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Timothy A. Judge
Cornell University

Theresa M. Welbourne
Cornell University

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Keywords

confirmatory factor analysis, pay, satisfaction, test, research, questionnaire, study, employ, work, compensation, data

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Timothy A. Judge and Theresa M. Welbourne

Center for Advanced Human Resource Studies

New York State School of Industrial and Labor Relations

Cornell University

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Research on the antecedents and consequences of pay satisfaction has received considerable attention during the past two decades (Miceli & Lane, 1991). Along with the escalating interest in understanding how individual and organizational phenomena relate to pay satisfaction, research on the measurement of the construct has kept pace by progressing from development of measures of overall pay satisfaction (such as found in the Minnesota Satisfaction Questionnaire and Job Descriptive Index) to a more comprehensive measure based on the assumption that it is a multi-dimensional construct. Heneman and Schwab (1979, 1985) developed the Pay Satisfaction Questionnaire (PSQ) to reflect this multidimensionality. The PSQ subsequently has become a popular instrument because it can be used to better understand satisfaction with the various components of compensation (e.g., base pay, raises, benefits, structure/administration).

Even though use of the PSQ has increased over the years, there is still debate regarding the appropriateness of the factor structure and thus the suitability of the current measure. Heneman and Schwab (1985) initially hypothesized that pay satisfaction was comprised of 5 facets (pay level, pay raises, benefits, structure, and administration). On the basis of initial factor analysis results, the validity of the level, raises, and benefits dimensions was supported, but the structure and administration dimensions were combined. This four-factor solution was then replicated on another sample of workers. Subsequent work has supported the multidimensional nature of pay satisfaction but has reached divergent, often conflicting conclusions about the adequacy of the PSQ in measuring dimensions of pay satisfaction.

Table 1 illustrates the confusion in past research over the proper number of dimensions represented by the PSQ. The number of factors that has emerged ranges from 1

to 4. Several limitations with these studies may explain the inconsistent results. First, most of the studies have used exploratory factor analysis, which is severely restricted in its ability to determine the proper factor structure due to the tenuous nature of the assumptions underlying the algorithms and the fact that the analysis is data-driven rather than theory-driven (Bobko, 1990; Long, 1983). The limitations with exploratory factor analysis are clearly illustrated by the fact that a number of the studies in Table 1 used a varimax factor rotation, which is an orthogonal rotation that assumes zero intercorrelations among the factors. Given that past research has suggested that the PSQ dimensions are significantly related, this is clearly a dubious assumption.

Insert Table 1 About Here

A second point to keep in mind when evaluating past research on the PSQ is that the dimensions of pay satisfaction are not independent, and in fact several are fairly highly related. However, this does not necessarily undermine the validity of the PSQ. Dimensions of compensation are not independent, so one should not expect dimensions of pay satisfaction to be independent. For example, since pay raises subsequently affect pay level, employees satisfied with their pay raises are likely in turn to be more satisfied with their level of pay. Similarly, if the procedures used to determine pay raises yield unfair results in the eyes of some employees, it is likely to influence satisfaction with both their pay raises and the administration of their pay. Rather than subjectively determining whether a particular factor intercorrelation is too high or not, the real issue seems to be if the dimensions are conceptually and empirically separable (i.e., are they capable of being distinguished from one another?). If they are not demonstrably distinct, there is little to be gained from measuring separate dimensions because they essentially measure the same thing.

Finally, the fact that specific items contained in the PSQ have large cross-loadings (i.e., load on factors in addition to the factor on which they are hypothesized to load) is a valid concern. However, one would expect some degree of cross-loadings if the factors are related. Even well-accepted measures of job satisfaction like the Job Descriptive Index have items that cross load on other factors (Smith, Kendall, & Hulin, 1969).

Two of the studies in Table 1 have provided in-depth analyses of the PSQ, but nonetheless reached divergent conclusions about the adequacy of the PSQ in measuring pay satisfaction. Scarpello, Huber, and Vandenberg (1988) theorized that contextual variables might be responsible for the conflicting results. Their study supported the hypothesis that the factor structure of the PSQ varied by job classification, and they found both three- and four-factor solutions supported in various samples. They also discovered that several items displayed substantial cross-factor loadings. On the basis of these results, Scarpello et al. argued that significant modification or abandonment of the PSQ was warranted. Judge (in press), on the other hand, attacked the problem by conducting a series of confirmatory analyses and found that the four-factor solution provided the best fit to the data. He further ascertained that the four dimensions displayed a significantly different pattern of correlations with a series of hypothesized predictors. Thus, Judge, in contrast to Scarpello et al., reached a favorable conclusion about the validity and usefulness of the PSQ.

Both studies offer unique contributions toward understanding why the PSQ has yielded inconsistent results in various settings. The study by Judge (in press) made a contribution to the literature in that it suggested discriminant validity of the PSQ dimensions, but was limited because only one organization was studied and no longitudinal data were available. On the other hand, the Scarpello et. al. (1988) study utilized an extensive multi-organizational data base, but did not employ confirmatory techniques. Therefore, although these two studies have used new techniques and approaches toward understanding the

dimensionality of the PSQ, due to their contradictory conclusions, questions about the dimensionality of the PSQ remain unanswered.

Present Study

The present study seeks to address a number of research needs regarding the PSQ. First, given that a reasonable basis exists for hypothesizing the dimensions of pay satisfaction, and since many of the assumptions of exploratory factor analysis are tenuous (Long, 1983), confirmatory rather than exploratory factor analysis will be used since with confirmatory factor analysis the hypothesized factor structure appropriately guides the analysis rather than the analysis being "data driven" (Bobko, 1990). As noted in Table 1, investigations of the dimensionality of the PSQ have largely relied on exploratory factor analysis. Interpretation of exploratory factor analysis results is limited by the subjectivity in which factor loadings, cross-factor loadings, and factor independence are assessed. A confirmatory approach that is theory-driven should help reduce the ambiguity produced by past research. Second, other than Judge's (in press) single-organization cross-sectional study, there has been no direct investigation of the discriminant validity of the PSQ. Covariance structure modeling is well-suited for investigations of discriminant validity (Long, 1983). When combined with longitudinal data, a confirmatory approach also will allow determination of the stability of the PSQ factor structure.

Consistent with Judge (in press), it is believed that items from the PSQ will load on their hypothesized dimensions, and that the four dimensions of pay satisfaction will be empirically distinguishable. This follows from the dimensions hypothesized by Heneman and Schwab (1985). As pointed out by Heneman (1985) and Heneman and Schwab (1985), each dimension reflects a relatively distinct (although perhaps related) aspect of pay. For example, the criteria used to establish benefit coverage of employees is not likely to strongly depend on how pay structures are established, the magnitude of pay raises awarded, and so

forth. While it is expected that some dimensions will be highly related (in particular, the raise and pay level dimensions, and the raise and structure/administration dimensions), it is hypothesized that even those PSQ dimensions which are highly related will be discrete. Furthermore, it is expected that the factor structure of the PSQ will remain stable over time such that temporal invariance with respect to the factor loadings and factor intercorrelations will be observed. Taken together, these tests should overcome the shortcomings of previous research and provide the most definitive evidence to date regarding the dimensionality of the PSQ.

Method

Setting, Subjects, and Procedure

The data were obtained from two separate companies in the Rocky Mountain Region. The first research site was a high technology company with over a billion dollars in annual revenues. Employees in the company's corporate services department, which comprised 200 service, maintenance, and security personnel, participated in the study.

The second research site was a food processing plant within a large, consumer products company which also generated over one billion dollars in annual revenues. This site employed production and maintenance workers in addition to clerical and supervisory personnel. A total of 115 employees participated in this study.

In both firms, a survey was administered on site prior to a compensation intervention. A gainsharing plan was then implemented one month after the first survey was administered, and after three quarters' experience with the plan, a second survey was administered to all employees at both sites. The survey was administered by one of the researchers during meetings on site with employees. Employees who participated in the study were told that the findings would be used for research purposes only and that their responses would remain anonymous.

At the high technology firm 172 surveys were collected at Time 1 (an 86% return rate), and 151 completed questionnaires were obtained at Time 2 (a 76% return rate). Between the Time 1 and Time 2 data collections 20 temporary employees left the organization. A chi-square (χ^2) test of the distributions of respondents versus nonrespondents revealed no significant differences with respect to age, education, gender, or tenure at either Time 1 or Time 2. The typical respondent of the high technology firm was an individual between 31 and 40 years of age, with four or less years of tenure, with a high school education, and with an equal probability of being either male or female.

Ninety-two completed surveys were collected at the consumer products firm at Time 1 (an 80% return rate). Later, 70 completed surveys were obtained at Time 2 (a 61% return rate). The χ^2 distribution of respondents and non-respondents for the Time 1 and Time 2 samples at the consumer products company also revealed no significant differences for age, education, gender, or tenure. The typical respondent at the consumer products firm was an individual over 40 years of age, with between four to ten years of tenure in the firm, with a high school education, and a strong likelihood of being male. In order to assure confidentiality to all employees participating in the study, they were not asked to identify themselves on the survey.

Confirmatory Factor Analysis

Confirmatory factor analysis, conducted in the present study using LISREL 7 (Joreskog & Sorbom, 1989), allows one to determine if the measures adequately represent their hypothesized constructs (Long, 1983). Confirmatory factor analysis is particularly well-suited to investigate the dimensionality of the PSQ, since it allows direct investigation of the degree to which the items from the PSQ uniquely load on their hypothesized dimensions, and the degree to which the 4 dimensions are capable of being distinguished from one another (Bollen, 1989; Long, 1983).

An important consideration in confirmatory factor analysis is the sample size, since the number of estimated parameters relative to sample size is an important determinant of convergence, standard errors, and model fit (Hayduk, 1987; Idaszak, Bottom, & Drasgow, 1988). Although strict guidelines for minimum sample sizes do not exist (Anderson & Gerbing, 1988), Bentler (1985) suggested that a sample size to parameter ratio of 5:1 or more is sufficient to achieve reliable estimates in maximum likelihood estimation. Since the sample size to estimated parameter ratio used in testing the hypothesized model was 5.8:1 for the Time 1 analysis and 5.0:1 for the Time 2 analysis, the sample sizes were considered adequate for the analyses (Brooke, Russell, & Price, 1988).

When using confirmatory factor analysis, it is essential to examine the overall fit of the model. If a model does not fit the data acceptably, the overall hypothesis that the model is an accurate representation of the data is rejected. In such a case, interpretation of specific parameter estimates in the model may be inappropriate (James, Mulaik, & Brett, 1982). The most widely used measure of fit is the χ^2 statistic. Perhaps the most popular use of the χ^2 statistic is to examine the ratio of χ^2 relative to the degrees of freedom (df), since levels of χ^2 depend on the sample size (Hoetler, 1983; La Du & Tanaka, 1989; Marsh, Balla, & McDonald, 1988). χ^2/df ratios of 2:1 (Hertig, 1985), 3:1 (Carmines & McIver, 1981), or even 5:1 (Marsh & Hocevar, 1985; Wheaton, Muthen, Alwin, & Summers, 1977) have been claimed to indicate an acceptable fit. Other indices that have been recommended include the goodness-of-fit index, adjusted goodness-of-fit index, root-mean-square residual (Joreskog & Sorbom, 1989), the normed fit index (Bentler & Bonnett, 1980), the Tucker-Lewis index (Marsh, Balla, & McDonald, 1988), and the parsimonious fit index (James et al., 1982; Mulaik, James, Alstine, Bennett, Lind, & Stilwell, 1989). Values for these fit indices represent rules of thumb for judging the adequacy of the fit of a hypothetical model to empirical data. Values judged acceptable are subjective since the distributions of most of

the statistics are unknown. In interpreting these indices, it is important to consider them cumulatively (James & James, 1989).

Results

Since the number of observations in the one of the samples was insufficient to perform factor analysis, the possibility of combining the samples was investigated by comparing the means of the PSQ dimensions between the two samples at Time 1 and at Time 2. Because there were 8 comparisons performed (each of the 4 PSQ dimensions was compared at Time 1 and at Time 2), α inflation was controlled using the Bonferroni procedure (Hays, 1980). Out of the 8 tests conducted, only 1 difference was significant at the .01 level (structure/administration satisfaction at Time 1) and another difference was significant at the .05 level (pay level satisfaction at Time 1). Since 6/8 tests revealed no significant differences between the 2 samples, they were combined for the confirmatory factor analyses.

Correlations served as input for the LISREL program. Using sample covariances as input yielded equivalent results. Due to space constraints the correlation tables are not reported but are available upon request. Table 2 provides the parameter estimates (factor loadings) of the PSQ items on their hypothesized dimensions both at Time 1 and Time 2. All factor loadings for the four dimensions are relatively strong (average loading, Time 1 = .80; average loading, Time 2 = .78) and highly significant ($p < .01$). These results support the hypothesis that the specific items from the PSQ converge on their hypothesized dimensions.

Insert Table 2 About Here

Table 3 provides the reliabilities for the PSQ subscales and the intercorrelations among the pay satisfaction dimensions as measured by the PSQ subscales at Time 1 and Time 2. The table indicates that some of the dimensions are highly correlated, particularly the raise and structure/administration subscales. This is consistent with past research (Judge, in press; Scarpello et al., 1988).

Insert Table 3 About Here

Tables 4 and 5 specify the fit statistics for the Time 1 and Time 2 estimations. All statistics, by typical conventions, indicate that the hypothesized measurement model fits the data acceptably at both Time 1 and Time 2. Thus, the hypothesis that the measurement model provides an adequate fit to the data is supported for both time periods.

Insert Tables 4 and 5 About Here

While convergent validity of the specific items measuring the four dimensions of the PSQ is evident by the fit statistics and parameter estimates reported above, this does not speak to discriminant validity. Are the measures capable of distinguishing the PSQ dimensions? This question is particularly relevant given the relatively high correlations between some of the PSQ dimensions. The discriminant validity of the dimensions of the PSQ was investigated by comparing the fit of the hypothesized model to alternative models. If the measures do not have adequate discriminant validity, the fit of the alternative models will not be significantly worse than the hypothesized four-factor model.

As can be seen from an examination of Tables 4 and 5, the null model (a model where the 18 PSQ items were not allowed to load on the factors and the 4 PSQ dimensions

were not allowed to intercorrelate) provided a very poor fit to the data, as did the single-factor model. Furthermore, forcing two of the PSQ dimensions to load on the same factor significantly decreased the fit of the model in every case for both the Time 1 and Time 2 data. Even forming the two most highly related dimensions (the raise satisfaction and structure/administration satisfaction scales) into one resulted in a significant decrease in fit for the Time 1 and Time 2 data. Overall, this evidence suggests the PSQ dimensions, as assessed, are valid; the measures converge on their respective constructs yet are relatively distinct.

While a subjective examination of the above results suggest that the Time 1 and Time 2 data yielded similar results, LISREL allows a multi-sample analysis where common parameters between two or more samples (in this case the Time 1 and Time 2 samples) can be constrained to be equal. If imposing that constraint results in a significant decrease in fit (as measured by an increase in χ^2), the coefficients are significantly different between the two samples. For example, if the factor loadings and factor structure were found to vary over time, it would call into question the factor stability of the PSQ. However, forcing all loadings in the matrix Λ_X (containing the factor loadings) to be equal in Time 1 and Time 2 did not lead to a significant increase in χ^2 (increase in χ^2 = 15.44, increase in df = 18, ns). Furthermore, in no case did equating any specific factor loading result in a significant decrease in fit. The same result was observed with respect to the correlations among the PSQ dimensions. Constraining all inter-factor correlations (contained in the matrix Φ) to be equal did not lead to a significant increase in χ^2 (increase in χ^2 = 5.67, increase in df = 6, ns), nor were any of the 6 correlations significantly different between Time 1 and Time 2. This evidence indicates that the pattern of factor loadings and the factor structure of the PSQ was robust over time. These results are particularly impressive given that a compensation intervention took place between the Time 1 and Time 2 assessments.

Discussion

The present study provides supportive evidence for the validity of the dimensions of pay satisfaction measured by the PSQ. Using a variety of confirmatory methods, results supported predictions regarding the ability of the items from the PSQ to measure discrete facets of compensation satisfaction. Particularly given the fact that these data were obtained at two separate companies, where one consisted of service employees and the other employed production workers, and under conditions where both firms implemented an extensive compensation intervention, the results of suggest that the measurement properties of the PSQ are adequate if not exemplary. A number of specific confirmatory tests support this inference.

First, results demonstrated that the PSQ dimensions were quite reliable, and more importantly the factor structure and dimensionality of the PSQ dimensions displayed considerable temporal stability. The pattern of factor loadings and the factor intercorrelations remained relatively constant over time. As noted by James et al. (1982), this suggests that generalization of the results to other populations and other contexts is appropriate.

Second, items from the PSQ loaded strongly and significantly on their hypothesized dimensions, and the hypothesized measurement model provided a good fit to the data. To the extent that the items loaded weakly on their hypothesized dimensions, or strong cross-factor loadings were observed, this fit would not have been achieved. In short, the fit statistics and factor loadings suggest that the PSQ is properly specified in terms of measuring the 4 dimensions of pay satisfaction.

Third, it is true that several PSQ dimensions displayed high intercorrelations with one another. Although some of the high correlations appear troubling as they bear on discriminant validity, a number of conceptual factors (discussed earlier) might explain this

fact which do not undermine the validity of the PSQ. Nevertheless, from a measurement standpoint if the dimensions are not empirically separable the usefulness of the dimensions is called into question. However, confirmatory tests suggested that the hypothesized model fit the data significantly better than all alternative models, even those joining the most highly related dimensions. This suggests that the PSQ dimensions are distinct and thus apparently measure discrete components of pay satisfaction.

Limitations, Contributions, and Future Research

There are several limitations with this study that point to areas for future research. First, because dividing the samples into employee job classifications would have made the samples too small to conduct confirmatory factor analyses, we were not able to directly compare our results to those of Scarpello et al. (1988) with respect to the degree to which the factor loadings and factor structure varied by job classification. It should be noted, however, that Judge (in press) found little variation in factor structure across diverse employee groups. Future research should address this issue directly.

A second limitation with this study, and one that applies to many studies in this area, is that the PSQ dimensions were not linked to outcome variables. As noted by Deckop (1992), the usefulness of the PSQ rests on the ability of the PSQ dimensions to differentially predict important outcome variables. Although Judge (in press) recently demonstrated that the PSQ dimensions are differentially predicted by a number of antecedent variables, no work has established that the PSQ dimensions differentially predict a series of consequent variables. Thus, before we can be confident that the PSQ is a valid and useful instrument, research needs to demonstrate that the PSQ dimensions are differentially related to relevant dependent variables. It is likely that contextual factors and referent comparisons need to be taken into account when relating the dimensions of pay satisfaction to outcomes (Ash & Bretz, 1988; Gerhart & Milkovich, 1992).

While the above limitations suggest some caution in interpreting the results as demonstrating the adequacy of the PSQ, the weaknesses of this study are accompanied by a number of strengths. First, the data that were analyzed came from two relatively diverse organizations. This should increase confidence in the generalizability of the results. Second, the pattern of factor loadings and the PSQ factor structure were compared longitudinally using confirmatory techniques, which has not been done to date. Finally, given the limitations of exploratory factor analysis, the confirmatory methods used to test the dimensionality of the PSQ allow greater confidence to be placed in these results than the results of past research efforts on the dimensionality of the PSQ.

The central contribution of the present study is that it utilizes a more rigorous statistical method with a diverse longitudinal sample to address problems cited by previous authors studying the PSQ. This resulted in one of the most extensive tests of the dimensionality of the PSQ that has been undertaken. When subjected to these confirmatory tests, the PSQ holds up well, thereby suggesting that the PSQ does not need substantial modification. As discussed above, the next logical step of research on the PSQ is demonstrating that the 4 PSQ dimensions differentially predict important dependent variables. This evidence, combined with that presented in this paper, should answer remaining questions about the adequacy of the PSQ that still exist.

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Author Notes

Correspondence regarding this article may be addressed to Timothy A. Judge, Department of Personnel & Human Resource Studies, New York State School of Industrial and Labor Relations, Cornell University, 393 Ives Hall, Ithaca, New York 14853-3901.

Table 1

Past Research on the Dimensionality of the Pay Satisfaction Questionnaire

Study	Type of Factor Analysis Used	Number of Factors
H. Heneman & Schwab (1985)	Exploratory-Varimax	4
Ash, Dreher, & Bretz (1987)	Exploratory-Varimax	3
Orpen & Bonnici (1987)	Exploratory-Varimax	1
R. Heneman, Greenberger, & Strasser (1988)	Exploratory-Oblique	4
Scarpello, Huber, & Vandenberg (1988)	Exploratory-Oblique & Varimax	3,4
Carraher (1991)	Exploratory-Oblique	3
Mulvey, Miceli, & Near (1992)	Confirmatory	*
Judge (in press)	Confirmatory	4

* Results of confirmatory factor analysis yielded inadmissable results.

Table 2

LISREL Estimates of PSQ Factor Loadings at Time 1 (T1) and Time 2 (T2)

	Level		Benefits		Raise		Structure/ Administration	
Item	T1	T2	T1	T2	T1	T2	T1	T2
My current salary	.95	.94						
My overall level of pay	.91	.92						
Size of my current salary	.96	.88						
My take-home pay	.88	.93						
My benefit package			.90	.85				
The value of my benefits			.94	.91				
Amount the company pays toward my benefits			.88	.77				
The number of benefits I receive			.90	.78				
My most recent raise					.74	.81		
Influence my supervisor has over my pay					.77	.70		
The raises I have typically received in the past					.63	.59		
How my raises are determined					.83	.80		
The company's pay structure							.78	.77
Information the company gives about pay issues of concern to me							.64	.67
Pay of other jobs in the company							.54	.53
Consistency of the company's pay policies							.79	.79
Differences in pay among jobs in the company							.59	.72
How the company administers pay							.70	.69

Note: All loadings are significant at $p < .01$; N = 246 (Time 1); N = 209 (Time 2).

Table 3

Reliabilities and Intercorrelations of PSQ Dimensions at Time 1 and Time 2

	Time 1				Time 2			
PSQ Dimension	1	2	3	4	1	2	3	4
1. Pay Level	.96				.95			
2. Benefits	.13	.95			.15	.90		
3. Pay Raise	.66	.23	.82		.73	.25	.81	
4. Structure/ Administration	.63	.19	.67	.84	.66	.27	.73	.85

Note: N (Time 1) = 246; N (Time 2) = 209. Coefficient α reliability estimates are in diagonals.

Table 4

Fit of Hypothesized and Alternative Models for Time 1

Fit Statistic	Hypothesized	Null	Single Factor	A	B	C	D	E	F
Chi-Square	290.38	3,535.96*	1,604.65*	355.72*	492.53*	810.93*	551.52*	916.02*	1,230.22*
Degrees of Freedom	129	147	135	132	132	132	132	132	132
Chi-Square/ Degrees of Freedom	2.25	24.05	11.89	2.69	3.73	6.14	4.18	6.94	9.32
Goodness of Fit Index	.886	.246	.528	.855	.794	.688	.743	.611	.636
Adjusted Goodness of Fit Index	.849	.123	.402	.813	.733	.596	.667	.496	.529
Root-Mean-Square Residual	.051	.401	.173	.056	.085	.228	.091	.250	.162
Tucker-Lewis Index	.946	---	.528	.926	.882	.777	.862	.742	.639
Normed Fit Index	.918	---	.546	.899	.861	.771	.844	.741	.652
Parsimonious Fit Index	.830	---	.502	.807	.773	.692	.758	.665	.585

Note: Model A=Combining raise and structure/administration subscales; Model B=Combining raise and pay level subscales; Model C=Combining raise and benefits subscales; Model D=Combining structure/administration and pay level subscales; Model E=Combining structure/administration and benefits subscales; Model F=Combining pay level and benefits subscales.

* increase in chi-squared over hypothesized model significant at $p < .01$.

Table 5

Fit of Hypothesized and Alternative Models for Time 2

Fit Statistic	Hypothesized	Null	Single Factor	A	B	C	D	E	F
Chi-Square	249.49	2,732.69*	995.92*	288.22*	354.94*	701.43*	460.49*	799.20*	752.87*
Degrees of Freedom	129	147	135	132	132	132	132	132	132
Chi-Square/ Degrees of Freedom	1.93	18.59	7.38	2.18	2.69	5.31	3.49	6.05	5.70
Goodness of Fit Index	.889	.239	.589	.866	.828	.687	.751	.599	.696
Adjusted Goodness of Fit Index	.852	.114	.479	.827	.777	.594	.677	.480	.606
Root-Mean-Square Residual	.045	.410	.144	.050	.069	.227	.083	.233	.137
Tucker-Lewis Index	.947	---	.637	.933	.904	.754	.858	.713	.733
Normed Fit Index	.909	---	.636	.894	.870	.743	.831	.708	.724
Parsimonious Fit Index	.798	---	.584	.803	.781	.667	.746	.636	.650

Note: Model A=Combining raise and structure/administration subscales; Model B=Combining raise and pay level subscales; Model C=Combining raise and benefits subscales; Model D=Combining structure/administration and pay level subscales; Model E=Combining structure/administration and benefits subscales; Model F=Combining pay level and benefits subscales.

* increase in chi-squared over hypothesized model significant at $p < .01$.