
γ	0.001***	0.002***	0.002***	0.004***
Adj. R^2	0.003	0.005	0.004	0.004

***: significant at 0.01 level, **: 0.05 level, *: 0.10 level

equation 6. A similar trend can be observed in the coefficients of β^{Q}, which shows a monotonic decrease from 0.026 to -0.050 for equation 5 and from -0.001 to -0.004 for equation 6. These shifts strongly indicate that the further away from the event date the cutoff date is, the lower the productivity increase for D^{Q} in comparison to D^{S}. These results support the hypothesis that compensation changes at the research site were able to reduce the adverse selection problem gradually over time.

V. Conclusion

The analytical research from agency theory suggests that an output-based contract offered in a labor market can affect performance by attracting workers with certain personal attributes to the company (self selection effects). An output-based contract can also affect performance by motivating better effort from workers (effort effect). Although there has been much analytical and experimental research about these two effects, formal empirical evidence is very rare. The recent study of Banker et al. (1996) provided empirical evidence on these two effects under a single output setting. This paper reports empirical evidence of these effects under a multi-output setting.

Our research is based upon the individual monthly sales data for the insurance sales force. After the adoption of the new compensation scheme, relative sales of the newly emphasized product increased, supporting the effort effect hypothesis. The results also supported the self selection hypothesis. Although, temporary workers seemed to show a quick adjustment to the new compensation scheme in the short term, sensitivity analyses provided evidence that the productivity of remaining employees increases over time.

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