**Assignment 2 – Item Analysis, Exploratory Factor Analysis & Reliability of Total Scores (30 points)**

**Part I: Item Analysis (Descriptive Statistics)**

I used the R software to analyze the dataset titled "TALIS 2013 Estonia teacher survey.csv". The TALIS data is collected from the middle school teachers and administrators in Estonia to examine their working situations. First, I read the data using the read.table() function. Next, to examine my data, I used several commands, including dim(), colnames(), and View(). From the dim() function, we know that there is data of 1000 respondents in the dataset. From the colnames() function, we know that each respondent is required to answer 10 survey items. Out of the 10 survey items, 3 of the items are negatively coded whereas the other 7 items are positively coded. We will handle the negatively coded items with reverse coding later on. To get the summary of my input data, I made a function call using summary(). From the descriptive statistics below, we can see the minimum data are all 1 and the maximum data are all 4, which makes sense, because the lowest possible value of the data is "strongly disagree" that represents 1, and the highest possible value of the data is "strongly agree" that represents 4.

Table 1
*Summary of the TALIS Data*

| TT2G46A | TT2G46B | TT2G46C | TT2G46D | TT2G46E | TT2G46F | TT2G46G |
|---|---|---|---|---|---|---|
| Min. :1.000 | Min. :1.000 | Min. :1.000 | Min. :1.00 | Min. :1.000 | Min. :1.000 | Min. :1.000 |
| 1st Qu.:2.000 | 1st Qu.:2.000 | 1st Qu.:1.000 | 1st Qu.:1.00 | 1st Qu.:3.000 | 1st Qu.:2.000 | 1st Qu.:3.000 |
| Median :3.000 | Median :3.000 | Median :2.000 | Median :2.000 | Median :3.000 | Median :2.000 | Median :3.000 |
| Mean :2.762 | Mean :2.823 | Mean :1.916 | Mean :1.76 | Mean :2.947 | Mean :2.218 | Mean :2.923 |
| 3rd Qu.:3.000 | 3rd Qu.:3.000 | 3rd Qu.:2.000 | 3rd Qu.:2.00 | 3rd Qu.:3.000 | 3rd Qu.:3.000 | 3rd Qu.:3.000 |
| Max. :4.000 | Max. :4.000 | Max. :4.000 | Max. :4.00 | Max. :4.000 | Max. :4.000 | Max. :4.000 |
| NA's :7 | NA's :9 | NA's :4 | NA's :9 | NA's :10 | NA's :5 | NA's :8 |

| TT2G46H | TT2G46I | TT2G46J |
|---|---|---|
| Min. :1.000 | Min. :1.00 | Min. :1.000 |
| 1st Qu.:1.000 | 1st Qu.:3.00 | 1st Qu.:3.000 |
| Median :2.000 | Median :3.00 | Median :3.000 |
| Mean :1.788 | Mean :2.97 | Mean :2.998 |
| 3rd Qu.:2.000 | 3rd Qu.:3.00 | 3rd Qu.:3.000 |
| Max. :4.000 | Max. :4.00 | Max. :4.000 |
| NA's :3 | NA's :1 | NA's :5 |

Then, I use the Revelle's 'psych' package to obtain descriptive statistics of the items.

I then reverse code item number 3, 4 and 6 on a rating scale with min 1 and max 4 with the following commands since we identified that these items are negatively coded.

```
> recodekey <- c(1,1,-1,-1,1,-1,1,1,1,1)
> recodedinput <- reverse.code(recodekey, input, mini=1, maxi=4)
```

Next, I create the sum total score for each administrator with 3 items reverse coded.
High values would then indicate greater satisfaction about the teaching job.

```
> sumscore <- rowSums(recodedinput)
> summary(sumscore)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
  11.00   26.00   28.00   28.33   31.00   40.00      28
```

I used the describe() function to make sure there is no outlier in the data in the sense that the minimum value remains 1 and the maximum value remains 4. From the table, we can see that item TT2G46I "I am satisfied with my performance in this school" and item TT2G46J "All in all, I am satisfied with my job" shows particularly high kurtosis.

Table 2
*Descriptive Statistics of the TALIS Data*

| | vars | n | mean | sd | median | trimmed | mad | min | max | range | skew | kurtosis | se |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TT2G46A | 1 | 993 | 2.76 | 0.63 | 3 | 2.76 | 0 | 1 | 4 | 3 | -0.4 | 0.38 | 0.02 |
| TT2G46B | 2 | 991 | 2.82 | 0.76 | 3 | 2.84 | 0 | 1 | 4 | 3 | -0.3 | -0.14 | 0.02 |
| TT2G46C | 3 | 996 | 1.92 | 0.69 | 2 | 1.86 | 0 | 1 | 4 | 3 | 0.55 | 0.59 | 0.02 |
| TT2G46D | 4 | 991 | 1.76 | 0.67 | 2 | 1.68 | 0 | 1 | 4 | 3 | 0.66 | 0.69 | 0.02 |
| TT2G46E | 5 | 990 | 2.95 | 0.62 | 3 | 2.95 | 0 | 1 | 4 | 3 | -0.3 | 0.6 | 0.02 |
| TT2G46F | 6 | 995 | 2.22 | 0.8 | 2 | 2.22 | 1.48 | 1 | 4 | 3 | 0.12 | -0.58 | 0.03 |
| TT2G46G | 7 | 992 | 2.92 | 0.66 | 3 | 2.93 | 0 | 1 | 4 | 3 | -0.4 | 0.45 | 0.02 |
| TT2G46H | 8 | 997 | 1.79 | 0.72 | 2 | 1.71 | 0 | 1 | 4 | 3 | 0.71 | 0.4 | 0.02 |
| TT2G46I | 9 | 999 | 2.97 | 0.49 | 3 | 2.97 | 0 | 1 | 4 | 3 | -0.4 | 2.44 | 0.02 |
| TT2G46J | 10 | 995 | 3 | 0.49 | 3 | 3.01 | 0 | 1 | 4 | 3 | -0.4 | 2.64 | 0.02 |

I then used the lapply() function to inspect the distribution of responses. In line with the high kurtosis level that we see from the previous table for item TT2G46I "I am satisfied with my performance in this school" and item TT2G46J "All in all, I am satisfied with my job", the distribution table below shows that both of these items are skewed towards the left. This left-skewed distribution means that majority of the respondents are satisfied with their jobs and their performances, where we can see that most of the respondents pick (agree=3) for these two items.

Table 3
*Distribution of the TALIS Data*

| $TT2G46A | | | | $TT2G46B | | | | $TT2G46C | | | | $TT2G46D | | | | $TT2G46E | | | | $TT2G46F | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 26 | 266 | 619 | 82 | 46 | 251 | 526 | 168 | 258 | 588 | 126 | 24 | 353 | 540 | 81 | 17 | 13 | 176 | 651 | 150 | 188 | 447 | 315 | 45 |

| $TT2G46G | | | | $TT2G46H | | | | $TT2G46I | | | | $TT2G46J | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | |
|---|---|---|---|
| | 365 501 108 | | 7 99 778 |
| 21 192 621 158 | 23 | 6 115 781 97 | 111 |

Next, I made sure that the responses are recognized by the software as having ordinal scale with the following command.

```
> input <- data.frame(lapply(input, factor, ordered=TRUE))
```

Subsequently, I use Fox's 'polycor' package to compute the item discrimination index and pairwise item correlations. Then, I append the sum total score earlier to the dataset and verify the new column.

```
> input$sumscore <- sumscore
> colnames(input)
 [1] "TT2G46A"  "TT2G46B"  "TT2G46C"  "TT2G46D"  "TT2G46E"  "TT2G46F"  "TT2G46G"  "TT2G46H"
 [9] "TT2G46I"  "TT2G46J"  "sumscore"
```

I then used the hetcor function to compute the item discrimination index, which is the polyserial correlation between each item and the total scale score. We can also see the polychoric correlations between the pair of items as follow. From table 4, we can see that there is a mixture of positive and negative correlations. If there is correlation that is less than 0.2, I will consider that too low. I will consider the index of item TT2G46C "change of school if possible" and TT2G46H "teaching profession valued in society" rather low, which is only -0.08863.

```
> hetcor(input, ML = FALSE, std.err = FALSE, use=c("pairwise.complete.obs"))
```

Table 4
*Two-Step Estimates and Correlations*

| | TT2G46A | TT2G46B | TT2G46C | TT2G46D | TT2G46E | TT2G46F | TT2G46G |
|---|---|---|---|---|---|---|---|
| TT2G46A | 1 | Polychoric | Polychoric | Polychoric | Polychoric | Polychoric | Polychoric |
| TT2G46B | 0.5811 | 1 | Polychoric | Polychoric | Polychoric | Polychoric | Polychoric |
| TT2G46C | -0.2494 | -0.2782 | 1 | Polychoric | Polychoric | Polychoric | Polychoric |
| TT2G46D | -0.482 | -0.6845 | 0.3707 | 1 | Polychoric | Polychoric | Polychoric |
| TT2G46E | 0.4964 | 0.5347 | -0.5987 | -0.5133 | 1 | Polychoric | Polychoric |
| TT2G46F | -0.4601 | -0.7354 | 0.3603 | 0.759 | -0.4495 | 1 | Polychoric |
| TT2G46G | 0.3106 | 0.2863 | -0.5585 | -0.2747 | 0.716 | -0.2534 | 1 |
| TT2G46H | 0.3232 | 0.2898 | -0.08863 | -0.166 | 0.211 | -0.2544 | 0.2294 |
| TT2G46I | 0.2205 | 0.2586 | -0.1834 | -0.2035 | 0.4174 | -0.2142 | 0.3172 |
| TT2G46J | 0.5332 | 0.5419 | -0.2914 | -0.4623 | 0.6232 | -0.4524 | 0.4292 |
| sumscore | 0.6898 | 0.7838 | -0.5882 | -0.7508 | 0.8186 | -0.7529 | 0.6355 |

| | TT2G46H | TT2G46I | TT2G46J | sumscore |
|---|---|---|---|---|
| TT2G46A | Polychoric | Polychoric | Polychoric | Polyserial |
| TT2G46B | Polychoric | Polychoric | Polychoric | Polyserial |
| TT2G46C | Polychoric | Polychoric | Polychoric | Polyserial |
| TT2G46D | Polychoric | Polychoric | Polychoric | Polyserial |
| TT2G46E | Polychoric | Polychoric | Polychoric | Polyserial |

| | | | | |
|---|---|---|---|---|
| TT2G46F | Polychoric | Polychoric | Polychoric | Polyserial |
| TT2G46G | Polychoric | Polychoric | Polychoric | Polyserial |
| TT2G46H | 1 | Polychoric | Polychoric | Polyserial |
| TT2G46I | 0.104 | 1 | Polychoric | Polyserial |
| TT2G46J | 0.258 | 0.6707 | 1 | Polyserial |
| sumscore | 0.4426 | 0.5003 | 0.7673 | 1 |

I examine the pattern of average total scores for persons in each category using the following command. We can see the mean total scores increase across response categories for all items as the sample is sufficiently large ( n = 1000 ) and the rating scale is working well.

> describeBy(input$sumscore,input$TT2G46A)

Table 5
*Descriptive Statistics by Group*

Group 1

| | vars | n | mean | sd | median | trimmed | mad | min | max | range | skew | kurtosis | se |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X1 | 1 | 26 | 24.96 | 4.65 | 25 | 24.95 | 4.45 | 14 | 36 | 22 | -0.04 | 0.16 | 0.91 |

Group 2

| | vars | n | mean | sd | median | trimmed | mad | min | max | range | skew | kurtosis | se |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X1 | 1 | 259 | 28.36 | 3.24 | 28 | 28.38 | 2.97 | 17 | 38 | 21 | -0.07 | 0.21 | 0.2 |

Group 3

| | vars | n | mean | sd | median | trimmed | mad | min | max | range | skew | kurtosis | se |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X1 | 1 | 606 | 32.13 | 2.99 | 32 | 32.12 | 2.97 | 21 | 41 | 20 | 0.02 | 0.41 | 0.12 |

Group 4

| | vars | n | mean | sd | median | trimmed | mad | min | max | range | skew | kurtosis | se |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X1 | 1 | 81 | 36.94 | 3.25 | 37 | 37.03 | 2.97 | 29 | 43 | 14 | -0.22 | -0.54 | 0.36 |

**Part II: Exploratory Factor Analysis**

We hypothesize that at least 2 factors, the first is the opinion that the advantages of being a teacher clearly outweigh the disadvantages (TT2G46A), the second is the opinion that the respondents would still work as a teacher if given a choice are positively correlated (TT2G46B). We will look at the EFA model for the different number of factors.

Descriptive statistics indicate low omission (n = 1000). From the descriptive data below, response distributions for the majority of the items are approximately normal. Item TT2G46I “I am satisfied with my performance in this school.” and item TT2G46J “All in all, I am satisfied with my job.” have particularly high kurtosis. We will expect to see some bias in both the item TT2G46I and item TT2G46J.

Table 6
*Descriptive Statistics of the TALIS Data*

| | vars | n | mean | sd | median | trimmed | mad | min | max | range | skew | kurtosis | se |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TT2G46A | 1 | 993 | 2.76 | 0.63 | 3 | 2.76 | 0 | 1 | 4 | 3 | -0.38 | 0.38 | 0.02 |
| TT2G46B | 2 | 991 | 2.82 | 0.76 | 3 | 2.84 | 0 | 1 | 4 | 3 | -0.33 | -0.14 | 0.02 |
| TT2G46C | 3 | 996 | 1.92 | 0.69 | 2 | 1.86 | 0 | 1 | 4 | 3 | 0.55 | 0.59 | 0.02 |
| TT2G46D | 4 | 991 | 1.76 | 0.67 | 2 | 1.68 | 0 | 1 | 4 | 3 | 0.66 | 0.69 | 0.02 |
| TT2G46E | 5 | 990 | 2.95 | 0.62 | 3 | 2.95 | 0 | 1 | 4 | 3 | -0.31 | 0.6 | 0.02 |
| TT2G46F | 6 | 995 | 2.22 | 0.8 | 2 | 2.22 | 1.48 | 1 | 4 | 3 | 0.12 | -0.58 | 0.03 |
| TT2G46G | 7 | 992 | 2.92 | 0.66 | 3 | 2.93 | 0 | 1 | 4 | 3 | -0.37 | 0.45 | 0.02 |
| TT2G46H | 8 | 997 | 1.79 | 0.72 | 2 | 1.71 | 0 | 1 | 4 | 3 | 0.71 | 0.4 | 0.02 |
| TT2G46I | 9 | 999 | 2.97 | 0.49 | 3 | 2.97 | 0 | 1 | 4 | 3 | -0.39 | 2.44 | 0.02 |
| TT2G46J | 10 | 995 | 3 | 0.49 | 3 | 3.01 | 0 | 1 | 4 | 3 | -0.37 | 2.64 | 0.02 |

Pearson correlation tells us that none of the items listed below have very small correlations or correlations that are very near to zero. A few items have positive correlations while the other few have negative correlations.

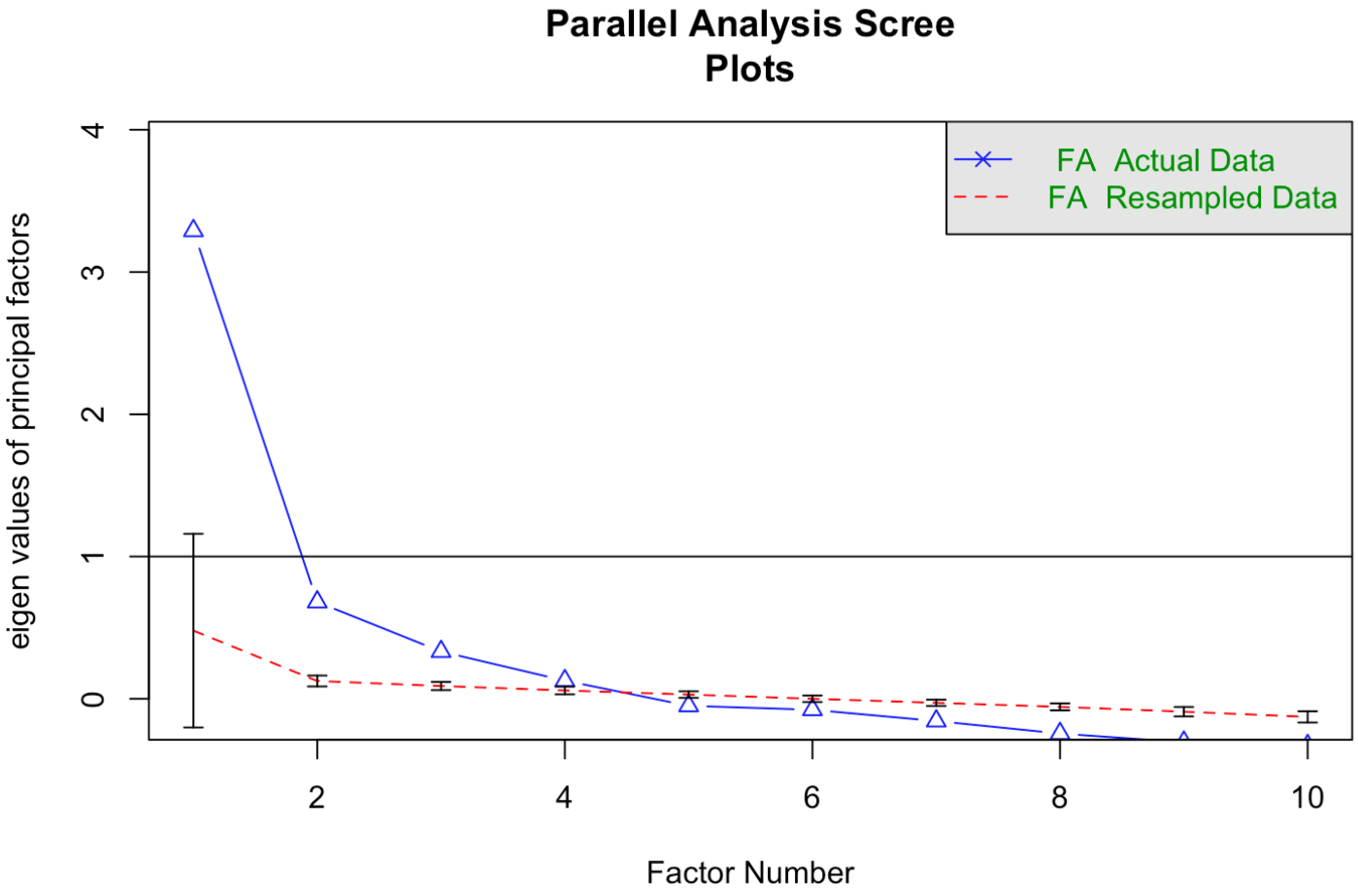
Table 7
*Pearson Correlation of the TALIS Data*

| | TT2G46A | TT2G46B | TT2G46C | TT2G46D | TT2G46E | TT2G46F | TT2G46G | TT2G46H |
|---|---|---|---|---|---|---|---|---|
| TT2G46A | 1 | | | | | | | |
| TT2G46B | 0.47 | 1 | | | | | | |
| TT2G46C | -0.19 | -0.22 | 1 | | | | | |
| TT2G46D | -0.38 | -0.57 | 0.28 | 1 | | | | |
| TT2G46E | 0.39 | 0.43 | -0.48 | -0.4 | 1 | | | |
| TT2G46F | -0.38 | -0.64 | 0.29 | 0.63 | -0.37 | 1 | | |
| TT2G46G | 0.24 | 0.23 | -0.45 | -0.21 | 0.59 | -0.2 | 1 | |
| TT2G46H | 0.25 | 0.23 | -0.07 | -0.13 | 0.16 | -0.2 | 0.18 | 1 |
| TT2G46I | 0.16 | 0.2 | -0.12 | -0.14 | 0.3 | -0.16 | 0.23 | 0.08 |
| TT2G46J | 0.39 | 0.41 | -0.21 | -0.34 | 0.46 | -0.34 | 0.31 | 0.18 |

| | TT2G46I | TT2G46J |
|---|---|---|
| TT2G46A | | |
| TT2G46B | | |
| TT2G46C | | |
| TT2G46D | | |
| TT2G46E | | |
| TT2G46F | | |

| | | |
|---|---|---|
| TT2G46G | | |
| TT2G46H | | |
| TT2G46I | 1 | |
| TT2G46J | 0.5 | 1 |

Figure 1
*Parallel Analysis Scree Plots*




Parallel analysis suggests that 3 factors have eigenvalues that exceed those from a randomly arranged dataset of the same size. The fourth factor is ambiguous because its eigenvalue just marginally exceeds that expected from a random dataset. Based on our parallel analysis result, we will compare models with 2, 3, and 4 factors.

**Results for 2-factor model**

If p-value > 0.05, it means the model fits the data, but in our case p-value is 6.1e-52, so we can see that our model doesn't fit the data. For larges samples, even minor misfit can lead to significant chi-square value.

**The total number of observations was 1000 with Likelihood Chi Square = 317.66 with prob < 6.1e-52**

Model with TLI > 0.9 fit the data well in general, but in our case, it is less than 0.9, so the model doesn't fit the data well.

**Tucker Lewis Index of factoring reliability = 0.841**

Root mean squared error of approximation is another model fit statistic. Generally, the range between 0.08 – 0.10 is merely a marginally acceptable fit, so we can see that our data doesn't fit the model very well.

**RMSEA index = 0.106 and the 90 % confidence intervals are 0.096 0.117**

From the matrix below, TT2G46F "I wonder whether it would have been better to choose another profession" loads highly on factor 1, whereas TT2G46G "I would recommend my school as a good place to work" loads highly on factor 2.

Table 8
*Standardized Loadings (Pattern Matrix) based upon Correlation Matrix*

| | ML1 | ML2 | h2 | u2 | com |
|---|---|---|---|---|---|
| TT2G46A | -0.45 | 0.15 | 0.313 | 0.69 | 1.2 |
| TT2G46B | -0.83 | -0.06 | 0.636 | 0.36 | 1 |
| TT2G46C | 0 | -0.56 | 0.312 | 0.69 | 1 |
| TT2G46D | 0.78 | 0.06 | 0.545 | 0.45 | 1 |
| TT2G46E | -0.05 | 0.81 | 0.71 | 0.29 | 1 |
| TT2G46F | 0.91 | 0.16 | 0.661 | 0.34 | 1.1 |
| TT2G46G | 0.2 | 0.83 | 0.523 | 0.48 | 1.1 |
| TT2G46H | -0.2 | 0.09 | 0.071 | 0.93 | 1.3 |
| TT2G46I | -0.04 | 0.35 | 0.143 | 0.86 | 1 |
| TT2G46J | -0.28 | 0.37 | 0.339 | 0.66 | 1.9 |

The matrix below shows us the estimated correlation between two latent factors, which is -0.64.

Table 9

*With Factor Correlations of*

| | ML1 | ML2 |
|---|---|---|
| ML1 | 1 | -0.64 |
| ML2 | -0.64 | 1 |

The possible conclusion for the 2-factor model is that none of the model fit indices shows a clear fit to response data from the TALIS data items. From the matrix, TT2G46F "I wonder whether it would have been better to choose another profession" loads highly on factor 1, whereas TT2G46G "I would recommend my school as a good place to work" loads highly on factor 2. The loading pattern is interpretable in the sense that scoring higher on factor 1 is associated with a lower score on factor 2 with the -0.64 correlation.

**Results for 3-factor model**

We want the p-value to be bigger than 0.05 to suggest that the model fits the data well, but in our case, it is not.

**The total number of observations was 1000 with Likelihood Chi Square = 92.61 with prob < 4.9e-12**

The TLI seems to show that the model fits the data well with its value > 0.9.

**Tucker Lewis Index of factoring reliability = 0.941**

With the RMSEA index of 0.064 ( < 0.08 ), the model seems to fit the data acceptably though not an excellent fit.

**RMSEA index = 0.064 and the 90 % confidence intervals are 0.052 0.078**

Factor 1 indicates TT2G46F "I wonder whether it would have been better to choose another profession." , factor 3 indicates TT2G46G "I would recommend my school as a good place to work", factor 2 indicates TT2G46J "All in all, I am satisfied with my job"

Table 10
*Standardized Loadings (Pattern Matrix) based upon Correlation Matrix*

| | ML1 | ML3 | ML2 | h2 | u2 | com |
|---|---|---|---|---|---|---|
| TT2G46A | -0.41 | 0.05 | 0.17 | 0.318 | 0.68 | 1.4 |
| TT2G46B | -0.8 | -0.06 | 0.03 | 0.623 | 0.38 | 1 |
| TT2G46C | 0.08 | -0.65 | 0.15 | 0.389 | 0.61 | 1.1 |
| TT2G46D | 0.8 | -0.02 | 0.11 | 0.56 | 0.44 | 1 |
| TT2G46E | -0.09 | 0.67 | 0.15 | 0.674 | 0.33 | 1.1 |
| TT2G46F | 0.93 | 0.06 | 0.14 | 0.684 | 0.32 | 1.1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TT2G46G | 0.16 | 0.81 | 0.05 | 0.568 | 0.43 | 1.1 |
| TT2G46H | -0.18 | 0.04 | 0.09 | 0.072 | 0.93 | 1.6 |
| TT2G46I | 0.11 | 0 | 0.64 | 0.338 | 0.66 | 1.1 |
| TT2G46J | -0.09 | -0.08 | 0.85 | 0.738 | 0.26 | 1 |

Table 11
*With factor correlations of*

| | ML1 | ML3 | ML2 |
|---|---|---|---|
| ML1 | 1 | -0.56 | -0.57 |
| ML3 | -0.56 | 1 | 0.55 |
| ML2 | -0.57 | 0.55 | 1 |

The possible conclusion for the 3-factor model is that although the chi-square model fit statistic indicates the model does not fit the data with p-value < 0.001, maybe because of the large sample size. However, the RMSEA index and TLI indicate a reasonably fit model. The loading pattern seems interpretable, with factor 1 indicates TT2G46F "I wonder whether it would have been better to choose another profession.", factor 3 indicates TT2G46G "I would recommend my school as a good place to work", factor 2 indicates TT2G46J "All in all, I am satisfied with my job". The correlations among the factors indicate that the factors are distinct and that scoring higher on factor 1 is associated with lower scores on both factor 2 and factor 3.

**Results for 4-factor model**

With the p-value very much less than 0.05, the p-value we get here doesn't suggest that the model fits the data well.

**The total number of observations was 1000 with Likelihood Chi Square = 33.39 with prob < 0.00045**

However, the TLI shown here indicates that the data fits the model well with TLI > 0.9.

**Tucker Lewis Index of factoring reliability = 0.971**

With RMSEA < 0.05, which indicates that the model fits the data well.

**RMSEA index = 0.045 and the 90 % confidence intervals are 0.028 0.063**

Table 12
*Standardized Loadings (Pattern Matrix) based upon Correlation Matrix*

| | ML1 | ML2 | ML3 | ML4 | h2 | u2 | com |
|---|---|---|---|---|---|---|---|
| TT2G46A | -0.07 | 0 | -0.05 | 0.64 | 0.44 | 0.56 | 1 |
| TT2G46B | -0.56 | -0.07 | 0.01 | 0.35 | 0.64 | 0.36 | 1.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TT2G46C | 0.17 | -0.69 | 0.06 | 0.19 | 0.44 | 0.56 | 1.3 |
| TT2G46D | 0.69 | -0.06 | 0.01 | -0.04 | 0.55 | 0.45 | 1 |
| TT2G46E | 0.01 | 0.65 | 0.07 | 0.22 | 0.68 | 0.32 | 1.3 |
| TT2G46F | 0.9 | 0.02 | -0.02 | 0.07 | 0.74 | 0.26 | 1 |
| TT2G46G | 0.17 | 0.74 | 0.02 | 0.1 | 0.55 | 0.45 | 1.1 |
| TT2G46H | 0.01 | -0.01 | -0.04 | 0.36 | 0.11 | 0.89 | 1 |
| TT2G46I | 0 | -0.02 | 0.88 | -0.17 | 0.62 | 0.38 | 1.1 |
| TT2G46J | -0.05 | 0.03 | 0.52 | 0.27 | 0.55 | 0.45 | 1.5 |

Table 13
*With Factor Correlations of*

| | ML1 | ML2 | ML3 | ML4 |
|---|---|---|---|---|
| ML1 | 1 | -0.46 | -0.35 | -0.65 |
| ML2 | -0.46 | 1 | 0.45 | 0.52 |
| ML3 | -0.35 | 0.45 | 1 | 0.54 |
| ML4 | -0.65 | 0.52 | 0.54 | 1 |

The possible conclusion for the 4-factor model is that although the chi-square model fit statistic indicates the model does not fit the data with p-value < 0.001, maybe because of the large samp-le size. However, the RMSEA index and TLI indicate that the model fits the data quite well. The loading pattern seems interpretable with factor 1 indicates TT2G46D “I regret that I decided to become a teacher”, factor 2 indicates TT2G46E “I enjoy working at this school.”, factor 3 indicates TT2G46I “I am satisfied with my performance in this school.”, factor 4 indicates TT2G46A “The advantages of being a teacher clearly outweigh the disadvantages”. The correlations among the factors indicates that the factors are distinct and that scoring high on factor 1 is associated with lower scores on factor 2, factor 3 and factor 4, which makes sense.

My overall conclusion is that perhaps the 3-factor model is interpretable and fits the data reasonably well should be chosen for parsimony reasons. We could consider using the items, mainly the consideration in choosing another profession, recommending the school as a good place to work and also satisfaction with the job. The 4-factor model is less parsimonious, but it is also a rather good model. Parallel analysis suggests considering a 4-factor model.

## Conclusions

The implication of the results is that I have now condensed my number of variables to only 3-4 of them. It’s easier for me to understand how these clusters of items will correlate to each other. If we were to perform a cluster analysis on the items from the 3-factor model, which are “choosing another profession”, “recommending the school as a good place to work” and also “satisfaction with the job”, we will perhaps see some interesting trends. From the 3-factor model, we can see that if the teaching staff is considering choosing another profession, then he/she would not recommend the school as a good place to work and they are not satisfied with the job. The model also tells us that vice versa is true. If the teaching staff would not consider another profession, then he/she would recommend the school as a good place to work and they are satisfied with the job.