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The Impact of Environmental Uncertainty on the Design of Salesforce Compensation Plans

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Abstract

Designing a sales compensation plan is an important task of salesforce managers. Recently, researchers in the marketing literature have used an agency-theoretic framework to explain the impact of environmental uncertainty on the proportion of incentive versus fixed pay in the sales compensation plan. While the theory and its variants have been well developed, empirical tests of some of the prescriptions emerging from this framework have been limited and inconclusive. In this research, we empirically investigate the impact of environmental uncertainty on the design of salesforce compensation plans. Our findings indicate that incorporating a measure of risk aversion is crucial to obtaining support for the agency-theoretic prescriptions. Specifically, as predicted by theory, we find that the proportion of incentive pay in the sales compensation plan is influenced not only by the amount of environmental uncertainty but also by the risk preferences of salespeople employed by the firm. We also test and find directional support for the agency-theoretic prescription that the amount of total compensation should increase with an increase in salespersons' tolerance for risk. Finally, we discuss the managerial implications of these findings and outline directions for future research.

Designing a sales compensation plan is an important task of salesforce managers. Salespeople value monetary compensation highly and a well-designed compensation plan can substantially increase the overall efficiency of the salesforce. In many industries, a firm's compensation of its salesforce is its number one marketing expenditure. We also observe wide variation in the types of compensation plans utilized both within and across industries (Peck, 1982). Clearly, the compensation plan offered to the salesforce can be a critical component of the overall control strategy of the sales organization (Anderson and Oliver, 1987; Weitz, Sujan, and Sujan, 1986).

Salesforce compensation plans can be described both by the proportion of incentive pay as well as the amount of total compensation. Indeed, the design of salesforce compensation plans has received much attention in the recent theoretical marketing literature (Basu, Lal, Srinivasan, and Staelin, 1985; Lal and Srinivasan, 1993). Basu et al. (1985) derive the profit-maximizing compensation contract by balancing the effort inducing nature of incentive pay against the amount of financial risk that the salesperson has to bear. A key prescription of their theory deals with the specification of the compensation plan under varying levels of environmental uncertainty. In their research setting, environmental uncertainty refers to factors that influence sales but are beyond the control of the salesperson. Typical

examples of such factors include competitive marketing activity, unpredictable effects of the firm's other marketing activity (advertising, promotion, and so on), and volatility in overall industry sales. Under this definition of environmental uncertainty, their theory prescribes that firms operating in sales environments characterized by high levels of environmental uncertainty should offer compensation contracts that emphasize fixed salary. On the other hand, firms operating in sales environments characterized by low levels of environmental uncertainty should offer compensation contracts that emphasize incentive pay. Further, their theory also predicts that the amount of total compensation will decrease with the level of environmental uncertainty. Thus, in their research setting, environmental uncertainty plays a major role in determining both the amount and form of total compensation.

Lal and Srinivasan (1993) use a similar analytical framework to examine the impact of environmental uncertainty on the design of salesforce compensation plans. Their theoretical results with respect to the impact of environmental uncertainty on salesforce compensation plans are identical to that obtained by Basu et al. (1985). In addition, they also derive the result that both the proportion of incentive pay as well as the amount of total compensation should decrease as the risk aversion of the salesperson increases.

Empirical support for the predicted impact of environmental uncertainty on the amount and form of total compensation has been limited and inconclusive (Coughlan and Narasimhan, 1992; John and Weitz, 1989; Lal, Outland, and Staelin, 1994; Umanath, Ray, and Campbell, 1993). In a cross-sectional study, Coughlan and Narasimhan (1992) find no support for the propositions related to the impact of environmental uncertainty on either the amount of total compensation or the proportion of fixed versus incentive pay. John and Weitz (1989) find only conditional support for the impact of environmental uncertainty on the proportion of incentive pay whereas Umanath, Ray, and Campbell (1993) find that the impact of environmental uncertainty on both the amount and form of total compensation is in a direction *opposite* to that prescribed by the theory of Basu et al. (1985). The study by Lal, Outland, and Staelin (1994) is the only one that offers significant supporting evidence. They analyze salesperson level data and find good support for the agency theoretic prescription with respect to the impact of environmental uncertainty on the optimal split between incentive and fixed pay.

Our work differs from the previous empirical research in two important ways. First, unlike previous researchers, we examine the impact of the level of risk aversion of the salesforce on the structure of the optimal compensation contract. We find that the firms in our sample differ considerably in the risk preferences of the salespeople that they are able to attract and retain from the salesforce labor market. Following the analytical work of Lal and Srinivasan (1993), we therefore explicitly account for the risk preferences of the salespeople employed by a firm. Our empirical findings demonstrate that incorporating a measure of risk aversion is critical in obtaining support for the basic agency-theoretic tradeoffs. Specifically, as predicted by agency theory, we find that the optimal amount of risk sharing between the firm and the salesperson is influenced not only by the level of environment uncertainty but also by the risk preferences of salespeople employed by the firm.

Second, our empirical findings reveal substantial heterogeneity in the composition of compensation plans even among firms that face the same level of environmental uncertainty. This is in direct contrast to previous empirical researchers who analyze the impact of environmental uncertainty on the design of compensation plans uniformly across the entire spectrum of firms.

The rest of the paper is organized in the following way: in the next section, we formally present our research hypotheses. We then describe our data and discuss key features of our research setting as well as the measures utilized in our analysis. Next, we present our empirical findings and discuss their managerial implications. Finally, we conclude by outlining directions for future research.

1. Statement of hypotheses

1.1. Research design

We surveyed a cross-sectional sample of sales organizations to study the impact of environmental uncertainty on the design of salesforce compensation plans. While this design precludes us from obtaining detailed information on individual salesperson level variables, it provides us with the valuable benefit of including firms that may differ considerably in the extent of environmental uncertainty faced by them.

1.2. Hypotheses related to the proportion of incentive pay

We examine the impact of two key variables—namely, environmental uncertainty and the level of risk aversion of the salesforce—on the proportion of incentive pay in the compensation contract. Our first hypothesis follows from the work of *both* Basu et al. (1985) and Lal and Srinivasan (1993). However, our second hypothesis follows only from the work of Lal and Srinivasan (1993). Since our hypotheses are developed using comparative statics, we state our hypothesis for each variable while holding the other constant. Our hypotheses related to the proportion of incentive pay read as follows:

H_1: For a given level of risk aversion of the salesforce, the proportion of incentive pay will decrease with an increase in environmental uncertainty.

H_2: For a given level of environmental uncertainty, the proportion of incentive pay will decrease with an increase in the level of risk aversion of the salesforce.

1.3. Hypotheses related to the amount of total compensation

Here, we examine the impact of environmental uncertainty and the level of risk aversion of the salesforce on the amount of total compensation. As before, our first hypothesis follows from the work of both Basu et al. (1985) and Lal and Srinivasan (1993) while our second hypothesis follows from the work of Lal and Srinivasan (1993). We have

H_3: For a given level of risk aversion of the salesforce, the amount of total compensation will decrease with an increase in environmental uncertainty.

H_4: For a given level of environmental uncertainty, the amount of total compensation will decrease with an increase in the level of risk aversion of the salesforce.

2. Data and research setting

2.1. Data

We collected primary data via a mail survey of sales organizations across a wide variety of industries. A national level (U.S.) mailing list of sales managers was obtained from the editor of *Sales and Marketing Management* magazine, and we sent our survey instrument to 836 firms on this list. After a couple of reminder waves, we received a total of 266 completed responses. Subtracting 37 mismatched cases, this translates to an effective response rate of 33 percent.

The firms in our sample follow several methods to compensate their salespeople. Overall, 37 percent of the firms in the survey use a fixed salary plus bonus compensation structure. About 35 percent use fixed salary, commission pay, and bonus pay to motivate their salespeople. Finally, 24 percent use fixed salary plus commission pay, while the remaining 5 percent use no incentive component and pay exclusively on the basis of fixed salary.

2.2. Research setting

At the outset, we describe two key aspects of our research setting. First, our unit of analysis is the firm. This is consistent with the theoretical framework of Basu et al. (1985) and Lal and Srinivasan (1993). It is also consistent with the empirical fact that most sales organizations offer the same sales contract to all members of the salesforce. Essentially, we make the assumption that the salesforce is homogeneous with respect to skill level and preference toward risk. While there may be some divergence from this assumption in practice, we hasten to point out that this is not a serious limitation. Sales managers are often constrained to design compensation plans with some average skill level and risk preference in mind. Also, we note that previous empirical researchers have taken a similar approach (John and Weitz, 1989; Coughlan and Narasimhan, 1992).

The second aspect of our research setting is concerned with the definition of incentive pay. Strictly speaking, the agency theoretic work on the design of compensation plans is developed in the context of firms that use some combination of commission pay and fixed salary. In this setting, an increase in environmental uncertainty leads to an increase in the variance in the amount of compensation by making the commission payouts more volatile. Recall, however, that the firms in our sample use one of four incentive schemes: (1) bonus, (2) bonus and commission, (3) commission, and (4) no incentive scheme. In our empirical work, we classify bonus pay as a form of incentive pay. This is consistent with the approach taken by previous empirical researchers (John and Weitz, 1989; Coughlan and Narasimhan, 1992). In addition, we next provide our justification for including these types of firms in our analysis.

With regard to the firms that use a pure bonus scheme, we find that these firms tend to base the bonus award on the attainment of prespecified sales quotas. In these situations, the magnitude of the bonus award is a function of the percentage of sales quota that is realized. Typically, in practice, the amount of bonus increases in a monotonic way from some percentage below the sales quota to some percentage above the sales quota. Clearly,

environmental uncertainty can perturb the level of sales further away from the sales quota and thus increase the compensation variance of such a salesperson in much the same way that environmental uncertainty can increase the compensation variance of a salesperson who works under a commission plan. Hence, it is logical to consider such a bonus payment as a part of the incentive component of a salesperson's total compensation.

With respect to firms that use a hybrid bonus and commission scheme, we find that such firms tend to use commission pay to motivate higher sales volume and bonus pay to achieve specific nonsales targets (such as, division profitability, new product sales, sales to new customers, and so on). Here, not only does the salesperson have to expend effort to obtain dollar sales but he or she has also to expend additional effort and care to attain the related goals specified by management. Again, in a typical application situation, the amount of bonus paid by management to the salesperson is contingent on the performance of the salesperson with respect to these nonsales goals in comparison to some implicit or explicit standard of reference. While we do not have a measure of how environmental uncertainty affects the difficulty of attaining these various nonsales standards, it is reasonable to assume that environmental uncertainty will also perturb the output of the salesperson's effort along these nonsales performance dimensions. Thus, environmental uncertainty will not only increase the compensation variance associated with commission pay, but it will also increase the compensation variance arising from such bonus awards. Hence, we argue that it is logical to consider such a bonus payment also as part of the incentive pay described in the Basu et al. (1985) model.

We fully acknowledge at this point that a unit percent increase in the proportion of commission pay may lead to a higher or lower variance in the amount of compensation as compared to a unit percent increase in the proportion of bonus pay. We demonstrate that our findings are robust to departures from this assumption via a sensitivity analysis in a later section.

3. Measures

3.1. Total compensation and proportion of incentive pay

Our survey sought from each sales manager the amount of commission pay, the amount of bonus pay, the proportion of commission pay, and the proportion of bonus pay for the typical salesperson at the firm. The specific items used to obtain this information are listed in the appendix. We use these measures to compute the amount of total compensation and the proportion of incentive pay in the compensation plan. As discussed earlier, we add up the proportion of commission pay as well as the proportion of bonus pay to arrive at the proportion of incentive pay in the compensation plan.

3.2. Environmental uncertainty

Our survey also sought the percentage fluctuation in sales for the typical salesperson from year to year (see the appendix). We use this variable directly to represent environmental

uncertainty. Our measure of environmental uncertainty can thus be viewed as the coefficient of variation of dollar sales, representing the ratio of the standard error over the mean level of sales, for the typical salesperson as estimated by the sales manager. As mentioned earlier, this fluctuation in sales level may arise due to competitive marketing activity, unpredictable effects of the firm's other marketing activity, and volatility in overall industry sales. If we assume that the salesperson expends the same amount of effort from year to year, the percentage variation in sales from year to year may be seen as a measure of environmental uncertainty since it is beyond the control of the salesperson. Using this percentage fluctuation in annual sales as a measure of environmental uncertainty controls for the fact that salespeople who realize high levels of dollar sales will typically observe higher absolute fluctuations in dollar sales. It is also consistent with Basu et al. (1985) who use the coefficient of variation in dollar sales to represent environmental uncertainty.

We utilize another variable reported in our survey—namely, the length of the selling cycle to check the validity of this measure of environmental uncertainty. Specifically, we examine the correlation between our measure of environmental uncertainty and the length of the selling cycle. We find a positive and significant correlation between our environmental uncertainty measure and the length of the selling cycle ($\rho = .15$, $p < .10$). This finding provides additional support for the validity of our environmental uncertainty measure because Coughlan and Narasimhan (1992, p. 117) theoretically demonstrate a positive relationship between the length of the selling cycle and the variance in the relationship between effort and sales.

3.3. Risk aversion of the salesforce

Previous empirical researchers have identified the importance of considering the risk preferences of salespeople. Oliver and Weitz (1991) find that salespeople vary in their level of risk aversion. Risk-averse salespeople both prefer, and appear to work under, compensation plans that incorporate lower levels of incentive pay. Given that our sample reports the compensation plans of salespeople working in diverse industries, their findings indicate that it is important to incorporate a measure of risk tolerance in our analysis.

Unfortunately, our survey does not directly elicit the risk preferences of the typical salesperson employed at a firm. However, we are able to compute the extent of compensation variability perceived by the typical salesperson employed at a firm and use this to create a measure of risk aversion. Specifically, we use the ratio of the standard deviation of a salesperson's total compensation to the salesperson's expected amount of total compensation as a measure of risk aversion. In essence, our measure of risk aversion represents the fluctuation in compensation that the typical salesperson is expected to tolerate per dollar of compensation.

We now provide a more formal derivation of our intuitive measure of risk aversion. We begin by examining the relationship between expected total compensation and compensation variance in our sample of firms. We estimate the following model:

$$\text{Expected total compensation} = \beta_0 + \beta_1 * (\text{Variance of total compensation})^{\delta}. \quad (1)$$

An OLS estimation of the model with $\delta = .5$ yields an estimate of 40,412 for β_0 with a standard deviation of 2,352 ($t = 17.18, p < .0001$). We also obtain an estimate of 3.03 for β_1 with a standard deviation of .34 ($t = 8.91, p < .0001$). The model has an $R^2 = .38$ and is highly significant ($p < .0001$). We settled on $\delta = .5$ by running several regressions with δ in the range .1 to .9 and choosing the model with the best fit based on R^2 values. These empirical results suggest a strong positive association between the expected amount of total compensation and the standard deviation of total compensation in the salesforce labor market. They show that salespeople who choose to seek higher levels of compensation will on the average encounter higher variability in total sales compensation. In other words, salespeople have to make a tradeoff between high pay and income security.

Consistent with Oliver and Weitz (1991), we now conjecture that the salesforce labor market consists of salespeople who differ in their tolerance for risk. Salespeople self-select into a firm (that is, choose a compensation contract) that maximizes their utility, given their level of tolerance for risk. Thus, a salesperson considering employment at a firm will use both the amount of total compensation as well as the standard deviation of the amount of compensation to evaluate the overall attractiveness of the compensation package offered by the firm.

The matching process between firms and salespeople can be used to yield information about risk preferences. Formally, assume that salespeople have a utility function of the form,

$$\text{Utility} = \text{Expected total compensation} - r\,[\text{Variance of total compensation}], \quad (2)$$

where r is a parameter denoting the risk aversion of the salesperson. The salesperson's problem is to choose a firm on the curve given by equation (1) so as to maximize his or her utility expression in equation (2). Selecting a firm implies choosing *both* the expected total compensation as well as the variance in the amount of total compensation since the two are related as described in equation (1). Substituting for the variance in the amount of total compensation from equation (1) into equation (2), we can show that a salesperson with risk aversion parameter r will maximize his or her utility by choosing a firm with expected total compensation $= (\beta_1^2/2r) + \beta_0$. Using equation (1) again, we can show that the corresponding variance in the amount of compensation associated with a firm offering this level of total compensation is $\beta_1^2/4r^2$. The standard deviation of compensation is thus $\beta_1/2r$. Hence, the ratio of the two observables in our sample—namely, the standard deviation of compensation and expected total compensation for the typical salesperson follows the relationship,

$$\frac{\text{Standard deviation of compensation}}{\text{Expected total compensation}} = \frac{1}{\beta_1 + \left[\dfrac{\beta_0}{\beta_1}\right] 2r}. \quad (3)$$

Since the risk aversion parameter r occurs in the denominator with positive coefficients, the ratio on the left side of equation (3) is monotonically related to the risk tolerance of the typical salesperson employed at the firm. This analysis thus provides an additional justification for our measure of risk aversion.

The components of our risk aversion are computed in the following way. The variance in the amount of total compensation is computed by calculating the variance that arises both from commission pay as well as bonus pay. In addition to the variables described earlier, our survey also reports the following three pieces of information: (1) proportion of individuals in the salesforce who receive a bonus, (2) mean amount of bonus among salespeople who receive a bonus, and (3) the lower and upper bounds among the salespeople who receive a bonus. Using these variables, we are able to calculate the compensation variance associated with the compensation policy of a firm. The variance in the amount of total compensation may be written as

$$\text{Variance in total compensation} = c^2\sigma^2 + p(1 - p)\mu_b^2 + p\sigma_b^2, \tag{4}$$

where c is the commission rate, σ^2 is the variance in the annual level of sales, p is the proportion of the salesforce that receives a bonus, μ_b is the average bonus amount among bonus recipients, and σ_b^2 is the variance of bonus award amounts among bonus recipients. The first term in equation (4) is the variance attributable to the commission policy of the firm. The last two terms represent the variance attributable to the bonus pay policy of the firm. Here, we expect the proportion of salespeople who receive a bonus and the variance in bonus award amounts to influence the bonus pay variablity of the typical salesperson. Specifically, we expect that a salesperson who works at a firm where p is close to .5 will have more uncertainty regarding receipt of a bonus than a salesperson who works at a firm where p is close to either 0 or 1. Likewise, we expect that a salesperson who works at a firm where the variability in bonus award amounts is larger will perceive greater variability in bonus award amounts than a salesperson who works at a firm where the variability in bonus award amounts is smaller. We hasten to point out, however, that our expression for variance in total compensation is only a proxy for the salesperson's perception of the expected variability in earnings under a given compensation plan. Ideally, we would have liked to have data on perceptions of income variability directly from the salesperson.

As derived in equation (3), we use the ratio of the standard deviation of compensation to the expected level of total compensation to compute our measure of risk aversion. We now provide an additional check for the validity of our risk aversion measure. We divide our sample of firms into two groups based on the median value of our risk aversion measure and examine the length of the selling cycle across the two groups. To the extent that longer selling cycles are indicative of higher uncertainty in the relationship between effort and sales, we expect relatively risk tolerant salespeople to choose firms with long selling cycles and relatively risk-averse salespeople to choose firms with short selling cycles. We find this effect in our sample of firms. Specifically, we find that the average selling cycle is longer at firms that employ salespeople who are relatively risk tolerant as compared to firms that hire relatively risk-averse salespeople ($z = 2.39$, $p < .01$).

3.4. Covariates and control variables

Here, we discuss the covariates and control variables that we use in our analysis. Previous research (Brown, Hamilton, and Medoff, 1990; John and Weitz, 1989; Shapiro, 1977) has

identified that monitoring and control costs increase with the size of the organization. Large sales firms will thus tend to use market-based control systems and utilize a higher proportion of incentive pay. We use the number of salespeople employed by the firm as a proxy for size. We also expect that the fraction of time spent on direct selling activities (as opposed to time spent on service, travel, and administrative activities) will directly influence the ability of the firm to rely on incentive pay. Our survey reports the fraction of time spent on direct selling activities, which we use in straightforward fashion. In addition to these two covariates, our survey also reports the number of resignations during 1992. We use the number of resignations and the number of salespeople to compute the turnover rate at the firm. As we will discuss in the next section, turnover rate serves as an important control variable while testing the predictions of agency theory.

4. Findings from a test of the hypotheses

To test our hypotheses pertaining to the impact of environmental uncertainty on the design of compensation plans, we partition our sample of firms into those facing low levels of environmental uncertainty and those facing high levels of environmental uncertainty. We use the median value of our environmental uncertainty measure to implement this partitioning. Similarly, to test our hypotheses pertaining to the impact of the risk tolerance of the salesforce on the design of compensation plans, we partition our sample of firms into those employing relatively risk tolerant salespeople and those employing relatively risk-averse salespeople. Again, we use the median value of our measure of risk tolerance to effect this partitioning. Using the two levels for our measure of environmental uncertainty and the two levels for our measure of risk tolerance, we thus obtain four groups of firms—I, II, III, and IV. See Table 1.

Table 1. Average turnover rate, average proportion of incentive pay, and average total compensation in firms with differential levels of environmental uncertainty and risk aversion.

	Low Environmental Uncertainty	High Environmental Uncertainty
Low Risk Aversion	**I** Turnover rate = 7 percent Proportion of incentive pay = 49 percent Amount of total compensation = $56,938 n = 23	**II** Turnover rate = 8 percent Proportion of incentive pay = 53 percent Amount of total compensation = $58,021 n = 40
High Risk Aversion	**III** Turnover rate = 5 percent Proportion of incentive pay = 33 percent Amount of total compensation = $47,576 n = 37	**IV** Turnover rate = 5 percent Proportion of incentive pay = 17 percent Amount of total compensation = $51,495 n = 25

Recall that in the agency-theoretic formulation of compensation plans the firm is expected to design the compensation plan keeping in mind the minimum utility constraint of the salesperson. Ideally, then, a correct test of prescriptions arising from agency theory will compare firms that have zero turnover. However, in practice, most sales firms experience for a variety of reasons, many of which are beyond the control of the firm, a small turnover rate. An example of such uncontrollable turnover is when a salesperson leaves the firm on account of his or her spouse being relocated to another geographical area. At equilibrium, we would expect this uncontrollable turnover rate among firms, between which salespeople could move, to be approximately equal. However, another reason for nonzero turnover may be that the firm is violating the minimum utility constraint in which case it will experience a higher turnover rate than other firms. One way to control for this violation is to test the prescriptions of agency theory across firms that do not differ significantly in their turnover rates. We would then be comparing firms that do not violate the minimum utility constraint or comparing firms that violate the minimum utility constraint to the same extent.

Table 1 displays the average turnover rates for each of the four groups of firms that we analyze in our study with regard to the differences in their sales compensation plans. Missing values leave us with a total of 125 firms across the four groups. We find no significant differences in the turnover rates between groups I through IV. We believe that our finding of relatively equal turnover rates lends some credibility to our testing of the predictions of agency theory across these four groups of firms.

4.1. Findings on tests of hypotheses related to the proportion of incentive pay

Table 1 displays the proportion of incentive pay by risk aversion and the level of environmental uncertainty. The average proportion of incentive pay in each group is reported within the table. For firms that employ relatively risk tolerant salespeople (firms in groups I and II), we find that environmental uncertainty has no significant impact on the proportion of incentive pay ($z = .58$, insignificant at conventional significance levels). However, among firms that employ relatively more risk-averse salespeople (firms in groups III and IV), we find that environmental uncertainty has a significant negative impact on the proportion of incentive pay. Specifically, among these firms that employ salespeople with greater aversion for risk, the proportion of incentive pay for thirty-seven firms facing lower level of environmental uncertainty is 33 percent versus 17 percent for the twenty-five firms that face a higher level of environmental uncertainty ($z = -3.06$, $p < .01$). *Our data thus support hypothesis H_1—namely, that the proportion of incentive pay will decrease with an increase in environmental uncertainty but only among firms that employ salespeople with a relatively greater level of risk aversion.*

It is interesting to note that it is only by partitioning our sample of firms by the level of risk aversion do we observe a negative impact for environmental uncertainty on the proportion of incentive pay. Indeed, we find no difference in the proportion of incentive pay when we compare the firms that face low environmental uncertainty (firms in groups I and III) with the firms that face high environmental uncertainty (firms in groups II and IV). The average proportion of incentive pay is identical across these two groups of firms and equals 39 percent. Thus, our empirical results suggest that it is important to incorporate

a measure of the risk aversion of the salesforce while testing the prescriptions of agency theory. *Consistent with agency theory, we find that risk sharing between the firm and the salesperson is more important among firms that hire salespeople with relatively greater levels of risk aversion.*

We next examine the empirical validity of hypothesis H_2 pertaining to the impact of the risk aversion of the salesforce on the proportion of incentive pay. For firms in situations characterized by low environmental uncertainty (firms in groups I and III), we observe that the proportion of incentive pay decreases as the level of risk aversion of the salesforce increases. Specifically, the proportion of incentive pay for group I firms is 49 percent versus 33 percent for group III firms ($z = -1.94$, $p < .05$). Similarly, for firms in situations characterized by high environmental uncertainty (firms in groups II and IV), we again observe that the proportion of incentive pay decreases as the level of risk aversion of the salesforce increases. Specifically, Table 1 reveals that the proportion of incentive pay for group II firms is 53 percent and that for group IV firms is 17 percent ($z = -7.98$, $p < .01$). Consistent with the prescriptions of agency theory, we find that firms place greater emphasis on fixed salary when they employ salespeople with relatively higher levels of risk aversion. Alternatively, our results here could be interpreted as being consistent with Oliver and Weitz (1991) in that risk-averse salespeople seek compensation plans that incorporate lower levels of incentive pay. *At any rate, our data offer very good support for hypothesis H_2—namely, that firms that employ salespeople with relatively higher levels of risk aversion emphasize fixed salary over incentive pay.*

We can also test the validity of hypotheses H_1 and H_2 in a continuous sense, although we lose the ability to control for turnover rate. Table 2 displays the results of estimating a model with the proportion of incentive pay as the dependent variable. The explanatory variables are environmental uncertainty, risk tolerance, and two covariates—namely, size of the salesforce and the proportion of time devoted to direct selling activities. Here, we use the continuous form of all our variables. Since our dependent variable is constrained to lie between 0 and 1, the appropriate econometric model in this case is the double-limit tobit model wherein estimation is done using a maximum likelihood procedure while

Table 2. Model of incentive pay: Dependent variable = proportion of incentive pay (intercept not reported).

	Expected Sign	Coefficient Estimate Tobit Model
Independent variable:		
Environmental uncertainty	−	−1.59*
Risk tolerance	+	3.85*
Covariates:		
Proportion of time spent on selling activities	+	3.03×10^{-3}**
Log (size of the salesforce)	+	3.09×10^{-2}***
Model fit		Log-likelihood = −32.13, significant at .0001 level

Note: Estimation done using 125 firms. Observations deleted due to missing values.

*Significant at the .0001 level.
**Significant at the .05 level.
***Significant at the .10 level.

explicitly taking into account the double-censored nature of the dependent variable. All the variables in our model have the expected signs and are statistically significant. Thus, when we use the continuous version of our variables, our cross-sectional data offer very good support for the agency theoretic prescriptions with respect to the optimal split between incentive pay and fixed salary.

We now relax our assumption that a given amount of bonus pay (such as $1,000) creates the same amount of compensation variance as an equal amount of commission pay. In this connection, we carried out a sensitivity analysis using weights in the range .5 to 1.5 for the proportion of bonus pay in the overall proportion of incentive pay. A weight of .5 implies that a given amount of bonus pay generates 50 percent of the compensation variance created by an equal amount of commission pay. A weight of 1.5 implies that a given amount of bonus pay generates 150 percent of the compensation variance created by an equal amount of commission pay. We ran eleven regressions by changing the weight for bonus pay from .5 to 1.5 in steps of .1. Thus, the dependent variable was slightly modified from that used in the earlier tobit model. However, the same set of independent variables were used. Although the significance levels varied across the different models, all variables in all models have the right sign and are significant at the .10 level or better. We thus conclude that our results are robust to the consideration that a unit of bonus pay may create a different amount of compensation variance as compared to a unit of commission pay.

4.2. Findings on tests of hypotheses related to the amount of total compensation

Turning now to the hypotheses related to the amount of total compensation, Table 1 displays the amount of total compensation by the level of risk aversion and the extent of environmental uncertainty. For firms that employ relatively risk tolerant salespeople, we find that environmental uncertainty has no impact on the amount of total compensation. Specifically, Table 1 reveals that among these firms that employ salespeople with relatively lower level of risk aversion, the total compensation for firms facing lower levels of environmental uncertainty is $56,938 versus $58,021 for firms that face higher levels of environmental uncertainty ($z = .13$, insignificant at conventional significance levels). Similarly, for firms that employ relatively risk-averse salespeople, we find that environmental uncertainty has no impact on the amount of total compensation ($47,576 versus $51,495, $z = .79$, also insignificant at conventional significance levels). In addition, for both of these comparisons, the observed effects are in a direction opposite to that hypothesized. *Thus, our data do not provide support for hypothesis H_3—namely, that for a given level of risk aversion of the salesforce, the amount of total compensation will decrease with an increase in the level of environmental uncertainty.*

We do, however, find some support for hypothesis H_4 pertaining to the impact of the level of risk aversion on the amount of total compensation. For firms in situations characterized by low environmental uncertainty (firms in groups I and III), we find that the amount of total compensation decreases as the level of risk aversion increases, although the effect is not statistically significant ($56,938 versus $47,576, $z = -1.37$). Similarly, for firms in situations characterized by high environmental uncertainty (firms in groups II and IV), we find that the amount of total compensation decreases as the level of risk aversion increases

although the effect is not statistically significant ($58,021 versus $51,495, $z = -1.00$). *Thus, our empirical results are directionally consistent with hypothesis H_4—namely, that the amount of total compensation decreases with the level of risk aversion. In other words, sales organizations value salespeople who have a relatively high tolerance for risk and they tend to reward such salespeople with a higher amount of total compensation.*

5. Discussion and conclusion

We set out to empirically examine the impact of environmental uncertainty on the design of salesforce compensation plans. Our empirical findings offer good support for the prescriptions of agency theory pertaining to the optimal sharing of risk between the firm and the salesperson. Specifically, we find that among firms that employ salespeople with relatively higher levels of risk aversion, those that face higher levels of environmental uncertainty should offer sales contracts with lower proportion of incentive pay than their counterpart firms that face lower levels of environmental uncertainty. In other words, it is more efficient for the firm to bear risk and increase the proportion of fixed salary vis-a-vis incentive pay as environmental uncertainty increases.

We also find directional support for the agency-theoretic prescription that the amount of total compensation should increase with tolerance for risk. We observe that risk tolerant salespeople tend to be paid more than risk-averse salespeople. Our empirical findings do not, however, provide support for the hypothesis that environmental uncertainty has a negative impact on the expected amount of total compensation. This is in contrast to the prescriptions of agency theory. Perhaps these empirical findings are a call for more theoretical research that specifically examines the determinants of the amount of total compensation for salespeople.

The aforediscussed findings suggest that firms differ in the nature of their compensation plans even when they face the same level of environmental uncertainty. That is, even firms in the same industry that presumably face the same level of environmental uncertainty may vary in the relative emphasis that they place on fixed salary versus incentive pay. This is consistent with the empirical findings of Peck (1982). We conjecture that this heterogeneity in compensation strategies may be due to differences in the marketing mix employed by the firms. For example, some firms in a given industry may see a greater opportunity for advertising and place more weight on it than on personal selling. A fruitful avenue for future research is to systematically examine why firms differ in their compensation strategy even when they face the same level of environmental uncertainty.

Appendix: Items in survey instrument

Amount and form of compensation

1. What is the average amount of commission pay per salesperson per year?
2. What is the average proportion of commission pay relative to the total compensation?

3. What is the average amount of bonus pay per salesperson per year?
4. What is the average proportion of bonus pay relative to the total compensation?

Features of bonus pay

1. What fraction of the salesforce received a bonus last year?
2. Among salespeople that received a bonus payment, what was the *mean amount* of the bonus payment?
3. Among salespeople that received a bonus payment, what was the *range* of the bonus payment?

Environmental uncertainty

1. What is the percentage fluctuation in dollar sales for the typical salesperson from year to year?

Size of the salesforce and turnover

1. What was your company salesforce size last year?
2. How many salespeople resigned from your company last year?

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