Marital Status and the Probability of Employee Attrition

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Introduction

Employees are the backbone of a company. Thus, the attrition rate has always been at the top of a list for human resources managers. A high attrition rate has high "hard" and "soft" costs to a company. The direct costs to a company include the additional expense and time of recruiting prospects and training new hires. The side effects of losing employees involve the loss of productivity and experienced workers, resulting in a reduction in revenues and lower morale. Therefore, a higher retention rate reduces potential operational costs and obviates the need to suffer the after-effects.

The goal is to find a solution to maximize the retention rate. I further investigate the determining factors that prompt employees to leave a company. The contributing factors to the probability of employee attrition are nonlinear. The effect of one variable may depend on the presence of another variable. The factors that influence the attrition probability may interact. This study explores the marginal effect of marital status on the probability of employee attrition, along with interaction effects of (1) years at a company and (2) monthly income, respectively.

Monetary rewards are not the only reason that influences people's career decisions. For example, factors that affect an accounting student's motivation to pursue a career in ac- counting are both intrinsic and extrinsic. (Jinkens and Angelo, 2011). Furthermore, an empirical study on labor economics has found a correlation between pay raise and labor supply behaviors in an academic setting (Gevrek et al., 2017). Faculty members who receive a salary raise, compared to those who do not receive a raise, will less likely to look for a position at another institution nor retire sooner. However, the study has also found that salary raise, per se, is not the only factor that affects the faculty's attrition. The correlation between perceived fairness in salary raise and the likeness of attrition is statistically significant. Perception of unfairness in salary between self and others prompts 75.7 percentage points higher in attrition than the perception of fairness.

Methods

The metrics are factors regarding demographics, occupational information, and employee satisfaction of 1470 employees. The variables used in this study are a binary variable of attrition, a categorical variable of marital status, and two continuous variables of monthly income and years at a company. The values of attrition are either yes or no. The categories of marital status are single, married, and divorced. Monthly income ranges from 1009 to 19999 (assuming in the US dollar). Years at a company are between zero and 40.

1. Logit

The logit model is an approximation to the unknown nonlinear population regression function $E(Y|X) = Pr(Y = 1|X)$, where Y is the binary dependent variable, and X is a regressor. The logit model predicts the probability when the binary dependent variable Y is 1, given the value of X.

Let X_1 denotes Marital Status, X_2 denotes Years at Company, and X_3 denotes Monthly Income (log). The population logit model with multiple regressors is

$$\Pr[\text{Attrition} = 1|\text{Marital Status}, \text{Years at Company}, \text{Monthly Income (log)}] \quad (1)$$

$$= F(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_1 X_2 + \beta_5 X_1 X_3 + \epsilon) \quad (2)$$

$$= \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_1 X_2 + \beta_5 X_1 X_3 + \epsilon)}} \quad (3)$$

with binary dependent variable Attrition = 1, given values X_1, X_2, ..., X_k and coefficients β_0, β_1, β_2, ..., β_k. The β_i is a change in probability of Attrition = 1 from a unit change in X_i. In the logit model, the predicted probabilities are limited between zero and one.

2. Marginal Effects

For the logit model, the marginal effect is calculated as

$$\frac{\partial P(\cdot)}{\partial X_i} = \beta_i F'(\cdot) \quad (4)$$

The marginal effect gives an approximation of the change in probability of attrition when X_i changes by one unit.

In this study, X_i is marital status. Since marital status is a binary independent variable, a change in X_i is a change in status. The questions here are what will happen to the probability of attrition (1) as marital status changes at different years at a company, holding monthly income equals, and (2) as marital status changes at different levels of monthly income, holding years at a company equal.

For a linear regression model, the marginal effects are constant. However, in a nonlinear model, the marginal effect depends on every specific value of the regressor. For simplicity, if

$$\Pr[\text{Attrition} = 1|\text{Marital Status}] = F(\beta_0 + \beta_1 \text{Marital Status} + \epsilon) \quad (5)$$

$$= \frac{1}{1 + e^{-(\beta_0 + \beta_1 \text{Marital Status} + \epsilon)}} \quad (6)$$

then

$$\frac{\partial Pr[\text{Attrition} = 1|\text{Marital Status}]}{\partial \text{Marital Status}} = F'(\text{Marital Status}'\beta_1)\beta_1 \quad (7)$$

$$= \frac{e^{\text{Marital Status}'\beta_1}}{(1 + e^{\text{Marital Status}'\beta_1})^2}\beta_1 \quad (8)$$

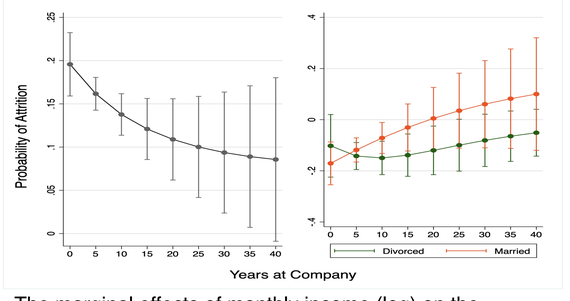
to find the marginal effect of marital status on attrition.

Results

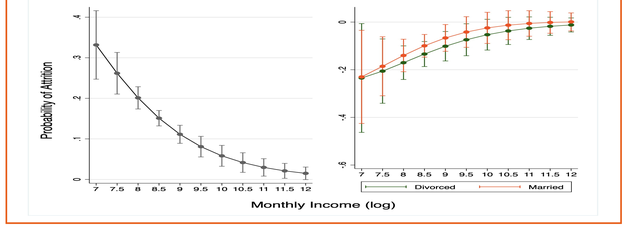
	(1)
Monthly Income (log)	-0.856**
	(0.37)
Years at Company	-0.153**
	(0.06)
Married	-2.796
	(3.48)
Single	0.179
	(3.42)
Married × Monthly Income (log)	0.268
	(0.43)
Single × Monthly Income (log)	0.049
	(0.43)
Married × Years at Company	0.162**
	(0.07)
Single × Years at Company	0.099
	(0.07)
Constant	5.791*
	(2.99)
Observations	1470

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The marginal effects of years at the company on the probability of attrition. The left panel shows the marginal effects when holding monthly income and marital status equal. The right panel depicts the marginal effects between divorced and married employees, and single is the reference category.



The marginal effects of monthly income (log) on the probability of attrition. The left panel depicts the marginal effects when holding years at company and marital status equal. The right panel shows the marginal effect between married and divorced employees, and single is the reference category.



Discussion

A high attrition rate brings the extra cost to a company, and maintaining a high retention rate supports an organization's operation. Therefore, it is a problem facing human resources managers. I investigate the marginal effects of predictors on the probability of attrition. Monthly income (log), years at a company, and the interaction of married and years at a company have statistically significant effects. Furthermore, I build a model to visualize the marginal effects of marital status – divorced versus single and married versus single - on the probability of attrition.

Overall, the study has generated some insights into the effects of marital status and income on the attrition probability. When single employees have been at a company for five to ten years, they have the highest risk of attrition than married and divorced employees. After the tenth year at a company, the marginal effects of divorced and married employees are indistinguishable. Moreover, financial rewards influence the probability of attrition, but the marginal effects of monetary incentives diminish. Divorced employees are least likely to leave a company on average. Therefore, monetary rewards are more tempting to divorced employees.

References

1. Gevrek, D., M. K. Spencer, D. Hudgins, and V. Chambers (2017). I can't get no satisfaction: The power of perceived differences in employee retention and turnover.
2. Jinkens, R. C. and A. Angelo (2011). Recruiting, retention, and succession planning of accountants: An investigation of the determinants of career choice for accounting students. *Available at SSRN 1907612* .

Acknowledgements

I take this opportunity to express my profound gratitude and deep regards to Prof. Lawrence De Geest and Prof. Aleksandar Tomic for their exemplary guidance, monitoring, and constant encouragement throughout the course of this project.