Paper: Understanding of the behavior of the Controllers within the Companies.

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Contents

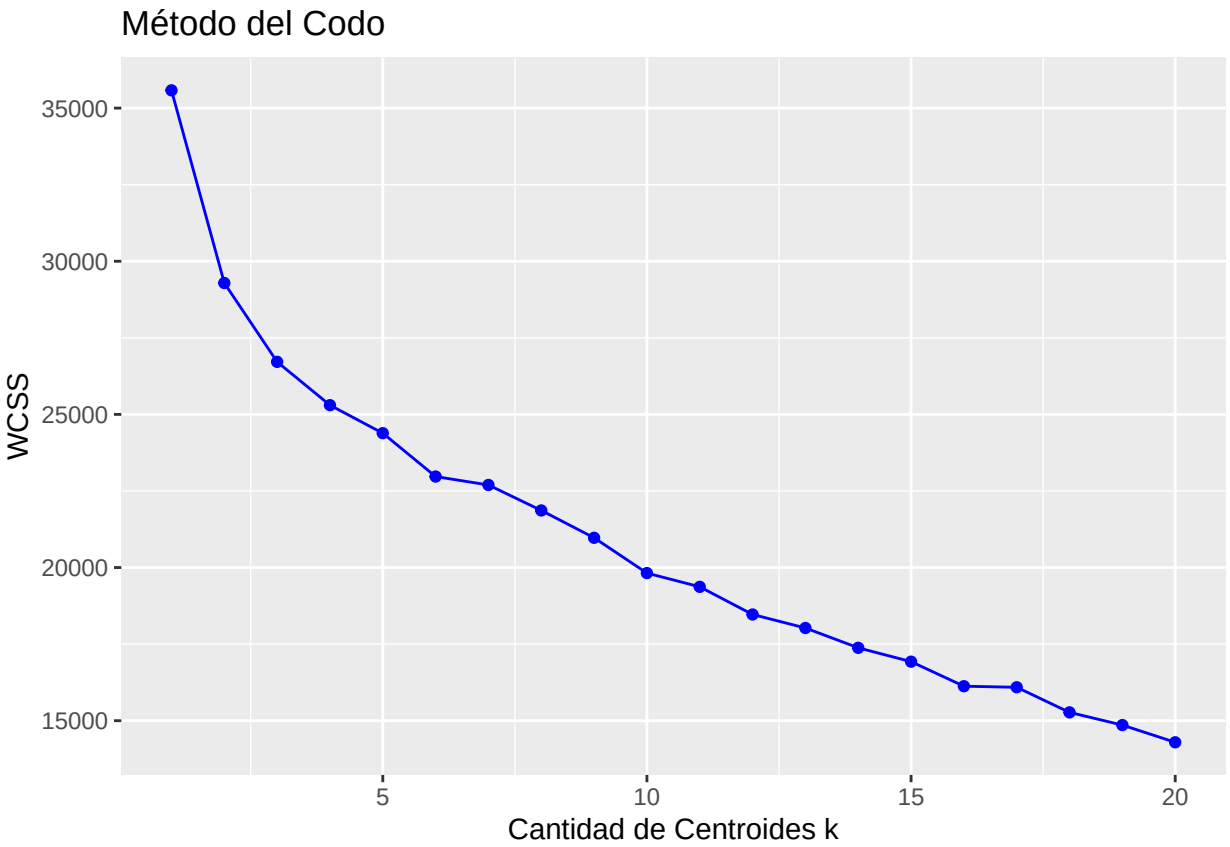
Este trabajo se basa en un relevamiento que se realizó entre 2020 y 2021 a 170 profesionales que ejercen de Controllers en diferentes empresas chilenas.

The data analysis process had several steps.

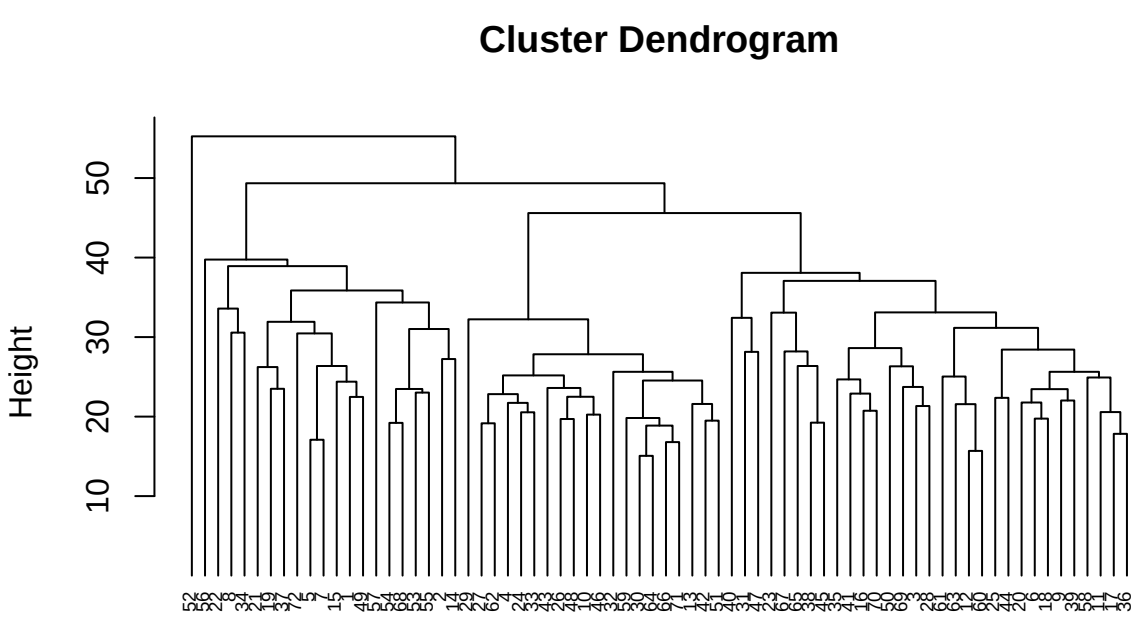
The first of them was to make a descriptive analysis of the data. In it you can analyze the different statistics that make up the data set. A data set of 73 Controllers was used, where 156 explanatory variables were surveyed.

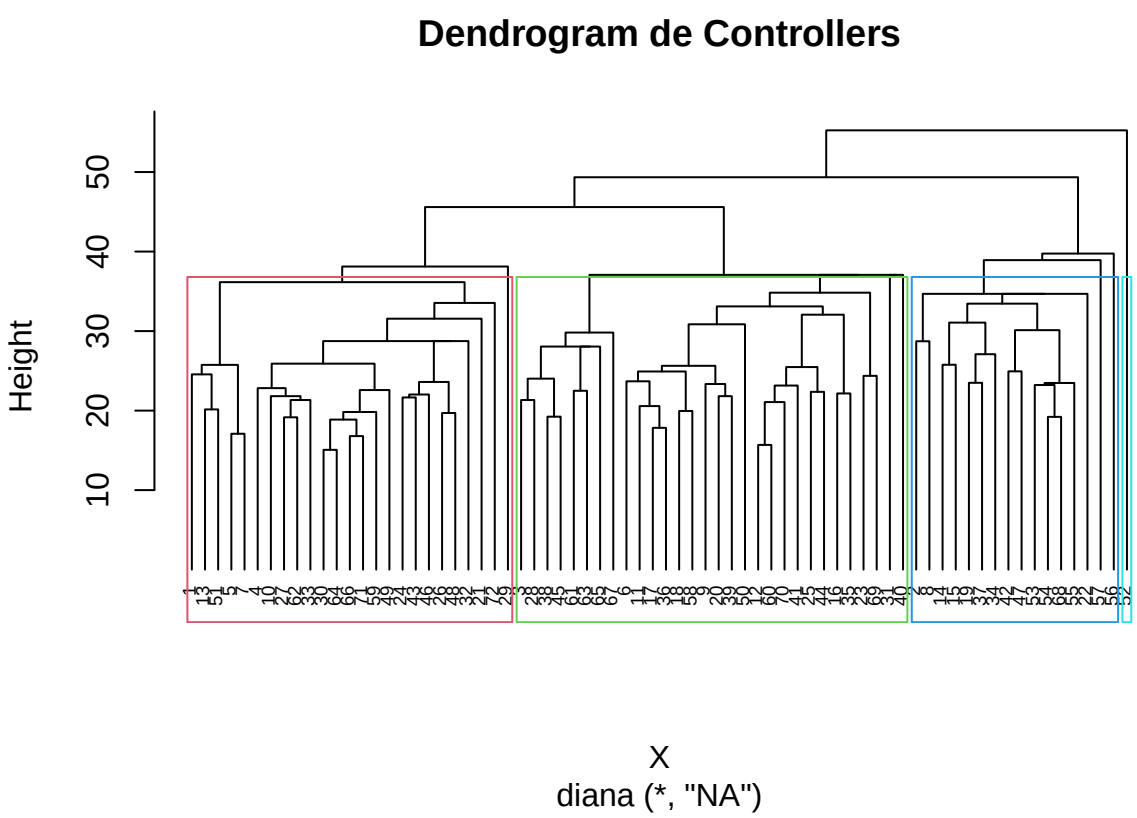
1 Hypothesis One - can the different groups of Controllers be grouped together?

To be able to identify the possibility of grouping the different Controllers. For this, the unsupervised cluster analysis technique was used. The first step in the process was to use the "elbow method" where an approximate number of clusters is identified.

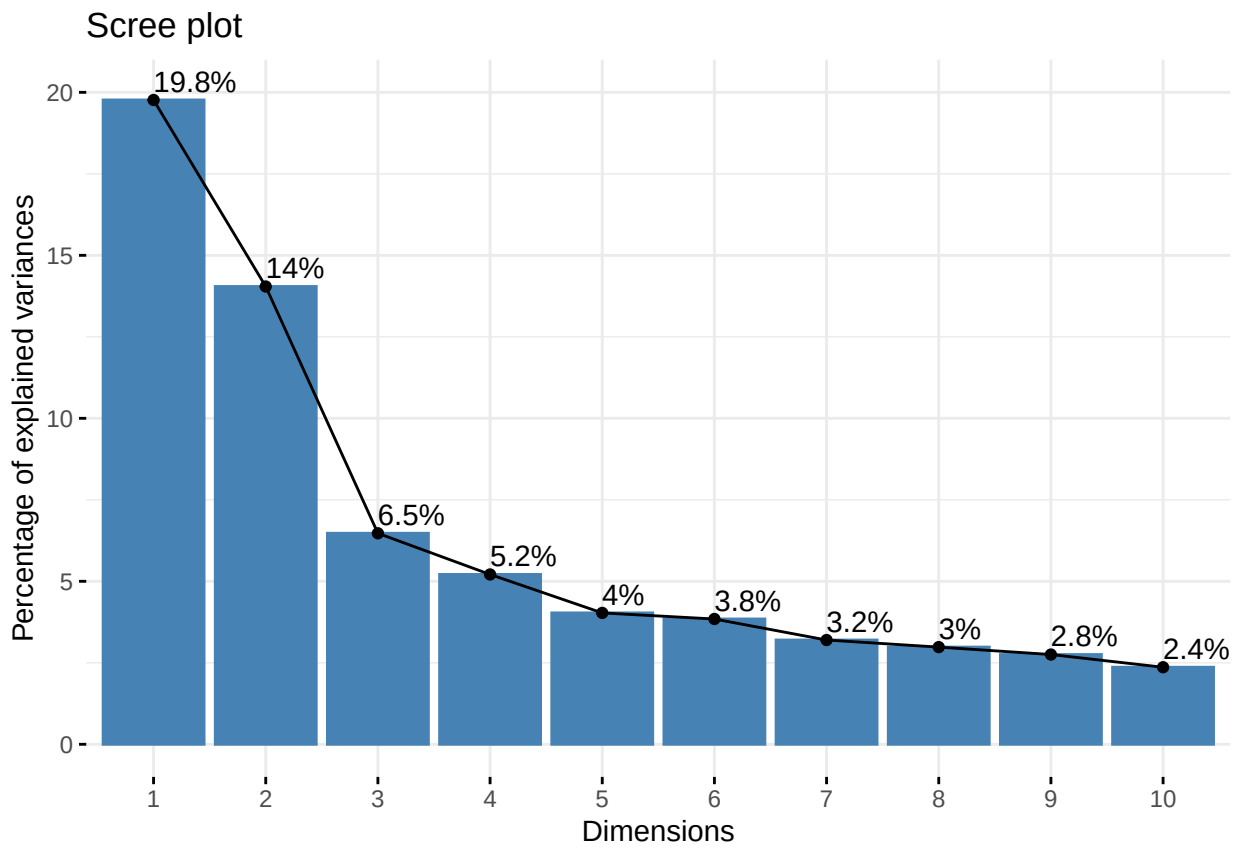


As you can see in the graph, the number of centroids can be 3 or 4 since 5 or more the improvement is marginal. The next step was to develop a Dendrogram of the Controllers in order to understand the different Clusters.


Cluster Dendrogram
Height
10
20
30
40
50
d
hclust (*, "complete")

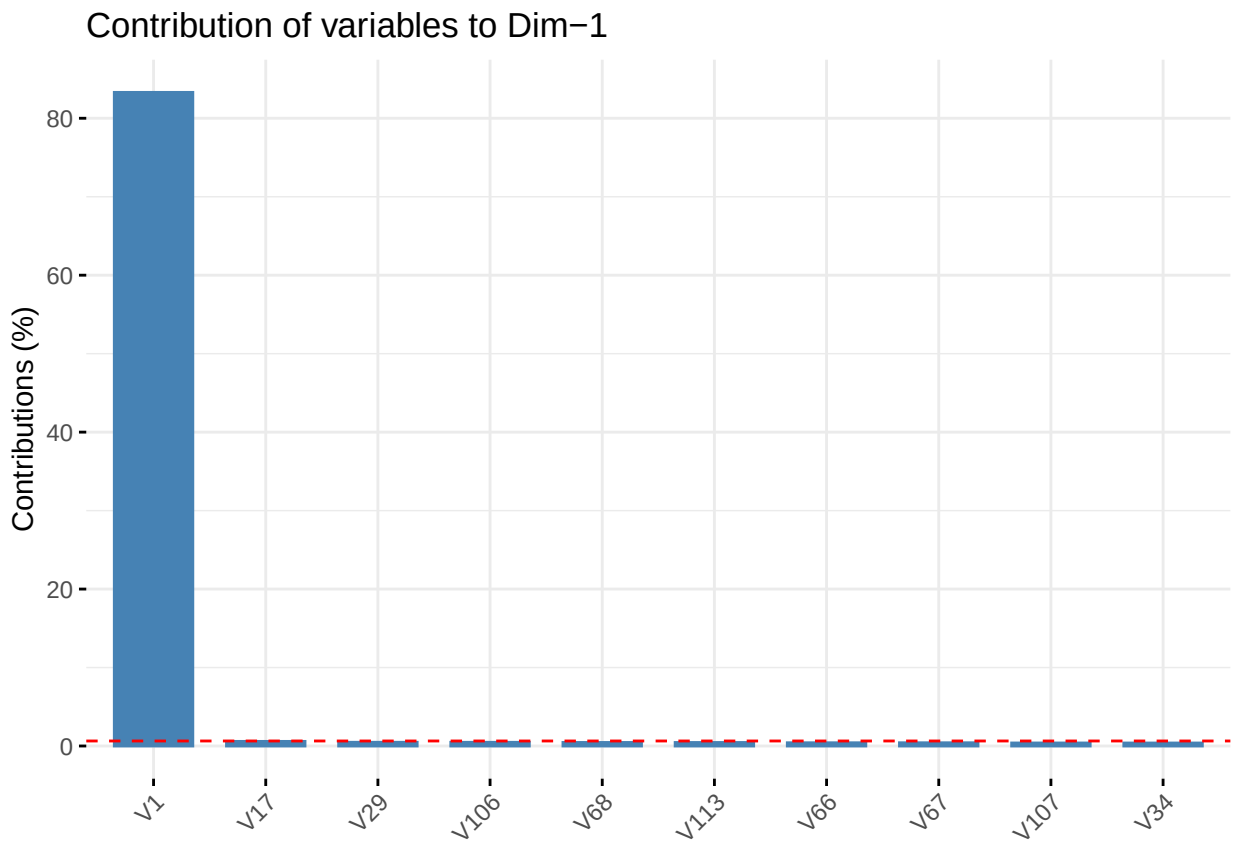


Finally, the different variables that define the grouping in the clusters were delved into. In order to better understand this, a principal component analysis was performed. The result is shown in the following graph.

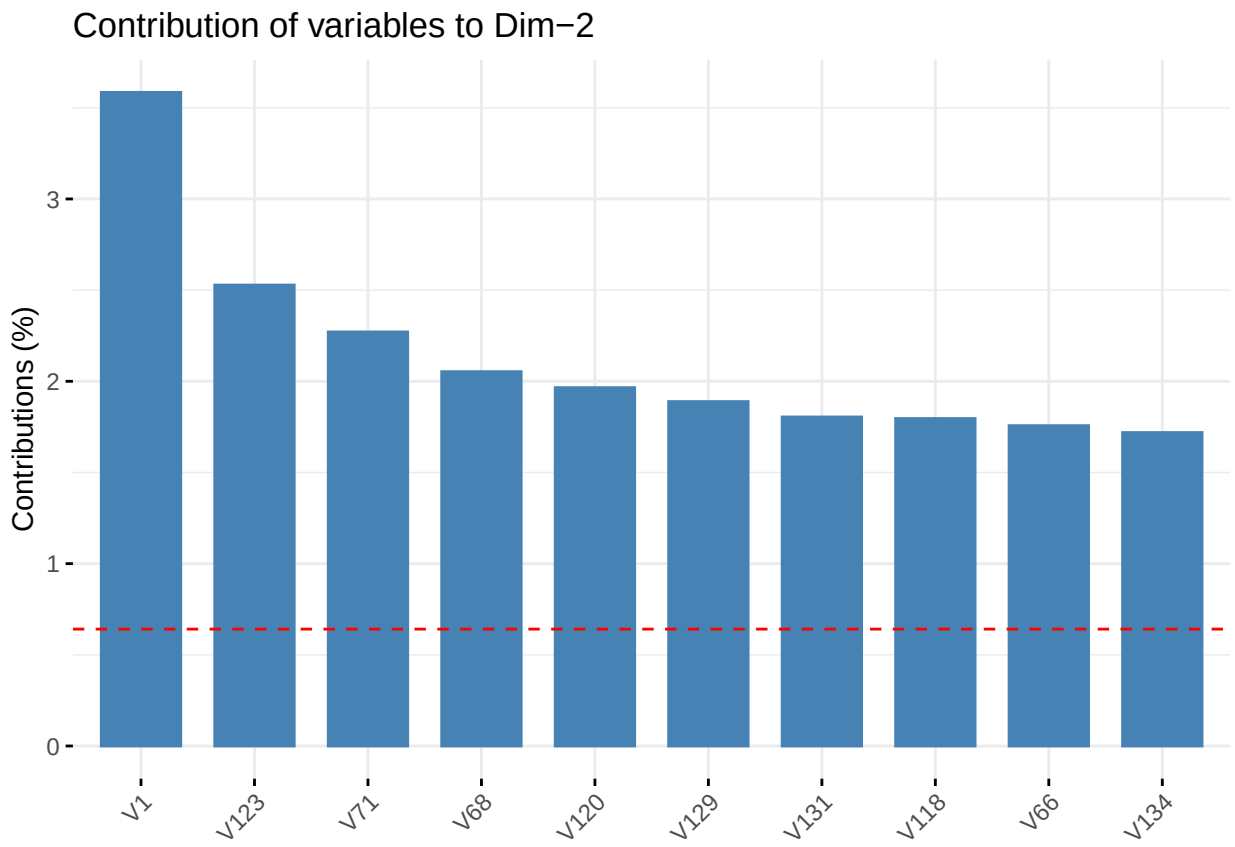


As can be seen, almost 20% of the variability is explained by DIM1. And another 14% for DIM2, while DIM3 accounts for another 6.5%. Total 40.3% of the variance. Finally, the variables found in each Dimension (DIM) were analyzed, reaching the following results.

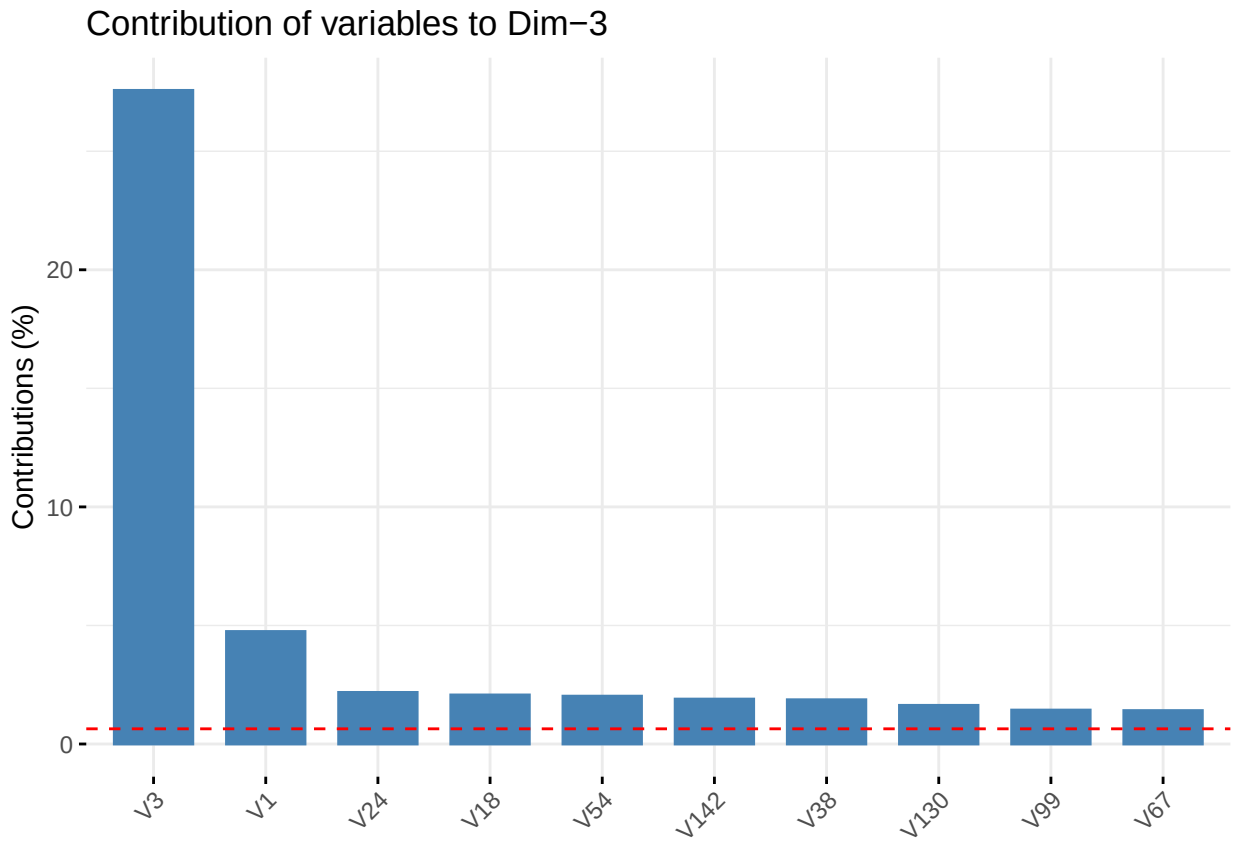
```
fviz_contrib(pca, choice = "var", axes = 1, top = 10)
```




```
fviz_contrib(pca, choice = "var", axes = 2, top = 10)
```




```
fviz_contrib(pca, choice = "var", axes = 3, top = 10)
```


Contribution of variables to Dim−3
Contributions (%)
20
10
0
V3
V1
V24
V18
V54
V142
V38
V130
V99
V67

2 Hypothesis two: can we infer certain type of variables for each group of controls?

For this we have defined 3 groups of controls. The **Strategic**, the **Accounting** and those in **Transformation**. For each of these groups we have taken the variables that were found in each DIM and we have elaborated descriptive LOGIT models.

In order for linear models to meet the inference conditions, they must meet that the errors are independent, that their distribution is normal, and that the variance is constant (does not vary across treatments), that is, it meets homoscedasticity. The models, their performance and the tests of compliance with the modeling assumptions are presented below.

```
##
## Call:
## lm(formula = V30 ~ V1 + V17 + V29 + V68, data = X)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.5493 -0.7300 -0.0888  0.6348  3.2859
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.37609    0.60215   2.285  0.02547 *
## V1           0.02824    0.01572   1.797  0.07686 .
## V17         -0.20855    0.08915  -2.339  0.02231 *
## V29          0.62011    0.08842   7.013 1.43e-09 ***
## V68          0.25199    0.08438   2.986  0.00394 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## s: 1.1 on 67 degrees of freedom
## Multiple R-squared: 0.6461,
## Adjusted R-squared: 0.625
## F-statistic: 30.58 on 4 and 67 DF,  p-value: 1.744e-14
```

```
## Analysis of Variance Table
##
## Response: V30
##           Df  Sum Sq Mean Sq F value    Pr(>F)
## V1         1   5.037   5.037  4.1646  0.045220 *
## V17        1  13.988  13.988 11.5656  0.001136 **
## V29        1 118.143 118.143 97.6834 1.029e-14 ***
## V68        1  10.786  10.786  8.9181  0.003941 **
## Residuals 67  81.033   1.209
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
##  Shapiro-Wilk normality test
##
## data:  ModeloEstrategico$residuals
## W = 0.98677, p-value = 0.6546
```

```
##
##  studentized Breusch-Pagan test
##
## data:  ModeloEstrategico
## BP = 3.2185, df = 4, p-value = 0.5219

##
## Call:
## lm(formula = V82 ~ V8 + V9 + V14 + V17 + V19 + V35 + V42 + V44 +
##     V43 + V73 + V83 + V86 + V125 + V140 + V142 + V143, data = X)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.67666 -0.27793  0.07468  0.38442  1.62654
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.08733    0.76858   0.114  0.90995
## V8          -0.18616    0.07583  -2.455  0.01728 *
## V9          -0.06459    0.04748  -1.360  0.17925
## V14         -0.08733    0.04964  -1.759  0.08408 .
## V17          0.08657    0.05615   1.542  0.12886
## V19         -0.06794    0.04626  -1.469  0.14763
## V35          0.16743    0.07273   2.302  0.02515 *
## V42         -0.10343    0.04939  -2.094  0.04088 *
## V44         -0.15547    0.06658  -2.335  0.02321 *
## V43          0.09908    0.05972   1.659  0.10282
## V73          0.10277    0.04456   2.307  0.02487 *
## V83          0.42076    0.08758   4.804 1.24e-05 ***
## V86          0.45919    0.08161   5.626 6.41e-07 ***
## V125         0.17824    0.05266   3.385  0.00132 **
## V140         0.23683    0.09540   2.483  0.01613 *
## V142         0.12233    0.07730   1.583  0.11925
## V143        -0.15786    0.07874  -2.005  0.04990 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## s: 0.5832 on 55 degrees of freedom
## Multiple R-squared: 0.8902,
## Adjusted R-squared: 0.8583
## F-statistic: 27.88 on 16 and 55 DF,  p-value: < 2.2e-16

## Analysis of Variance Table
##
## Response: V82
##           Df Sum Sq Mean Sq  F value    Pr(>F)
## V8         1  0.277   0.277   0.8134  0.371057
## V9         1  0.833   0.833   2.4502  0.123248
## V14        1  0.297   0.297   0.8734  0.354097
## V17        1 26.428  26.428  77.7010 4.185e-12 ***
## V19        1  2.683   2.683   7.8889  0.006872 **
## V35        1  0.385   0.385   1.1316  0.292074
## V42        1  4.059   4.059  11.9343  0.001069 **
## V44        1  6.196   6.196  18.2162 7.844e-05 ***
```

```
## V43        1  0.747   0.747   2.1948  0.144184
## V73        1  8.864   8.864  26.0617 4.255e-06 ***
## V83        1 82.293  82.293 241.9471 < 2.2e-16 ***
## V86        1 12.300  12.300  36.1626 1.530e-07 ***
## V125       1  2.995   2.995   8.8048  0.004441 **
## V140       1  1.967   1.967   5.7818  0.019587 *
## V142       1  0.046   0.046   0.1366  0.713062
## V143       1  1.367   1.367   4.0197  0.049905 *
## Residuals 55 18.707   0.340
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
##  Shapiro-Wilk normality test
##
## data:  ModeloContable$residuals
## W = 0.9658, p-value = 0.04737


##
##  studentized Breusch-Pagan test
##
## data:  ModeloContable
## BP = 13.403, df = 16, p-value = 0.6431


##
## Call:
## lm(formula = V27 ~ V1 + V28 + V50 + V60 + V62 + V64 + V67 + V152,
##     data = X)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.5661 -0.7778  0.0512  0.6910  2.5842
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.31058    1.69729   1.951   0.0556 .
## V1           0.04255    0.01690   2.517   0.0144 *
## V28          0.49092    0.08783   5.589 5.23e-07 ***
## V50          0.14741    0.09669   1.525   0.1324
## V60          0.30357    0.14634   2.074   0.0421 *
## V62          0.16151    0.09223   1.751   0.0848 .
## V64         -0.32880    0.13544  -2.428   0.0181 *
## V67          0.11438    0.08490   1.347   0.1827
## V152        -0.58917    0.23829  -2.472   0.0161 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## s: 1.215 on 63 degrees of freedom
## Multiple R-squared: 0.5384,
## Adjusted R-squared: 0.4797
## F-statistic: 9.184 on 8 and 63 DF,  p-value: 2.819e-08


## Analysis of Variance Table
```

```
##
## Response: V27
##           Df Sum Sq Mean Sq F value    Pr(>F)
## V1         1  5.475   5.475  3.7083   0.05866 .
## V28        1 68.828  68.828 46.6152 3.989e-09 ***
## V50        1  4.623   4.623  3.1309   0.08166 .
## V60        1  8.984   8.984  6.0847   0.01637 *
## V62        1  1.437   1.437  0.9735   0.32758
## V64        1  8.452   8.452  5.7241   0.01973 *
## V67        1  1.654   1.654  1.1204   0.29387
## V152       1  9.026   9.026  6.1132   0.01613 *
## Residuals 63 93.020   1.477
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
##  Shapiro-Wilk normality test
##
## data:  ModeloTransformacion$residuals
## W = 0.99037, p-value = 0.8621
```

```
##
##  studentized Breusch-Pagan test
##
## data:  ModeloTransformacion
## BP = 4.9389, df = 8, p-value = 0.7641
```

```
## # Comparison of Model Performance Indices
##
## Name                | Model |    R2 | R2 (adj.) |  RMSE | Sigma | AIC weights | BIC weights | Perfo
## ------------------------------------------------------------------------------------------------------
## ModeloContable      |   lmm | 0.890 |     0.858 | 0.510 | 0.583 |        1.00 |       1.000 |
## ModeloEstrategico   |   lmm | 0.646 |     0.625 | 1.061 | 1.100 |    < 0.001 |     < 0.001 |
## ModeloTransformacion |   lmm | 0.538 |     0.480 | 1.137 | 1.215 |    < 0.001 |     < 0.001 |
```

3 Analysis of V156 "measures how satisfied you are with the work of the controller"

The evidence we present, which coincides with current theory, shows that the company's Board of Directors is more satisfied with a strategic controller role than with a more accounting/financial role.

```
## [1] 0.2975413
```

```
## [1] 0.2896048
```

```
## [1] 0.07843289
```

```
##
## Call:
## lm(formula = V30 ~ V156, data = X)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.7107 -1.1005 -0.1005  1.3444  2.8995
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.2699     0.7810   2.906  0.00489 **
## V156          0.6102     0.2340   2.608  0.01114 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## s: 1.727 on 70 degrees of freedom
## Multiple R-squared: 0.08853,
## Adjusted R-squared: 0.07551
## F-statistic: 6.799 on 1 and 70 DF,  p-value: 0.01114

##
## Call:
## lm(formula = V27 ~ V156, data = X)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.8500 -0.9607  0.2071  1.1500  2.8214
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.6214     0.7345   3.569 0.000653 ***
## V156          0.5571     0.2201   2.531 0.013606 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## s: 1.624 on 70 degrees of freedom
## Multiple R-squared: 0.08387,
## Adjusted R-squared: 0.07078
## F-statistic: 6.408 on 1 and 70 DF,  p-value: 0.01361

##
## Call:
## lm(formula = V82 ~ V156, data = X)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.8857 -0.7469  0.2531  1.1143  1.5306
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   5.3306     0.7036   7.576  1.1e-10 ***
## V156          0.1388     0.2108   0.658    0.513
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## s: 1.556 on 70 degrees of freedom
## Multiple R-squared: 0.006152,
```

```
## Adjusted R-squared: -0.008046
## F-statistic: 0.4333 on 1 and 70 DF,  p-value: 0.5125
```