



**PUC - SP**

**WORLD DEVELOPMENT INDICATORS  
BANCO MUNDIAL**

**ALDAIR ALMEIDA FONSECA  
MESTRADO EM ADMINISTRAÇÃO DE EMPRESAS  
MÉTODOS QUANTITATIVOS  
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## **Introdução**

A proposta do presente trabalho é demonstrar a possível relação entre o aumento da área agrícola, da produção de alimentos e da produção pecuária com o incremento de máquinas agrícolas e o aumento da população urbana versus o êxodo rural.

O software estatístico utilizado é o MINITAB.

### **1. Os dados**

Os dados utilizados nesse trabalho são referentes aos dados disponibilizados pelo Banco Mundial, a tabela utilizada foi a World Development Indicators que oferece mais de 1000 indicadores relacionados aos 185 países membros do banco.

A tabela completa está disponível para download em Excel no endereço:

<http://data.worldbank.org/data-catalog>

### **2. As variáveis**

No caso específico dessa análise, utilizaremos as seguintes variáveis:

- Área agrícola (AA);
- Índice de produção de alimentos (IPA);
- Índice de produção de pecuária (IPP);
- Máquinas agrícolas (MA);
- População urbana (PU);
- População rural (PR).

Obs.1: Para os itens área agrícola, máquinas agrícolas, população urbana, população rural foi utilizado logaritmo base 10, devido á grande discrepância nos valores entre os maiores países e os menores países analisados.

OBs. 2: Os *outliers* foram removidos para que se tenha uma análise mais apurada dos dados.

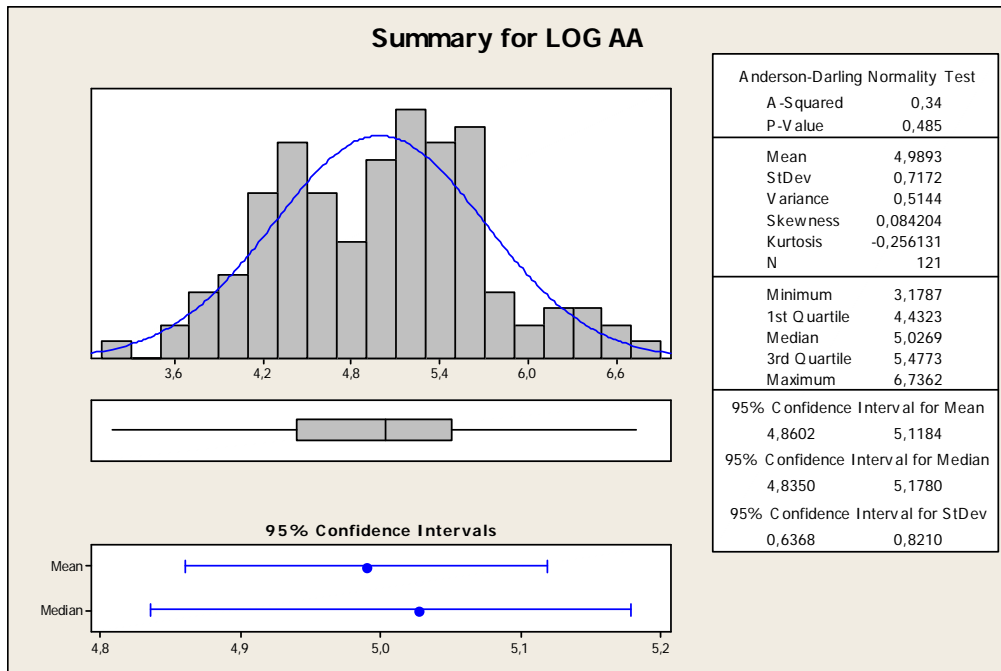
### 3. Tabela de dados

Cod Países	Países	Área agrícola	Índice de produção de alimentos	Índice de produção de pecuária	Máquinas agrícolas	População urbana	População rural
CHN	China	5.447.898	109,2	108,3	1.186.350	504.217.322	786.721.178
AUS	Australia	4.460.848	90,7	94,3	315.000	17.648.652	2.427.668
USA	United States	4.140.557	102	101,2	4.487.265	234.184.008	57.490.392
BRA	Brazil	2.628.242	112,9	110,4	792.586	151.824.249	30.511.524
RUS	Russian Federation	2.163.639	107,3	103,8	617.849	105.397.080	38.803.949
KAZ	Kazakhstan	2.073.622	106,1	111,4	49.280	8.603.098	6.503.438
IND	India	1.805.028	103	108,7	2.453.890	304.924.065	766.007.838
SDN	Sudan	1.349.337	109,2	112,5	27.118	14.862.905	22.752.627
ARG	Argentina	1.301.648	106	99,9	248.826	34.765.464	3.441.987
MNG	Mongolia	1.217.834	85,1	83,9	4.449	1.419.466	1.081.099
MEX	Mexico	1.072.400	106	106,2	260.903	77.020.883	24.535.014
ZAF	South Africa	995.790	103,7	108,4	69.125	26.967.290	19.027.863
NGA	Nigeria	743.488	109,1	105,7	21.436	61.576.606	74.579.061
CAN	Canada	676.033	101,3	104	730.241	25.456.900	6.406.320
IRN	Iran, Islamic Rep.	591.532	112,2	110,7	258.798	44.637.647	22.872.534
AGO	Angola	574.840	122,7	98,4	9.000	8.380.955	7.529.845
MOZ	Mozambique	485.925	103,2	107,2	5.854	6.723.388	13.333.281
IDN	Indonesia	462.821	113,3	120,3	4.435	99.611.137	115.388.107
SOM	Somalia	441.722	102,2	102,2	1.165	2.799.345	5.266.010
COL	Colombia	431.010	102	105,1	21.000	30.787.041	11.279.405
UKR	Ukraine	413.814	105,3	102,2	365.280	32.264.374	15.501.682
TUR	Turkey	405.891	103,4	100,8	970.341	46.411.356	23.338.452
MDG	Madagascar	404.391	105,2	98,8	668	4.770.441	12.154.054
DZA	Algeria	404.237	117,8	106,6	98.062	20.035.376	12.128.146
MLI	Mali	389.907	113,3	111,9	1.417	3.417.666	8.031.603
NAM	Namibia	388.185	101	98,1	2.000	672.618	1.282.434
BOL	Bolivia	368.835	107,1	106,9	5.940	5.669.040	3.252.460
TZA	Tanzania	343.571	113,8	103,1	18.980	8.936.120	28.678.901
TKM	Turkmenistan	325.316	114,9	114,4	50.000	2.227.300	2.512.375
ETH	Ethiopia	321.554	113,9	114,2	3.000	11.399.636	60.591.197
MAR	Morocco	303.786	117,2	102,1	43.226	16.363.413	13.647.967
FRA	France	296.489	98,2	98,6	1.223.792	46.140.997	14.201.653
ESP	Spain	293.102	100,9	103	942.288	32.556.996	9.929.930
PAK	Pakistan	277.630	106,4	108,2	380.682	51.884.918	98.449.273
UZB	Uzbekistan	270.121	112,8	109,3	170.000	9.523.895	16.231.660
KEN	Kenya	268.584	110,9	115,8	12.901	7.086.809	27.458.406
BWA	Botswana	258.429	105,2	104,9	3.058	1.013.720	792.557
ZMB	Zambia	252.295	105,7	103,3	6.000	3.987.742	7.386.946
YEM	Yemen, Rep.	236.095	109,3	115,6	6.374	5.712.494	14.483.079

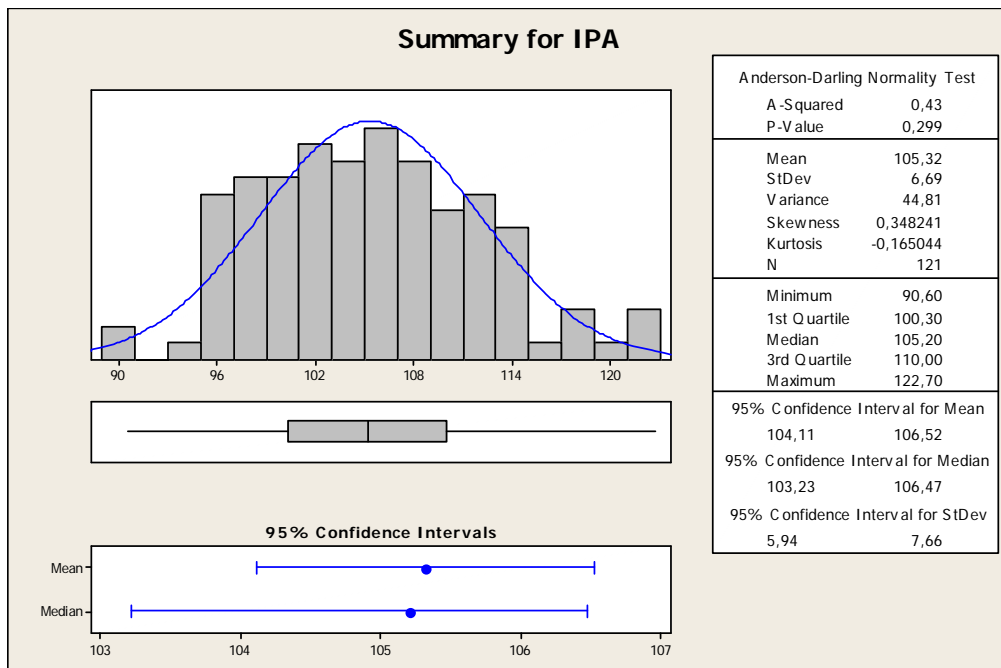
ZAR	Congo, Dem. Rep.	227.860	98,9	97,9	2.430	17.914.745	38.698.440
VEN	Venezuela, RB	214.068	100,2	99,9	49.000	23.690.903	2.208.097
PER	Peru	212.556	110,5	111,7	13.191	19.365.033	7.909.179
PRY	Paraguay	199.945	112,5	101,5	16.500	3.306.091	2.432.030
CIV	Cote d'Ivoire	197.900	104,3	104,7	8.856	8.584.535	10.097.538
THA	Thailand	197.579	105,7	104,3	622.195	20.739.765	44.011.837
GBR	United Kingdom	172.078	98,5	98,9	451.050	53.658.109	6.212.943
DEU	Germany	170.535	96,6	99,9	916.217	60.382.836	21.958.921
POL	Poland	170.514	102,4	102,7	1.381.842	23.541.038	14.711.965
LBY	Libya	154.970	101,4	100,3	39.555	4.423.038	1.329.930
CHL	Chile	154.911	107,2	106	54.000	13.961.602	2.070.225
ZWE	Zimbabwe	150.770	90,6	98	23.900	4.402.564	8.066.927
ITA	Italy	150.312	96,8	98,3	1.759.411	39.207.154	18.847.268
URY	Uruguay	148.224	108,7	105,6	36.230	3.036.505	272.492
GHA	Ghana	146.156	112	103,3	3.591	9.918.234	11.280.790
ROM	Romania	144.696	102,8	105,7	168.475	11.743.657	10.110.897
SYR	Syrian Arab Republic	138.033	114,7	115,5	102.133	9.655.849	8.628.719
NZL	New Zealand	136.106	108,9	108,7	73.690	3.481.938	563.292
GIN	Guinea	129.769	107,9	114,1	5.369	2.922.390	6.062.435
UGA	Uganda	124.650	103,3	107,8	4.700	3.421.328	24.047.232
PHL	Philippines	113.443	108,6	108,7	60.915	51.155.214	32.022.041
MMR	Myanmar	110.706	118,7	137,3	8.558	14.334.466	33.522.500
KGZ	Kyrgyz Republic	107.497	100,4	100,7	23.787	1.813.338	3.257.423
BFA	Burkina Faso	106.380	111,8	109,5	6.563	2.360.269	10.795.865
COG	Congo, Rep.	105.432	107,2	118,2	700	1.968.116	1.328.591
TUN	Tunisia	96.850	107,9	98,6	38.367	6.409.705	3.486.035
IRQ	Iraq	96.206	103,4	98,2	65.485	18.463.513	9.017.349
VNM	Vietnam	93.723	110,5	109	157.255	21.071.657	60.438.991
CMR	Cameroon	91.600	105,7	100	500	9.159.266	8.088.141
BLR	Belarus	90.793	113,8	108,3	63.560	7.042.163	2.810.301
BGD	Bangladesh	90.357	104,6	111,5	1.369	37.586.962	111.756.307
SEN	Senegal	87.261	84,9	103,2	760	4.503.163	6.377.612
GRC	Greece	84.611	94	100,1	255.255	6.656.475	4.394.086
ECU	Ecuador	76.576	104,3	106,4	14.668	8.044.786	4.788.307
ERI	Eritrea	75.211	98,3	98,9	488	806.494	3.414.062
CUB	Cuba	66.251	96,1	91,5	75.412	8.431.089	2.723.170
HUN	Hungary	59.155	100,2	94,6	112.982	6.671.158	3.457.219
BGR	Bulgaria	53.926	89,6	80,6	36.641	5.472.154	2.365.164
GAB	Gabon	51.600	100,2	99,9	927	1.095.826	232.395
NIC	Nicaragua	51.570	111,6	112,4	3.805	2.973.810	2.375.591
KHM	Cambodia	50.526	117,5	104,5	2.981	2.569.559	10.970.999
MWI	Malawi	48.315	100,9	109,4	1.428	2.207.628	10.913.082
AZE	Azerbaijan	47.386	114,5	113,2	23.685	4.273.249	4.026.032
TJK	Tajikistan	45.885	125,2	135,6	23.113	1.705.965	4.732.430
GTM	Guatemala	45.545	111,3	103	4.300	5.731.066	6.545.326
IRL	Ireland	43.542	96,3	96,5	168.404	2.442.684	1.619.844

CZE	Czech Republic	42.694	97,6	96,2	88.551	7.568.117	2.699.081
NPL	Nepal	42.065	107	106,1	27.497	3.998.381	22.374.689
PRT	Portugal	37.497	97,9	99,4	172.023	5.912.770	4.524.092
EGY	Egypt, Arab Rep.	34.317	107,1	108,7	93.550	32.006.372	43.074.110
AUT	Austria	33.331	96,6	96,6	334.102	5.413.942	2.744.692
SWE	Sweden	31.764	100,1	97,9	163.539	7.577.397	1.419.070
HND	Honduras	31.286	119,8	114,3	5.256	3.078.601	3.619.004
LTU	Lithuania	29.597	112	109,7	108.023	2.300.121	1.141.165
PRK	Korea, Dem. Rep.	29.400	106,6	114,7	64.483	14.280.157	9.035.478
GEO	Georgia	28.119	96,6	98	19.098	2.395.495	2.154.023
CRI	Costa Rica	27.435	104,3	103,8	7.000	2.561.562	1.641.302
DNK	Denmark	26.688	100,5	101,7	119.181	4.628.405	769.840
MDA	Moldova	25.296	106	103,2	40.453	1.677.625	2.195.583
DOM	Dominican Republic	25.192	115,3	116	1.881	6.105.590	3.216.374
LKA	Sri Lanka	23.571	102,1	107,7	19.065	2.968.086	16.371.741
ISL	Iceland	22.810	102,5	102	10.193	271.317	22.948
FIN	Finland	22.655	100,6	101,3	174.247	3.245.517	1.983.070
PAN	Panama	22.146	102,5	101,9	7.940	2.181.143	966.065
SVK	Slovak Republic	21.798	100,2	94,5	22.804	3.034.669	2.353.962
BIH	Bosnia and Herzegovina	21.447	110	115,9	29.000	1.688.233	2.061.606
NLD	Netherlands	19.379	95,1	95	146.993	12.809.344	3.383.221
LAO	Lao PDR	19.264	110	108,2	1.078	1.493.281	4.250.157
KOR	Korea, Rep.	19.134	95,4	99,3	207.261	38.446.772	9.353.228
HRV	Croatia	17.407	97,2	105,2	96.334	2.503.950	1.945.150
GUY	Guyana	17.053	98,5	120,8	5.625	216.102	544.676
LVA	Latvia	16.782	111	104,9	56.073	1.581.313	741.464
CHE	Switzerland	15.586	100,2	101	108.473	5.404.424	1.964.285
SLV	El Salvador	15.528	101,2	109,1	3.430	3.576.130	2.450.148
ARM	Armenia	14.133	122,6	109,9	13.917	1.979.236	1.090.465
SWZ	Swaziland	13.417	106,5	109,9	2.107	266.850	847.024
ALB	Albania	11.266	106,8	106	7.737	1.359.965	1.737.692
BEL	Belgium	11.094	68,9	64,9	76.459	10.136.540	289.055
NOR	Norway	10.404	98,6	96,7	133.635	3.527.648	1.064.371
JOR	Jordan	10.286	121,8	107,1	5.625	4.109.029	1.137.120
PNG	Papua New Guinea	10.117	104,1	107,2	1.202	756.955	5.144.604
EST	Estonia	8.636	107,9	104,8	41.467	940.170	414.072
LBN	Lebanon	6.312	102	111,1	8.027	3.437.921	540.120
ISR	Israel	5.377	103,8	104	24.500	6.168.472	570.968
JAM	Jamaica	5.130	98,1	103,6	2.070	1.380.635	1.251.991
SVN	Slovenia	5.027	102,1	101,8	106.851	996.640	1.003.361
FJI	Fiji	4.282	96,2	103,7	5.913	410.795	409.431
WBG	West Bank and Gaza	3.716	95,4	95,9	7.355	2.439.788	967.117
NCL	New Caledonia	2.470	98,7	96,6	1.924	144.075	83.826
CYP	Cyprus	1.509	98,7	99,3	13.006	567.515	253.270
BLZ	Belize	1.508	103,3	125,8	1.150	138.977	140.910
LUX	Luxembourg	1.029	68,6	66	5.700	379.783	77.280

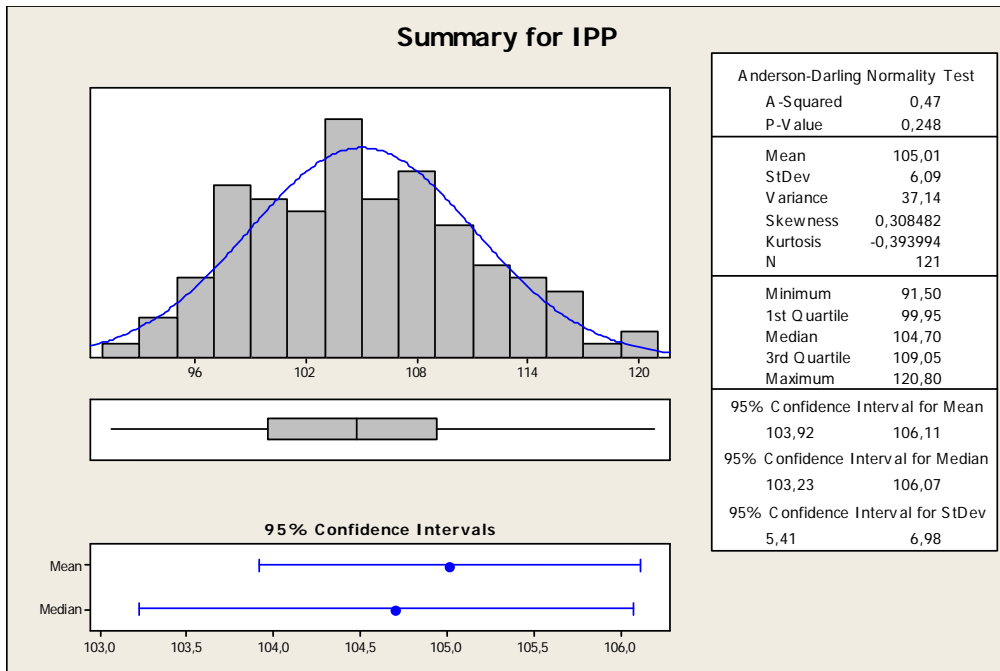
#### 4. Análise das variáveis



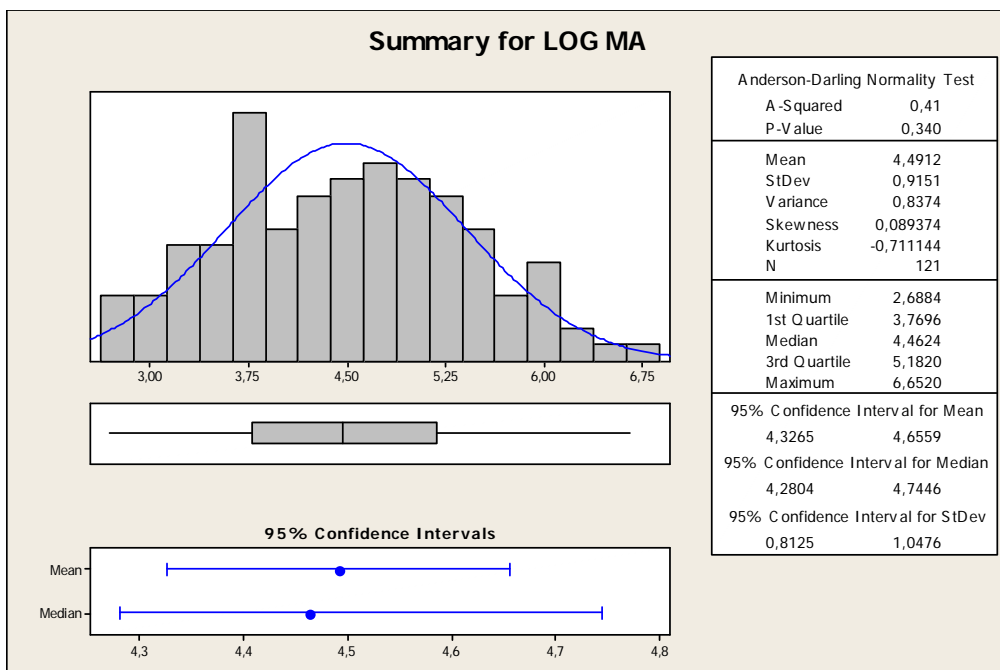
O Histograma nos permite verificar que trata-se de uma distribuição levemente assimétrica à esquerda com uma lacuna em 4,8. Observamos que a média está bem centrada com relação à mediana. **Dois grupos**



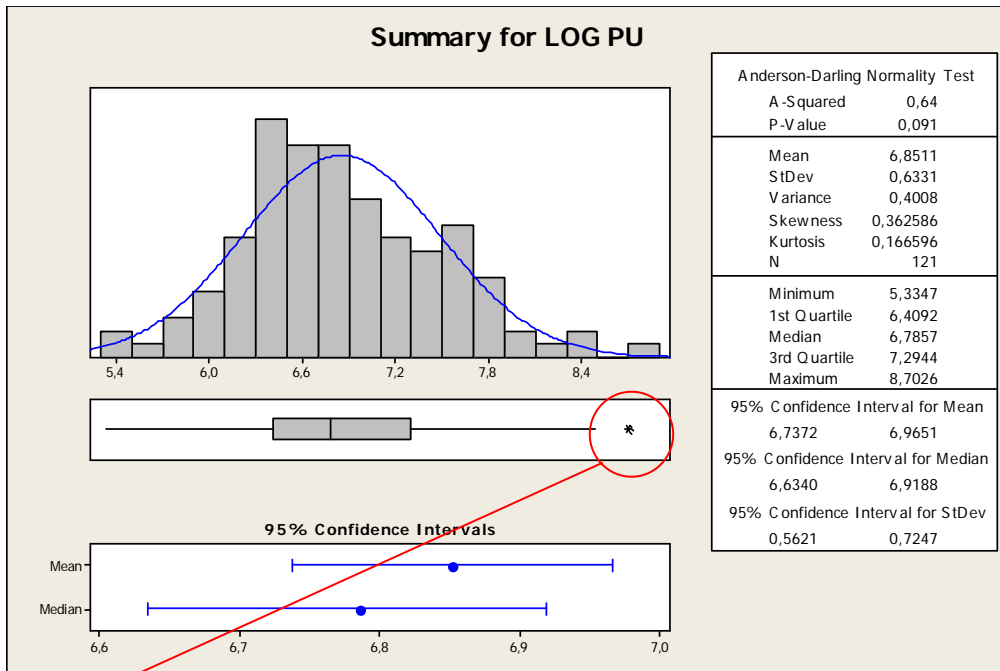
Nesse caso, o Histograma nos mostra uma curva com tendência de normal, porém com alta concentração no centro, uma lacuna no lado esquerdo da curva e uma calda mais longa à direita.



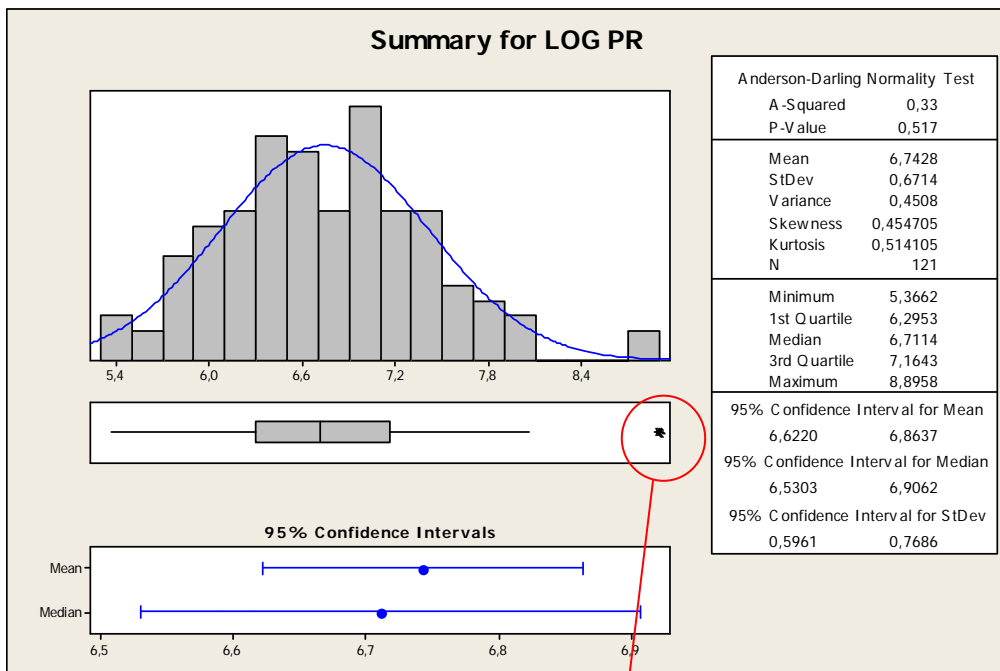
O Histograma acima nos mostra uma curva próxima a normal.



Nesse exemplo, o Histograma nos mostra uma curva com tendência de normal, porém com uma leve tendência de assimetria à esquerda, vemos um pico no valor de 3,75.



O Histograma apresenta uma leve tendência de assimetria à esquerda. Observamos um **outlier** conforme destacado, que se trata da China, país extremamente populoso que mesmo tendo gerado o logaritmo para reduzir a discrepância, ela ainda persiste.



Nesse Histograma podemos observar uma leve tendência de assimetria à esquerda, com duas lacunas próximas a 8,4, observamos ainda dois **outliers** conforme destacado, que são respectivamente a Índia e a China, pois são os países com as maiores populações rurais do planeta, tão acima da média mundial que da mesma forma que no exemplo anterior, mesmo tendo gerado o logaritmo para reduzir a discrepância, ela ainda persiste.

**Obs.: No caso do LOG PU e do LOG PR, os outliers China e Índia foram mantidos, pois são países de grande importância mundial e de extrema relevância para as análises.**



## 5. Correlação entre variáveis

### Correlations: IPA; IPP; LOG AA; LOG MA; LOG PU; LOG PR

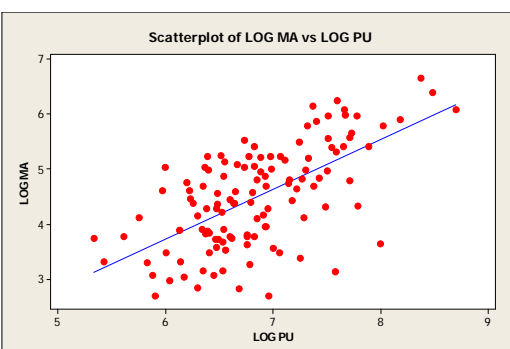
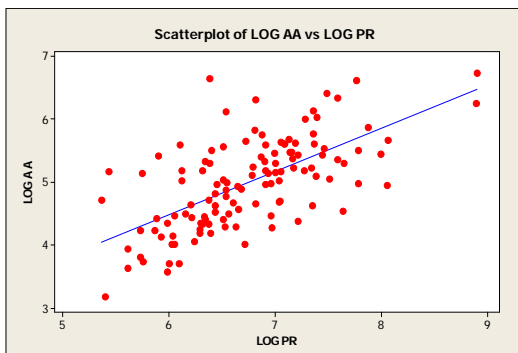
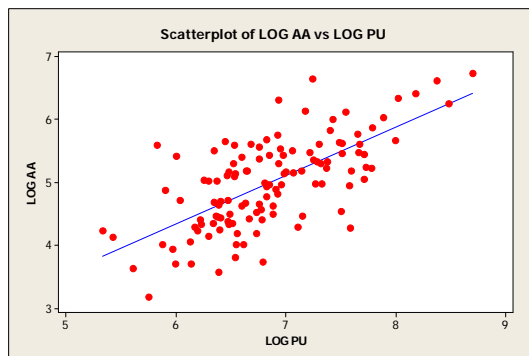
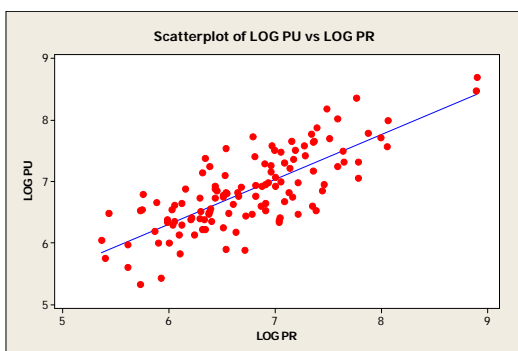
	IPA	IPP	LOG AA	LOG MA	LOG PU
IPP	0,590 0,000				
LOG AA	0,175 0,055	0,082 0,370			
LOG MA	-0,215 0,018	-0,260 0,004	0,318 0,000		
LOG PU	0,052 0,572	-0,026 0,773	<b>0,678</b> 0,000	<b>0,625</b> 0,000	
LOG PR	0,185 0,042	0,203 0,025	<b>0,644</b> 0,000	0,290 0,001	<b>0,773</b> 0,000

**Análise:** De acordo com os resultados apresentados na análise de correlação, podemos notar que as variáveis que possuem maior relação são:

- LOG PU x LOG PR = 0,773
- LOG AA x LOG PU = 0,678
- LOG AA x LOG PR = 0,644
- LOG MA x LOG PU = 0,625

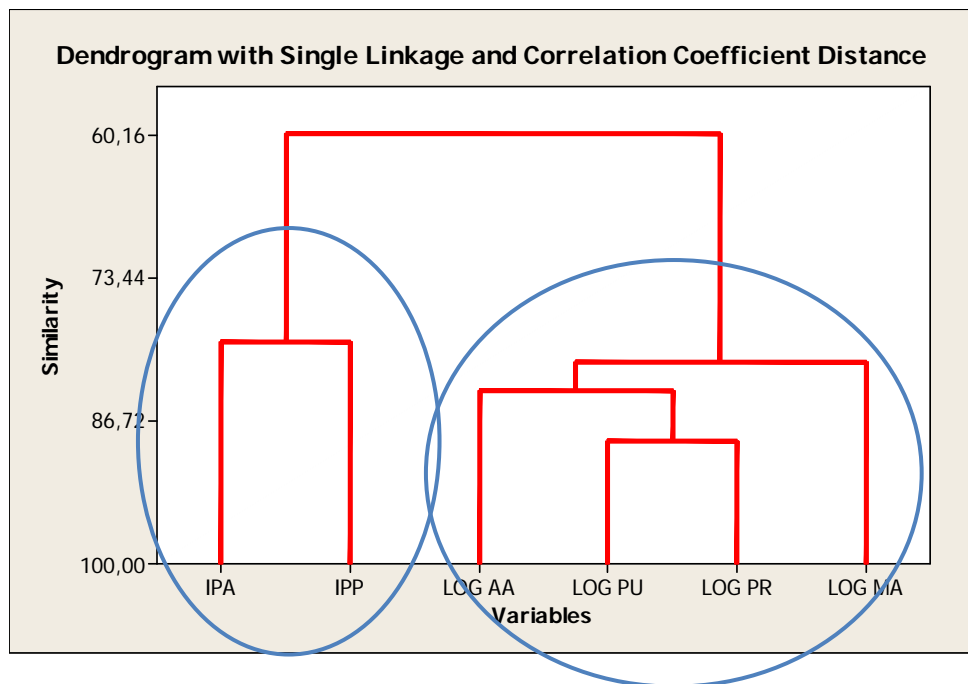
Podemos notar que em todos os casos existe um alto grau de confiança no resultado da análise de correlação.

Os gráficos de dispersão que seguem, demonstram essa relação.



## 6. Dendrograma

Dendrogramas são estruturas gráficas em forma de árvore, utilizadas para representar as junções (métodos hierárquicos) ou divisões (métodos de partição) que ocorreram a partir de valores provenientes da matriz de distâncias (JOHNSON & WICHERN, 1988). De acordo com Bussab et al (1990), para construirmos um dendrograma utilizando os valores da matriz de distâncias com o objetivo de ilustrar as junções, devemos colocar no eixo horizontal os elementos, em uma ordem conveniente de acordo com os grupos formados, de onde partirá de cada um desses elementos uma linha vertical até a altura correspondente ao nível (o valor da distância) em que ocorreu a junção (a um outro elemento ou grupo). Essa altura é marcada no eixo vertical.



O dendrograma acima mostra da mesma forma que na análise de correlação, que os indicadores IPA e IPP estão mais distantes dos demais indicadores, sendo assim, esse trabalho dará mais ênfase aos demais itens em detrimento do IPA e do IPP.

No gráfico podemos notar uma grande similaridade entre LOG PR e LOG PU em seguida esse conjunto com LOG AA e por fim esse conjunto maior com LOG MA.

## 7. Principal componente

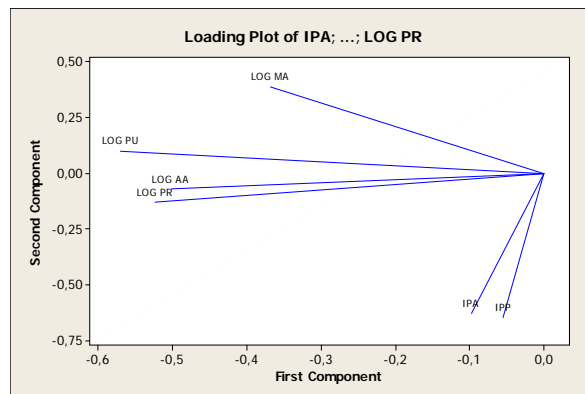
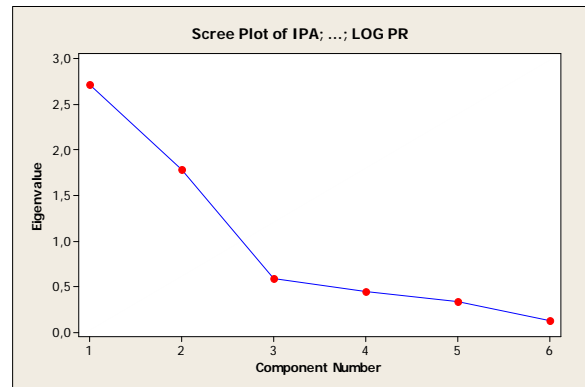
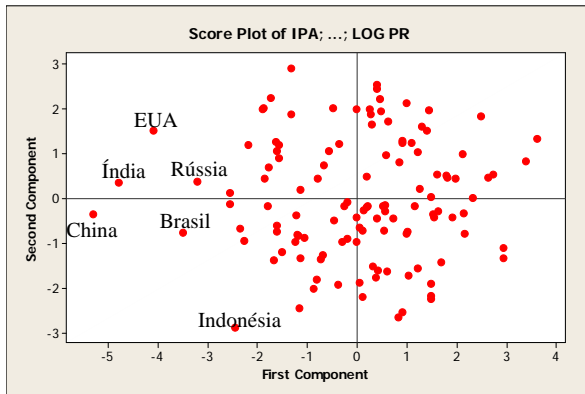
### 7.1 Principal componente para população

#### Principal Component Analysis: IPA; IPP; LOG AA; LOG MA; LOG PU; LOG PR

Eigenanalysis of the Correlation Matrix

Eigenvalue	2,7174	1,7866	0,5889	0,4441	0,3365	0,1264
Proportion	0,453	0,298	0,098	0,074	0,056	0,021
Cumulative	0,453	0,751	0,849	0,923	0,979	1,000

Variable	PC1	PC2	PC3	PC4	PC5	PC6
IPA	<b>-0,097</b>	<b>-0,631</b>	<b>-0,312</b>	<b>0,609</b>	<b>-0,346</b>	<b>0,066</b>
IPP	<b>-0,055</b>	-0,646	-0,268	-0,564	0,425	-0,095
LOG AA	-0,502	-0,071	0,400	0,404	0,639	0,101
LOG MA	-0,368	0,390	-0,756	0,015	0,164	0,338
LOG PU	-0,570	0,101	-0,068	-0,068	-0,228	-0,777
LOG PR	-0,524	-0,131	0,308	-0,378	-0,460	0,509



Podemos notar no Score Plot que os maiores países do mundo (EUA, Índia, Rússia, China, Brasil e Indonésia) estão representados de maneira dispersa no gráfico.

Observamos uma pequena diferença no grau de representatividade de cada variável, com exceção das variáveis IPA (-0,097) e IPP (-0,055) que de acordo com o que já foi demonstrado na análise de correlação e no dendograma, possui pouca relação com o grupo, isso ainda pode ser provado no Loading Plot acima que demonstra essas duas variáveis bastante discrepantes das demais.

A nova variável PC1 representa apenas 45,3% do total sendo necessário o uso do PC2 com 29,8% e do PC3 com 9,8% - totalizando 84,9%.

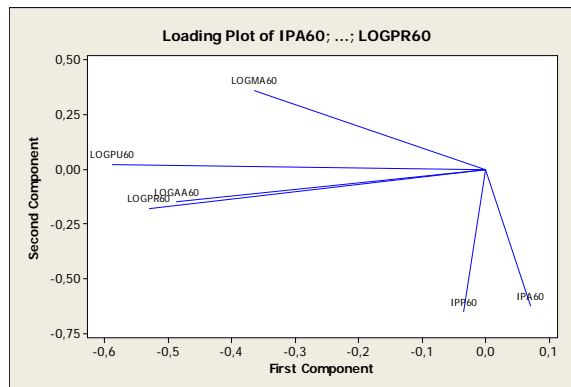
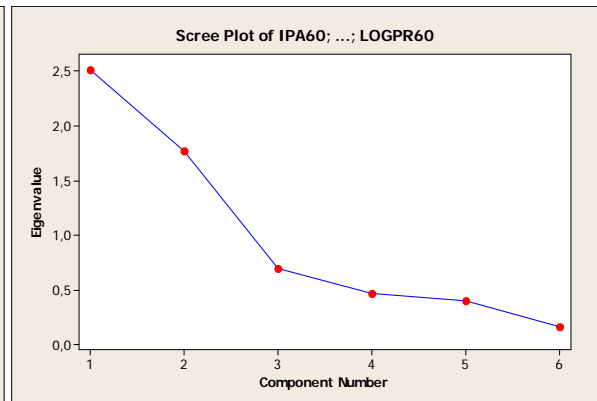
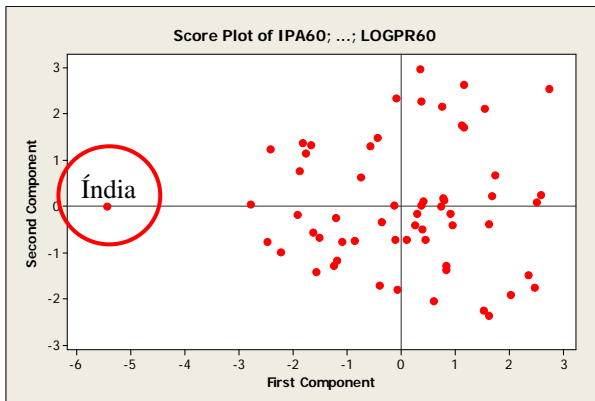
## 7.2 Principal componente para 60 indivíduos

### Principal Component Analysis: IPA60; IPP60; LOGAA60; LOGMA60; LOGPU60; LOGPR60

Eigenanalysis of the Correlation Matrix

Eigenvalue	2,5131	1,7697	0,6945	0,4621	0,4001	0,1605
Proportion	0,419	0,295	0,116	0,077	0,067	0,027
Cumulative	0,419	0,714	0,830	0,907	0,973	1,000

Variable	PC1	PC2	PC3	PC4	PC5	PC6
IPA60	0,070	-0,625	0,401	-0,379	0,537	-0,101
IPP60	-0,034	-0,652	0,196	0,344	-0,637	0,109
LOGAA60	-0,486	-0,148	-0,383	-0,692	-0,329	-0,090
LOGMA60	-0,364	0,360	0,755	-0,090	-0,223	-0,332
LOGPU60	-0,587	0,023	0,123	0,127	0,242	0,751
LOGPR60	-0,529	-0,178	-0,263	0,484	0,298	-0,543



Podemos notar no Score Plot que Índia está representada de maneira dispersa no gráfico. Observamos uma pequena diferença no grau de representatividade de cada variável, com exceção das variáveis IPA (0,070) e IPP (-0,034).

A nova variável PC1 representa apenas 41,9% do total sendo necessário o uso do PC2 com 29,5% e do PC3 com 11,6% - totalizando 83%.

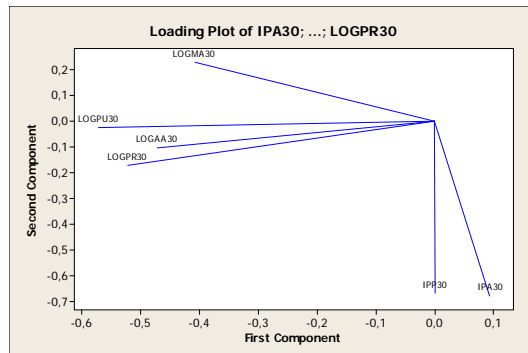
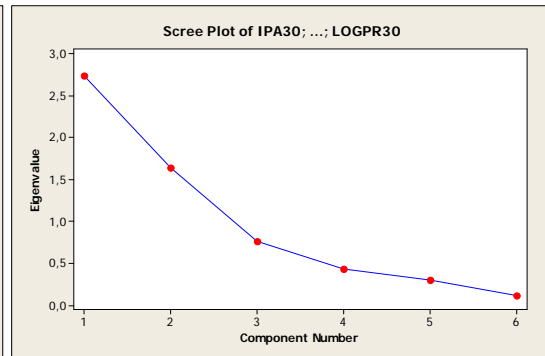
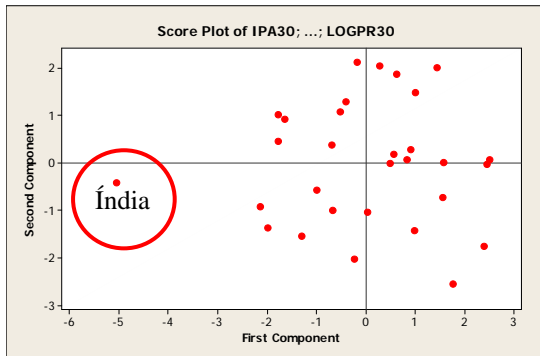
### 7.3 Principal componente para 30 indivíduos

#### Principal Component Analysis: IPA30; IPP30; LOGAA30; LOGMA30; LOGPU30; LOGPR30

Eigenanalysis of the Correlation Matrix

Eigenvalue	2,7455	1,6452	0,7653	0,4316	0,2966	0,1158
Proportion	0,458	0,274	0,128	0,072	0,049	0,019
Cumulative	0,458	0,732	0,859	0,931	0,981	1,000

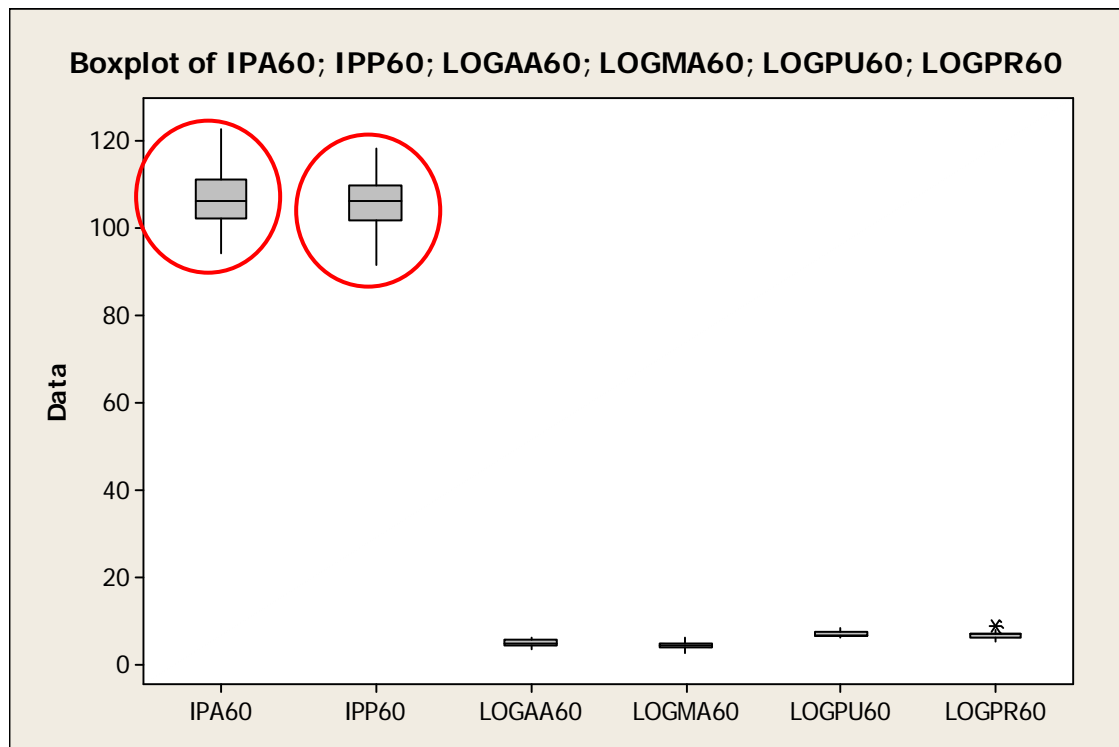
Variable	PC1	PC2	PC3	PC4	PC5	PC6
IPA30	0,094	-0,679	-0,007	0,689	-0,194	-0,136
IPP30	0,000	-0,668	-0,365	-0,548	0,325	0,115
LOGAA30	-0,472	-0,106	0,551	0,127	0,657	-0,121
LOGMA30	-0,409	0,226	-0,720	0,259	0,227	-0,381
LOGPU30	-0,572	-0,028	-0,108	0,142	-0,211	0,772
LOGPR30	-0,523	-0,172	0,181	-0,348	-0,574	-0,462



Podemos notar no Score Plot que Índia está representada de maneira dispersa no gráfico, estando ligeiramente abaixo quando comparado com a análise de 60 indivíduos. Observamos ainda uma pequena diferença no grau de representatividade de cada variável, com exceção das variáveis IPA (0,094) e IPP (0,000).

A nova variável PC1 representa apenas 45,8% do total sendo necessário o uso do PC2 com 27,4% e do PC3 com 12,8% - totalizando 85,9%.

### 8. Análise de conglomerado ou clusters



Conforme observados em outras análises e aqui também no Boxplot, as variáveis IPA e IPP estão muito discrepantes com relação às demais e portanto não serão consideradas na análise de clusters.

### 8.1 Análise de conglomerados para população

#### Cluster Analysis of Observations: LOG AA; LOG MA; LOG PU; LOG PR

Euclidean Distance, Single Linkage  
Amalgamation Steps

Step	Number of clusters	Similarity level	Distance level	Clusters joined	New cluster	Number of obs. in new cluster
1	120	97,3232	0,16367	12 74	12	2
2	119	97,1580	0,17378	42 94	42	2
3	118	97,1418	0,17477	10 27	10	2
4	117	96,5893	0,20855	10 29	10	3
5	116	96,4995	0,21404	10 50	10	4
6	115	96,3414	0,22371	61 105	61	2
7	114	96,2963	0,22647	72 96	72	2
8	113	96,1693	0,23423	14 93	14	2
9	112	96,0183	0,24346	10 107	10	5
10	111	96,0062	0,24420	92 104	92	2
11	110	95,9942	0,24494	40 98	40	2
12	109	95,6884	0,26364	24 85	24	2
13	108	95,6668	0,26496	12 42	12	4
14	107	95,5314	0,27324	57 90	57	2
15	106	95,5202	0,27392	19 116	19	2
16	105	95,5119	0,27443	40 108	40	3
17	104	95,3139	0,28653	25 119	25	2
18	103	95,1909	0,29405	15 47	15	2

19	102	95,1230	0,29821	10	91	10	6
20	101	95,1177	0,29853	55	69	55	2
21	100	95,0366	0,30349	26	39	26	2
22	99	94,9621	0,30805	53	111	53	2
23	98	94,8169	0,31693	49	81	49	2
24	97	94,7769	0,31937	5	24	5	3
25	96	94,7340	0,32200	26	55	26	4
26	95	94,6770	0,32548	25	76	25	3
27	94	94,6530	0,32695	16	71	16	2
28	93	94,6452	0,32742	22	37	22	2
29	92	94,5524	0,33310	3	25	3	4
30	91	94,5443	0,33359	15	120	15	3
31	90	94,5419	0,33374	3	15	3	7
32	89	94,4151	0,34149	26	103	26	5
33	88	94,2671	0,35054	43	57	43	3
34	87	94,2650	0,35067	40	43	40	6
35	86	94,2475	0,35174	78	99	78	2
36	85	94,2451	0,35189	53	73	53	3
37	84	94,2399	0,35221	92	115	92	3
38	83	94,2112	0,35396	26	30	26	6
39	82	94,0066	0,36647	7	10	7	7
40	81	93,8683	0,37493	67	118	67	2
41	80	93,8666	0,37503	13	77	13	2
42	79	93,8594	0,37547	26	102	26	7
43	78	93,8489	0,37611	54	92	54	4
44	77	93,8325	0,37711	1	5	1	4
45	76	93,8147	0,37821	1	49	1	6
46	75	93,7906	0,37968	26	83	26	8
47	74	93,6173	0,39028	2	75	2	2
48	73	93,5179	0,39635	7	45	7	8
49	72	93,4614	0,39981	1	34	1	7
50	71	93,4529	0,40033	70	72	70	3
51	70	93,3606	0,40597	7	19	7	10
52	69	93,3480	0,40674	7	26	7	18
53	68	93,3171	0,40863	3	88	3	8
54	67	93,2984	0,40978	8	32	8	2
55	66	93,2030	0,41561	3	110	3	9
56	65	93,1926	0,41625	1	46	1	8
57	64	93,1700	0,41763	65	86	65	2
58	63	93,1650	0,41793	3	44	3	10
59	62	93,1550	0,41854	7	8	7	20
60	61	93,1102	0,42128	3	11	3	11
61	60	93,0738	0,42351	59	67	59	3
62	59	93,0582	0,42446	1	31	1	9
63	58	93,0227	0,42663	64	87	64	2
64	57	93,0068	0,42761	3	61	3	13
65	56	92,8635	0,43637	7	12	7	24
66	55	92,8407	0,43776	18	40	18	7
67	54	92,8165	0,43924	1	59	1	12
68	53	92,7039	0,44613	1	16	1	14
69	52	92,6981	0,44648	3	21	3	14
70	51	92,6963	0,44659	80	114	80	2
71	50	92,6419	0,44992	1	7	1	38
72	49	92,6251	0,45095	1	66	1	39
73	48	92,6210	0,45120	2	3	2	16
74	47	92,5397	0,45616	2	54	2	20
75	46	92,4092	0,46415	1	36	1	40
76	45	92,4082	0,46420	1	79	1	41
77	44	92,2695	0,47269	1	2	1	61
78	43	92,2221	0,47559	68	80	68	3
79	42	92,1696	0,47880	18	53	18	10
80	41	92,1351	0,48090	1	97	1	62
81	40	92,0236	0,48773	48	101	48	2
82	39	92,0117	0,48845	1	121	1	63
83	38	91,9692	0,49105	64	68	64	5
84	37	91,9428	0,49266	1	64	1	68
85	36	91,9145	0,49440	18	112	18	11
86	35	91,7330	0,50550	1	100	1	69
87	34	91,3837	0,52685	1	62	1	70
88	33	91,3590	0,52836	1	109	1	71

89	32	91,1733	0,53971	14	18	14	13
90	31	91,1044	0,54393	33	117	33	2
91	30	90,9719	0,55203	1	56	1	72
92	29	90,5585	0,57731	14	106	14	14
93	28	90,3497	0,59008	14	84	14	15
94	27	90,1546	0,60201	33	89	33	3
95	26	90,1305	0,60348	23	35	23	2
96	25	90,0395	0,60904	1	65	1	74
97	24	90,0171	0,61041	1	95	1	75
98	23	89,9500	0,61452	20	51	20	2
99	22	89,9123	0,61682	1	14	1	90
100	21	89,8448	0,62095	28	38	28	2
101	20	89,7777	0,62505	1	4	1	91
102	19	89,7019	0,62968	1	58	1	92
103	18	89,5753	0,63743	1	6	1	93
104	17	89,4202	0,64691	1	22	1	95
105	16	89,2210	0,65909	1	70	1	98
106	15	89,0881	0,66722	1	63	1	99
107	14	88,9824	0,67368	28	48	28	4
108	13	88,9767	0,67403	1	60	1	100
109	12	88,6608	0,69334	1	33	1	103
110	11	88,4699	0,70502	1	78	1	105
111	10	87,9912	0,73429	1	9	1	106
112	9	87,9457	0,73707	1	17	1	107
113	8	87,8822	0,74096	1	23	1	109
114	7	87,4365	0,76821	52	82	52	2
115	6	86,3659	0,83367	1	13	1	111
116	5	86,1932	0,84423	1	28	1	115
117	4	86,1518	0,84676	1	113	1	116
118	3	86,0812	0,85108	1	52	1	118
119	2	85,8447	0,86554	1	41	1	119
120	1	80,1264	1,21519	1	20	1	121

Final Partition

Number of clusters: 40

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	62	61,8263	0,957119	1,63655
Cluster2	1	0,0000	0,000000	0,00000
Cluster3	1	0,0000	0,000000	0,00000
Cluster4	1	0,0000	0,000000	0,00000
Cluster5	2	0,0703	0,187516	0,18752
Cluster6	2	0,0274	0,117116	0,11712
Cluster7	1	0,0000	0,000000	0,00000
Cluster8	10	2,0698	0,426914	0,74314
Cluster9	1	0,0000	0,000000	0,00000
Cluster10	2	0,0536	0,163712	0,16371
Cluster11	1	0,0000	0,000000	0,00000
Cluster12	1	0,0000	0,000000	0,00000
Cluster13	1	0,0000	0,000000	0,00000
Cluster14	1	0,0000	0,000000	0,00000
Cluster15	1	0,0000	0,000000	0,00000
Cluster16	1	0,0000	0,000000	0,00000
Cluster17	2	0,1189	0,243863	0,24386
Cluster18	1	0,0000	0,000000	0,00000
Cluster19	1	0,0000	0,000000	0,00000
Cluster20	1	0,0000	0,000000	0,00000
Cluster21	1	0,0000	0,000000	0,00000
Cluster22	1	0,0000	0,000000	0,00000
Cluster23	1	0,0000	0,000000	0,00000
Cluster24	1	0,0000	0,000000	0,00000
Cluster25	2	0,0910	0,213315	0,21332
Cluster26	2	0,0872	0,208814	0,20881
Cluster27	3	0,3094	0,310818	0,37386
Cluster28	3	0,1523	0,216820	0,29058



Cluster29	2	0,0619	0,175870	0,17587
Cluster30	1	0,0000	0,000000	0,00000
Cluster31	1	0,0000	0,000000	0,00000
Cluster32	1	0,0000	0,000000	0,00000
Cluster33	1	0,0000	0,000000	0,00000
Cluster34	1	0,0000	0,000000	0,00000
Cluster35	1	0,0000	0,000000	0,00000
Cluster36	1	0,0000	0,000000	0,00000
Cluster37	1	0,0000	0,000000	0,00000
Cluster38	1	0,0000	0,000000	0,00000
Cluster39	1	0,0000	0,000000	0,00000
Cluster40	1	0,0000	0,000000	0,00000

Cluster Centroids

Variable	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
LOG AA	4,78251	6,11449	6,64942	4,95596	5,50069	6,37743	4,96190
LOG MA	4,39717	5,39590	5,49831	3,13640	3,39323	5,84496	2,69897
LOG PU	6,71390	7,54115	7,24671	7,57504	5,91684	8,10208	6,96186
LOG PR	6,57890	6,53681	6,38519	8,04827	6,00353	7,53667	6,90785

Variable	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12	Cluster13
LOG AA	5,54371	6,73623	5,43246	5,02297	3,17869	4,53551
LOG MA	5,86522	6,07421	3,43136	2,84510	4,11414	4,97104
LOG PU	7,60403	8,70262	7,15505	6,29405	5,75398	7,50524
LOG PR	7,20480	8,89582	7,68505	6,12339	5,40358	7,63422

Variable	Cluster14	Cluster15	Cluster16	Cluster17	Cluster18	Cluster19
LOG AA	4,87628	3,63165	4,71265	4,17973	6,25648	5,66541
LOG MA	2,68842	3,77181	2,96708	3,53689	6,38986	3,64689
LOG PU	5,90660	5,61363	6,03974	5,38046	8,48419	7,99831
LOG PR	6,53327	5,61218	5,36623	5,83202	8,88423	8,06216

Variable	Cluster20	Cluster21	Cluster22	Cluster23	Cluster24	Cluster25
LOG AA	3,73054	3,71012	6,31673	4,46835	4,28181	5,16615
LOG MA	4,38917	3,31597	4,69267	4,80945	5,31652	4,29691
LOG PU	6,79018	6,14008	6,93465	7,15473	7,58486	6,38890
LOG PR	5,75661	6,09760	6,81314	6,95595	6,97096	6,44942

Variable	Cluster26	Cluster27	Cluster28	Cluster29	Cluster30	Cluster31
LOG AA	4,14490	5,16501	5,61430	4,49815	5,87127	5,44347
LOG MA	3,05626	4,67456	3,01416	4,35976	4,33114	5,58056
LOG PU	6,02661	6,55664	6,55311	6,53718	7,78942	7,71504
LOG PR	6,66988	5,76997	6,90367	7,28193	7,87262	7,99321

Variable	Cluster32	Cluster33	Cluster34	Cluster35	Cluster36	Cluster37
LOG AA	5,05478	3,70131	6,13012	5,29574	5,51231	5,23573
LOG MA	4,78472	5,02878	4,43326	5,79393	4,69897	5,65422
LOG PU	7,70889	5,99854	7,17210	7,31680	6,34778	7,72964
LOG PR	7,50545	6,00146	7,35703	7,64357	6,40008	6,79330

Variable	Cluster38	Cluster39	Cluster40	Grand centroid
LOG AA	6,61706	4,97185	5,17831	4,98931
LOG MA	6,65198	5,19660	4,37840	4,49121
LOG PU	8,36956	7,32370	6,64371	6,85114
LOG PR	7,75960	7,78132	6,90671	6,74280

Distances Between Cluster Centroids

	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6
Cluster7						

Cluster1 1,75663	0,00000	1,85950	2,24037	2,12608	1,57797	2,73574
Cluster2 3,01250	1,85950	0,00000	0,63743	2,95519	2,70373	1,25903
Cluster3 3,32240	2,24037	0,63743	0,00000	3,36453	2,76860	1,50057
Cluster4 1,36672	2,12608	2,95519	3,36453	0,00000	2,70060	3,14585
Cluster5 1,63773	1,57797	2,70373	2,76860	2,70060	0,00000	3,72900
Cluster6 3,68735	2,73574	1,25903	1,50057	3,14585	3,72900	0,00000
Cluster7 0,00000	1,75663	3,01250	3,32240	1,36672	1,63773	3,68735
Cluster8 3,29609	1,97957	0,99811	1,46855	2,91619	3,22524	1,02649
Cluster9 4,63927	3,99407	2,78579	2,96009	3,71347	4,98398	1,54571
Cluster10 1,18288	1,66535	2,40668	2,72971	0,78890	2,08968	2,76357
Cluster11 1,04232	1,68834	3,06988	3,26511	2,33140	0,82784	4,01249
Cluster12 2,98401	2,22602	3,83927	4,14170	3,79807	2,50955	4,82611
Cluster13 2,48334	1,45954	1,96959	2,52458	1,92847	2,93312	2,12653
Cluster14 1,12309	1,89273	3,39637	3,58571	2,29912	1,08045	4,24784
Cluster15 2,53319	1,96487	3,65684	3,91820	3,45532	1,97021	4,66191
Cluster16 1,83328	1,99376	3,38951	3,55714	3,10457	1,10629	4,47412
Cluster17 2,22983	1,85453	3,51632	3,70613	3,23896	1,44316	4,52439
Cluster18 4,63920	3,81994	2,72174	2,95395	3,71506	4,94375	1,50780
Cluster19 1,94940	2,27864	2,40757	2,78804	0,97122	2,94311	2,37179
Cluster20 2,39329	1,33742	2,80525	3,21770	2,98978	2,22463	3,74367
Cluster21 1,81093	1,69704	3,50186	3,83529	2,72921	1,80854	4,40803
Cluster22 2,41249	1,59523	0,98976	1,01993	2,49184	2,01143	1,79384
Cluster23 2,17651	0,77793	1,83813	2,35920	2,09920	2,34752	2,43959
Cluster24 2,77600	1,41711	1,88559	2,46903	2,52351	2,98377	2,29313
Cluster25 1,77019	0,52879	1,85538	2,09366	2,31392	1,16198	2,82503
Cluster26 1,31395	1,63867	3,41537	3,71563	2,22752	1,55170	4,22137
Cluster27 2,32447	0,94992	1,72602	1,93306	2,93895	1,48942	2,88954
Cluster28 0,83191	1,65406	2,65211	2,82708	1,67416	1,17119	3,37577
Cluster29 1,81482	0,77958	2,29113	2,68920	1,83593	1,98957	2,87251
Cluster30 2,25978	2,00505	1,74324	2,11536	1,53036	2,83143	1,66086
Cluster31 3,20637	2,19997	1,62349	2,06547	2,49684	3,46122	1,14036
Cluster32 2,29656	1,43973	1,56937	2,12619	1,74336	2,75722	1,74043
Cluster33 2,96085	1,55342	2,93675	3,25837	3,43948	2,43299	3,82224
Cluster34 2,14906	1,62259	1,31753	1,53429	1,92371	2,21031	1,71791
Cluster35 3,21830	1,92649	1,45053	1,87304	2,72183	3,23341	1,34192

Cluster36 2,22213	0,88865	1,51366	1,65538	2,64080	1,43110	2,53597
Cluster37 3,06775	1,69212	0,96968	1,55647	2,83135	3,01533	1,42520
Cluster38 4,59053	3,54753	2,00295	2,11702	3,97909	4,57879	0,91101
Cluster39 2,67061	1,57880	1,71506	2,20463	2,09263	2,94475	1,74979
Cluster40 1,72294	0,51904	1,68937	2,01344	1,93973	1,55516	2,47233

	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12	Cluster13
Cluster1	1,97957	3,99407	1,66535	1,68834	2,22602	1,45954
Cluster2	0,99811	2,78579	2,40668	3,06988	3,83927	1,96959
Cluster3	1,46855	2,96009	2,72971	3,26511	4,14170	2,52458
Cluster4	2,91619	3,71347	0,78890	2,33140	3,79807	1,92847
Cluster5	3,22524	4,98398	2,08968	0,82784	2,50955	2,93312
Cluster6	1,02649	1,54571	2,76357	4,01249	4,82611	2,12653
Cluster7	3,29609	4,63927	1,18288	1,04232	2,98401	2,48334
Cluster8	0,00000	2,35207	2,52354	3,50397	3,91493	1,41781
Cluster9	2,35207	0,00000	3,54195	5,18170	6,11459	3,01422
Cluster10	2,52354	3,54195	0,00000	1,92133	3,56564	1,81669
Cluster11	3,50397	5,18170	1,92133	0,00000	2,41281	2,91665
Cluster12	3,91493	6,11459	3,56564	2,41281	0,00000	3,25851
Cluster13	1,41781	3,01422	1,81669	2,91665	3,25851	0,00000
Cluster14	3,72421	5,32187	1,93559	0,60348	2,49279	3,01566
Cluster15	3,81268	5,93832	3,16727	1,87587	0,62095	3,14991
Cluster16	3,86228	5,77045	2,71193	0,86554	1,93697	3,36730
Cluster17	3,75637	5,77904	2,85716	1,45230	1,28778	3,15372
Cluster18	2,09248	0,61452	3,55476	5,14838	5,84984	2,73782
Cluster19	2,41377	2,86872	0,97674	2,77830	4,30200	1,85912
Cluster20	2,86809	5,03841	2,76874	2,10599	1,25639	2,24126
Cluster21	3,63727	5,58228	2,55538	1,40345	1,24508	2,76503
Cluster22	1,60433	3,08996	1,78371	2,44407	3,68278	2,06154
Cluster23	1,59212	3,59193	1,83309	2,36647	2,55316	0,78328
Cluster24	1,39590	3,39894	2,36061	3,00696	2,91056	0,79370
Cluster25	2,15622	4,11851	1,71285	1,49785	2,34101	1,87139
Cluster26	3,55265	5,28572	2,02546	1,08893	1,93145	2,63349
Cluster27	2,17183	4,33635	2,37543	1,88705	2,24456	2,20441
Cluster28	3,05428	4,38311	1,08628	1,02674	3,16719	2,53642
Cluster29	2,12220	3,90412	1,50968	1,99273	2,43780	1,19846
Cluster30	1,71494	2,38061	1,19990	2,86773	4,18763	1,52687
Cluster31	0,85147	1,92482	2,24226	3,62974	4,22274	1,16996
Cluster32	1,22797	2,72226	1,52093	2,77038	3,49412	0,60201
Cluster33	2,84951	5,09834	3,11779	2,57244	1,23570	2,37387
Cluster34	1,61373	2,78755	1,26428	2,45782	3,82620	1,73776
Cluster35	0,58446	2,37533	2,37240	3,48238	3,84234	1,13608
Cluster36	1,89390	3,89400	1,97890	1,93797	2,67084	1,97255
Cluster37	0,56963	2,79199	2,47087	3,23205	3,52672	1,30940
Cluster38	1,63245	1,32286	3,64091	4,90085	5,53670	2,81446
Cluster39	1,08859	2,65081	1,83465	3,05632	3,53621	0,54393
Cluster40	1,83173	3,67404	1,35232	1,76380	2,66821	1,42686

	Cluster14	Cluster15	Cluster16	Cluster17	Cluster18	Cluster19
Cluster1	1,89273	1,96487	1,99376	1,85453	3,81994	2,27864
Cluster2	3,39637	3,65684	3,38951	3,51632	2,72174	2,40757
Cluster3	3,58571	3,91820	3,55714	3,70613	2,95395	2,78804
Cluster4	2,29912	3,45532	3,10457	3,23896	3,71506	0,97122
Cluster5	1,08045	1,97021	1,10629	1,44316	4,94375	2,94311
Cluster6	4,24784	4,66191	4,47412	4,52439	1,50780	2,37179
Cluster7	1,12309	2,53319	1,83328	2,22983	4,63920	1,94940
Cluster8	3,72421	3,81268	3,86228	3,75637	2,09248	2,41377
Cluster9	5,32187	5,93832	5,77045	5,77904	0,61452	2,86872
Cluster10	1,93559	3,16727	2,71193	2,85716	3,55476	0,97674
Cluster11	0,60348	1,87587	0,86554	1,45230	5,14838	2,77830
Cluster12	2,49279	0,62095	1,93697	1,28778	5,84984	4,30200
Cluster13	3,01566	3,14991	3,36730	3,15372	2,73782	1,85912
Cluster14	0,00000	1,91235	1,21826	1,40487	5,27035	2,87300
Cluster15	1,91235	0,00000	1,43465	0,67696	5,71755	3,98007
Cluster16	1,21826	1,43465	0,00000	1,12263	5,69654	3,53185

Cluster17	1,40487	0,67696	1,12263	0,00000	5,60370	3,74780
Cluster18	5,27035	5,71755	5,69654	5,60370	0,00000	2,96396
Cluster19	2,87300	3,98007	3,53185	3,74780	2,96396	0,00000
Cluster20	2,36414	1,34017	1,92417	1,70913	4,79946	3,32714
Cluster21	1,41353	0,85249	1,29297	0,95755	5,40305	3,35339
Cluster22	2,68833	3,35337	2,90606	3,04643	3,09428	2,05165
Cluster23	2,53015	2,44080	2,68783	2,47264	3,34378	2,17251
Cluster24	3,20444	2,92248	3,26620	3,05517	3,08558	2,46245
Cluster25	1,70614	1,98304	1,80813	1,71720	3,98595	2,42135
Cluster26	0,83862	1,43691	1,42477	1,16264	5,14925	2,91322
Cluster27	2,24350	2,01999	1,88423	1,91110	4,18899	2,93922
Cluster28	1,09816	2,65623	1,85539	2,20336	4,41128	1,95797
Cluster29	1,97344	2,17658	2,42959	2,05396	3,68392	2,14810
Cluster30	3,00456	3,89518	3,54209	3,66869	2,42750	0,76821
Cluster31	3,75341	4,07916	4,13184	3,98681	1,64361	1,96808
Cluster32	2,93594	3,32053	3,28378	3,24727	2,55395	1,43570
Cluster33	2,67378	1,37278	2,38299	1,69273	4,78229	3,47338
Cluster34	2,62615	3,48615	3,06667	3,18483	2,81037	1,41920
Cluster35	3,61131	3,72633	3,89207	3,65661	2,04455	2,32079
Cluster36	2,15852	2,35718	2,19149	2,09394	3,76140	2,57236
Cluster37	3,50945	3,46253	3,51946	3,47000	2,55430	2,42821
Cluster38	5,12934	5,42353	5,32555	5,31927	1,21519	3,18835
Cluster39	3,14100	3,38462	3,53824	3,31029	2,37430	1,84841
Cluster40	1,90526	2,34457	2,22408	2,11094	3,53644	1,98554

	Cluster20	Cluster21	Cluster22	Cluster23	Cluster24	Cluster25
Cluster1	1,33742	1,69704	1,59523	0,77793	1,41711	0,52879
Cluster2	2,80525	3,50186	0,98976	1,83813	1,88559	1,85538
Cluster3	3,21770	3,83529	1,01993	2,35920	2,46903	2,09366
Cluster4	2,98978	2,72921	2,49184	2,09920	2,52351	2,31392
Cluster5	2,22463	1,80854	2,01143	2,34752	2,98377	1,16198
Cluster6	3,74367	4,40803	1,79384	2,43959	2,29313	2,82503
Cluster7	2,39329	1,81093	2,41249	2,17651	2,77600	1,77019
Cluster8	2,86809	3,63727	1,60433	1,59212	1,39590	2,15622
Cluster9	5,03841	5,58228	3,08996	3,59193	3,39894	4,11851
Cluster10	2,76874	2,55538	1,78371	1,83309	2,36061	1,71285
Cluster11	2,10599	1,40345	2,44407	2,36647	3,00696	1,49785
Cluster12	1,25639	1,24508	3,68278	2,55316	2,91056	2,34101
Cluster13	2,24126	2,76503	2,06154	0,78328	0,79370	1,87139
Cluster14	2,36414	1,41353	2,68833	2,53015	3,20444	1,70614
Cluster15	1,34017	0,85249	3,35337	2,44080	2,92248	1,98304
Cluster16	1,92417	1,29297	2,90606	2,68783	3,26620	1,80813
Cluster17	1,70913	0,95755	3,04643	2,47264	3,05517	1,71720
Cluster18	4,79946	5,40305	3,09428	3,34378	3,08558	3,98595
Cluster19	3,32714	3,35339	2,05165	2,17251	2,46245	2,42135
Cluster20	0,00000	1,30041	2,81383	1,51404	1,80833	1,64636
Cluster21	1,30041	0,00000	3,13577	2,13815	2,67940	1,80775
Cluster22	2,81383	3,13577	0,00000	1,87056	2,23109	1,38224
Cluster23	1,51404	2,13815	1,87056	0,00000	0,69076	1,26202
Cluster24	1,80833	2,67940	2,23109	0,69076	0,00000	1,87723
Cluster25	1,64636	1,80775	1,38224	1,26202	1,87723	0,00000
Cluster26	1,83451	0,77257	2,87050	2,12903	2,76520	1,66194
Cluster27	1,48118	2,05994	1,59934	1,50592	1,92140	0,79524
Cluster28	2,60982	2,13011	1,86134	2,21381	2,85402	1,44208
Cluster29	1,72646	1,80854	1,94828	0,83110	1,46851	1,07946
Cluster30	3,17208	3,40179	1,47724	1,85474	2,08619	2,11785
Cluster31	3,19551	3,76918	1,88481	1,71328	1,57516	2,42211
Cluster32	2,41092	2,89975	1,63699	0,97650	1,08690	1,76294
Cluster33	1,04719	1,72136	2,91351	1,69832	1,96879	1,74197
Cluster34	2,90984	3,12346	0,67403	1,75048	2,12505	1,54434
Cluster35	2,87422	3,52550	1,75808	1,46727	1,33426	2,13186
Cluster36	1,96988	2,30113	1,07804	1,43604	1,93695	0,53441
Cluster37	2,41314	3,28719	1,65092	1,28821	1,03756	1,93984
Cluster38	4,46752	5,22610	2,62370	3,18332	2,91111	3,64569
Cluster39	2,56454	3,06016	1,77521	1,05507	1,10246	1,86949
Cluster40	1,85482	2,04760	1,21990	0,97644	1,60427	0,52993

	Cluster26	Cluster27	Cluster28	Cluster29	Cluster30	Cluster31
Cluster1	1,63867	0,94992	1,65406	0,77958	2,00505	2,19997
Cluster2	3,41537	1,72602	2,65211	2,29113	1,74324	1,62349

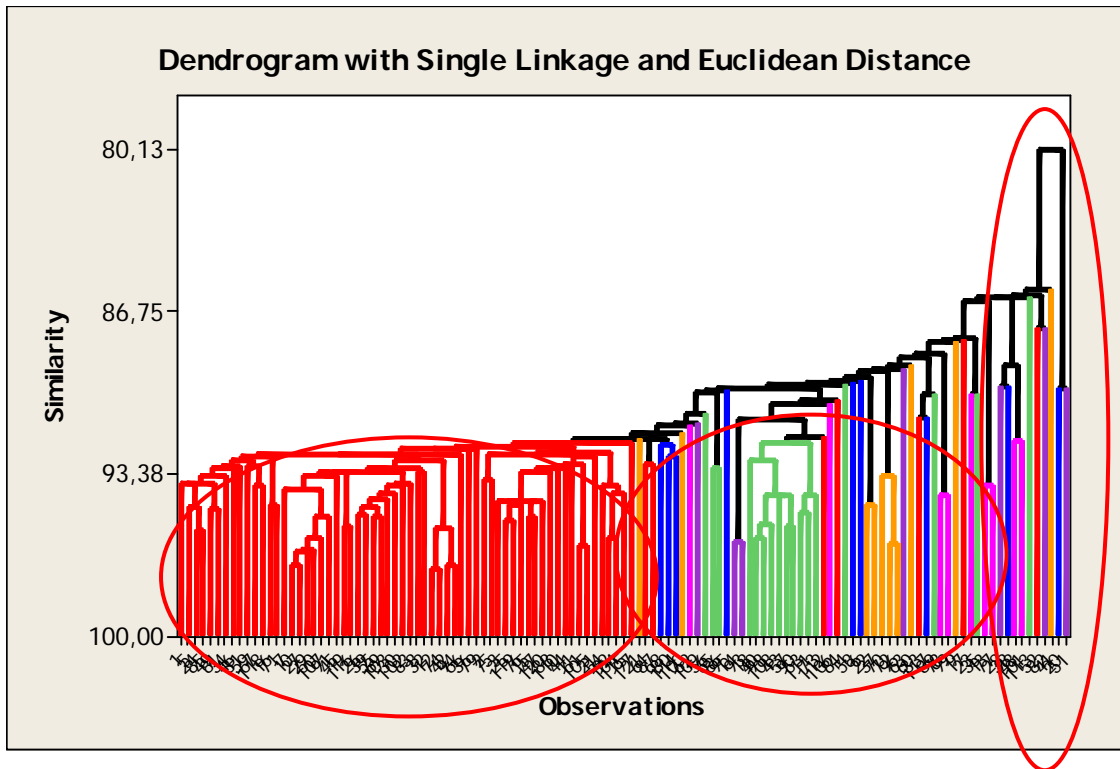
Cluster3	3,71563	1,93306	2,82708	2,68920	2,11536	2,06547
Cluster4	2,22752	2,93895	1,67416	1,83593	1,53036	2,49684
Cluster5	1,55170	1,48942	1,17119	1,98957	2,83143	3,46122
Cluster6	4,22137	2,88954	3,37577	2,87251	1,66086	1,14036
Cluster7	1,31395	2,32447	0,83191	1,81482	2,25978	3,20637
Cluster8	3,55265	2,17183	3,05428	2,12220	1,71494	0,85147
Cluster9	5,28572	4,33635	4,38311	3,90412	2,38061	1,92482
Cluster10	2,02546	2,37543	1,08628	1,50968	1,19990	2,24226
Cluster11	1,08893	1,88705	1,02674	1,99273	2,86773	3,62974
Cluster12	1,93145	2,24456	3,16719	2,43780	4,18763	4,22274
Cluster13	2,63349	2,20441	2,53642	1,19846	1,52687	1,16996
Cluster14	0,83862	2,24350	1,09816	1,97344	3,00456	3,75341
Cluster15	1,43691	2,01999	2,65623	2,17658	3,89518	4,07916
Cluster16	1,42477	1,88423	1,85539	2,42959	3,54209	4,13184
Cluster17	1,16264	1,91110	2,20336	2,05396	3,66869	3,98681
Cluster18	5,14925	4,18899	4,41128	3,68392	2,42750	1,64361
Cluster19	2,91322	2,93922	1,95797	2,14810	0,76821	1,96808
Cluster20	1,83451	1,48118	2,60982	1,72646	3,17208	3,19551
Cluster21	0,77257	2,05994	2,13011	1,80854	3,40179	3,76918
Cluster22	2,87050	1,59934	1,86134	1,94828	1,47724	1,88481
Cluster23	2,12903	1,50592	2,21381	0,83110	1,85474	1,71328
Cluster24	2,76520	1,92140	2,85402	1,46851	2,08619	1,57516
Cluster25	1,66194	0,79524	1,44208	1,07946	2,11785	2,42211
Cluster26	0,00000	2,17952	1,57886	1,56818	3,02651	3,55815
Cluster27	2,17952	0,00000	2,06012	1,68232	2,56078	2,68013
Cluster28	1,57886	2,06012	0,00000	1,78879	2,06586	3,02536
Cluster29	1,56818	1,68232	1,78879	0,00000	1,95020	2,06815
Cluster30	3,02651	2,56078	2,06586	1,95020	0,00000	1,32821
Cluster31	3,55815	2,68013	3,02536	2,06815	1,32821	0,00000
Cluster32	2,70993	2,08898	2,26846	1,38322	1,00683	1,01113
Cluster33	2,12959	1,62264	2,97318	1,73559	3,45021	3,20204
Cluster34	2,76072	1,97160	1,69369	1,75428	0,85108	1,57712
Cluster35	3,38111	2,31480	2,99320	1,85245	1,65735	0,59008
Cluster36	2,17813	0,74958	1,77335	1,39896	2,12387	2,27803
Cluster37	3,29467	1,84061	2,91713	1,96986	1,82290	1,22008
Cluster38	5,07126	3,64196	4,27450	3,65100	2,50835	1,73442
Cluster39	2,86053	2,22345	2,55732	1,33892	1,33537	0,75359
Cluster40	1,80358	1,17798	1,43508	0,78429	1,65168	1,96055

	Cluster32	Cluster33	Cluster34	Cluster35	Cluster36	Cluster37
Cluster1	1,43973	1,55342	1,62259	1,92649	0,88865	1,69212
Cluster2	1,56937	2,93675	1,31753	1,45053	1,51366	0,96968
Cluster3	2,12619	3,25837	1,53429	1,87304	1,65538	1,55647
Cluster4	1,74336	3,43948	1,92371	2,72183	2,64080	2,83135
Cluster5	2,75722	2,43299	2,21031	3,23341	1,43110	3,01533
Cluster6	1,74043	3,82224	1,71791	1,34192	2,53597	1,42520
Cluster7	2,29656	2,96085	2,14906	3,21830	2,22213	3,06775
Cluster8	1,22797	2,84951	1,61373	0,58446	1,89390	0,56963
Cluster9	2,72226	5,09834	2,78755	2,37533	3,89400	2,79199
Cluster10	1,52093	3,11779	1,26428	2,37240	1,97890	2,47087
Cluster11	2,77038	2,57244	2,45782	3,48238	1,93797	3,23205
Cluster12	3,49412	1,23570	3,82620	3,84234	2,67084	3,52672
Cluster13	0,60201	2,37387	1,73776	1,13608	1,97255	1,30940
Cluster14	2,93594	2,67378	2,62615	3,61131	2,15852	3,50945
Cluster15	3,32053	1,37278	3,48615	3,72633	2,35718	3,46253
Cluster16	3,28378	2,38299	3,06667	3,89207	2,19149	3,51946
Cluster17	3,24727	1,69273	3,18483	3,65661	2,09394	3,47000
Cluster18	2,55395	4,78229	2,81037	2,04455	3,76140	2,55430
Cluster19	1,43570	3,74338	1,41920	2,32079	2,57236	2,42821
Cluster20	2,41092	1,04719	2,90984	2,87422	1,96988	2,41314
Cluster21	2,89975	1,72136	3,12346	3,52550	2,30113	3,28719
Cluster22	1,63699	2,91351	0,67403	1,75808	1,07804	1,65092
Cluster23	0,97650	1,69832	1,75048	1,46727	1,43604	1,28821
Cluster24	1,08690	1,96879	2,12505	1,33426	1,93695	1,03756
Cluster25	1,76294	1,74197	1,54434	2,13186	0,53441	1,93984
Cluster26	2,70993	2,12959	2,76072	3,38111	2,17813	3,29467
Cluster27	2,08898	1,62264	1,97160	2,31480	0,74958	1,84061
Cluster28	2,26846	2,97318	1,69369	2,99320	1,77335	2,91713
Cluster29	1,38322	1,73559	1,75428	1,85245	1,39896	1,96986
Cluster30	1,00683	3,45021	0,85108	1,65735	2,12387	1,82290

Cluster31	1,01113	3,20204	1,57712	0,59008	2,27803	1,22008
Cluster32	0,00000	2,66059	1,26097	1,11775	1,81415	1,13858
Cluster33	2,66059	0,00000	3,07711	2,74991	1,91556	2,52375
Cluster34	1,26097	3,07711	0,00000	1,62808	1,43093	1,70861
Cluster35	1,11775	2,74991	1,62808	0,00000	1,93160	0,95735
Cluster36	1,81415	1,91556	1,43093	1,93160	0,00000	1,74733
Cluster37	1,13858	2,52375	1,70861	0,95735	1,74733	0,00000
Cluster38	2,53544	4,45524	2,59919	1,89839	3,31219	2,06078
Cluster39	0,63324	2,56250	1,45853	0,69334	1,84390	1,19164
Cluster40	1,29363	1,95966	1,17938	1,73595	0,74737	1,68022

	Cluster38	Cluster39	Cluster40
Cluster1	3,54753	1,57880	0,51904
Cluster2	2,00295	1,71506	1,68937
Cluster3	2,11702	2,20463	2,01344
Cluster4	3,97909	2,09263	1,93973
Cluster5	4,57879	2,94475	1,55516
Cluster6	0,91101	1,74979	2,47233
Cluster7	4,59053	2,67061	1,72294
Cluster8	1,63245	1,08859	1,83173
Cluster9	1,32286	2,65081	3,67404
Cluster10	3,64091	1,83465	1,35232
Cluster11	4,90085	3,05632	1,76380
Cluster12	5,53670	3,53621	2,66821
Cluster13	2,81446	0,54393	1,42686
Cluster14	5,12934	3,14100	1,90526
Cluster15	5,42353	3,38462	2,34457
Cluster16	5,32555	3,53824	2,22408
Cluster17	5,31927	3,31029	2,11094
Cluster18	1,21519	2,37430	3,53644
Cluster19	3,18835	1,84841	1,98554
Cluster20	4,46752	2,56454	1,85482
Cluster21	5,22610	3,06016	2,04760
Cluster22	2,62370	1,77521	1,21990
Cluster23	3,18332	1,05507	0,97644
Cluster24	2,91111	1,10246	1,60427
Cluster25	3,64569	1,86949	0,52993
Cluster26	5,07126	2,86053	1,80358
Cluster27	3,64196	2,22345	1,17798
Cluster28	4,27450	2,55732	1,43508
Cluster29	3,65100	1,33892	0,78429
Cluster30	2,50835	1,33537	1,65168
Cluster31	1,73442	0,75359	1,96055
Cluster32	2,53544	0,63324	1,29363
Cluster33	4,45524	2,56250	1,95966
Cluster34	2,59919	1,45853	1,17938
Cluster35	1,89839	0,69334	1,73595
Cluster36	3,31219	1,84390	0,74737
Cluster37	2,06078	1,19164	1,68022
Cluster38	0,00000	2,43293	3,30835
Cluster39	2,43293	0,00000	1,39263
Cluster40	3,30835	1,39263	0,00000

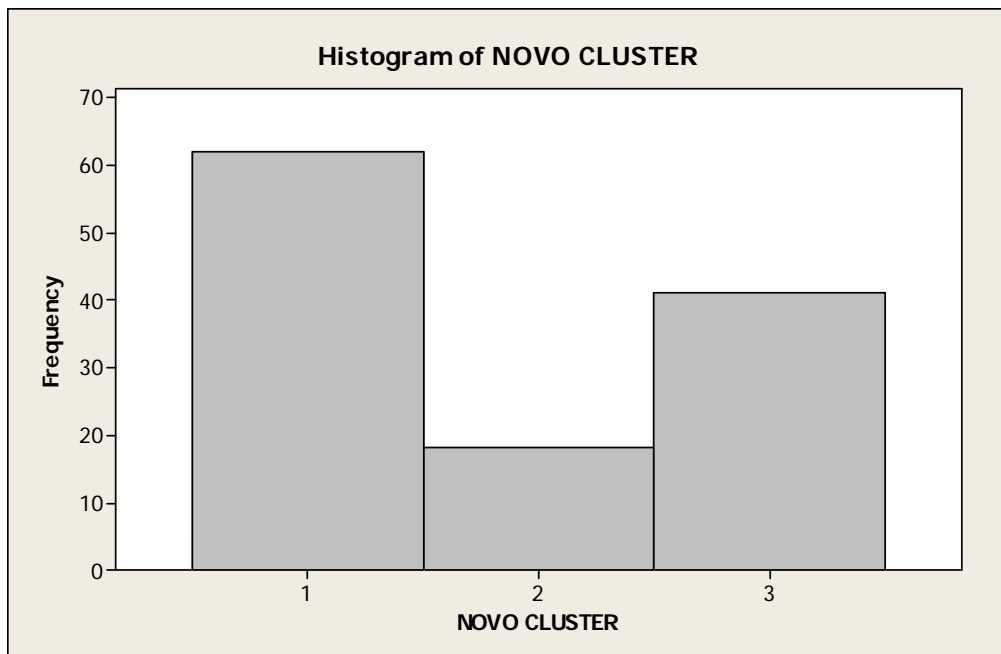
### 8.1.1 Dendograma



Foi necessário gerar um número de clusters igual a 40 para que se conseguisse uma boa distribuição, notamos que mesmo assim ainda não temos uma distribuição adequada da população.

Observamos claramente a existência de 1 grande grupo nitidamente separado dos demais.

### 8.1.2 Histograma



Podemos observar uma boa distribuição entre os diversos clusters.

### 8.2 Análise de conglomerados para 60 indivíduos

Cluster Analysis of Observations: LOGAA60; LOGMA60; LOGPU60; LOGPR60

Euclidean Distance, Single Linkage  
Amalgamation Steps

Step	Number of clusters	Similarity level	Distance level	Clusters joined		New cluster	Number of obs. in new cluster
1	59	96,6054	0,17477	40	51	40	2
2	58	95,6012	0,22647	30	59	30	2
3	57	95,4727	0,23308	9	40	9	3
4	56	95,2567	0,24420	4	14	4	2
5	55	94,4345	0,28653	32	44	32	2
6	54	94,2884	0,29405	3	54	3	2
7	53	94,2015	0,29853	8	50	8	2
8	52	94,0166	0,30805	6	7	6	2
9	51	93,7457	0,32200	8	47	8	3
10	50	93,6781	0,32548	32	36	32	3
11	49	93,3329	0,34325	8	20	8	4
12	48	93,1680	0,35174	18	52	18	2
13	47	93,1651	0,35189	6	45	6	3
14	46	92,9438	0,36328	17	28	17	2
15	45	92,9077	0,36514	22	37	22	2
16	44	92,7175	0,37493	15	58	15	2
17	43	92,6946	0,37611	4	5	4	3
18	42	92,6751	0,37711	10	49	10	2
19	41	92,4195	0,39028	27	46	27	2
20	40	92,2242	0,40033	2	30	2	3
21	39	92,2233	0,40037	9	13	9	4
22	38	92,0180	0,41094	8	16	8	5
23	37	91,9274	0,41561	3	56	3	3
24	36	91,9150	0,41625	1	55	1	2
25	35	91,8823	0,41793	32	43	32	4
26	34	91,7740	0,42351	15	21	15	3
27	33	91,7228	0,42614	17	57	17	3
28	32	91,4971	0,43776	17	38	17	4
29	31	91,4777	0,43876	3	32	3	7
30	30	90,7347	0,47701	10	22	10	4
31	29	90,7000	0,47880	6	17	6	7
32	28	90,6591	0,48090	27	34	27	3
33	27	90,2622	0,50134	8	9	8	9
34	26	90,1815	0,50550	26	27	26	4
35	25	89,8180	0,52421	10	15	10	7
36	24	89,7667	0,52685	4	24	4	4
37	23	89,7470	0,52786	4	8	4	13
38	22	89,6095	0,53494	4	10	4	20
39	21	89,5212	0,53949	1	60	1	3
40	20	89,4349	0,54393	12	42	12	2
41	19	89,3128	0,55022	1	3	1	10
42	18	89,1093	0,56070	4	26	4	24
43	17	88,9465	0,56908	1	29	1	11
44	16	88,7014	0,58169	33	53	33	2
45	15	88,3069	0,60201	12	41	12	3
46	14	88,2864	0,60306	1	33	1	13
47	13	88,0192	0,61682	4	6	4	31
48	12	87,1145	0,66339	4	19	4	32
49	11	86,9359	0,67259	1	4	1	45
50	10	86,9079	0,67403	1	48	1	46
51	9	86,1984	0,71056	1	12	1	49
52	8	85,9462	0,72354	1	2	1	52
53	7	85,6834	0,73707	1	35	1	53
54	6	84,6819	0,78864	1	18	1	55
55	5	83,4690	0,85108	1	23	1	56
56	4	82,4416	0,90397	1	39	1	57
57	3	80,2050	1,01912	1	11	1	58
58	2	75,8515	1,24326	1	31	1	59
59	1	63,4057	1,88402	1	25	1	60

Final Partition



Number of clusters: 12

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	13	4,1355	0,53801	0,91446
Cluster2	3	0,1523	0,21682	0,29058
Cluster3	32	42,0706	1,03729	1,95165
Cluster4	1	0,0000	0,00000	0,00000
Cluster5	3	0,3531	0,34243	0,36983
Cluster6	2	0,0619	0,17587	0,17587
Cluster7	1	0,0000	0,00000	0,00000
Cluster8	1	0,0000	0,00000	0,00000
Cluster9	1	0,0000	0,00000	0,00000
Cluster10	1	0,0000	0,00000	0,00000
Cluster11	1	0,0000	0,00000	0,00000
Cluster12	1	0,0000	0,00000	0,00000

Cluster Centroids

Variable	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
LOGAA60	5,08181	5,61430	4,93190	5,17092	4,85404	4,49815	5,87127
LOGMA60	3,77535	3,01416	4,94430	4,55907	4,98412	4,35976	4,33114
LOGPU60	6,69985	6,55311	6,96685	6,48237	7,51261	6,53718	7,78942
LOGPR60	6,84612	6,90367	6,66154	5,43535	7,64033	7,28193	7,87262

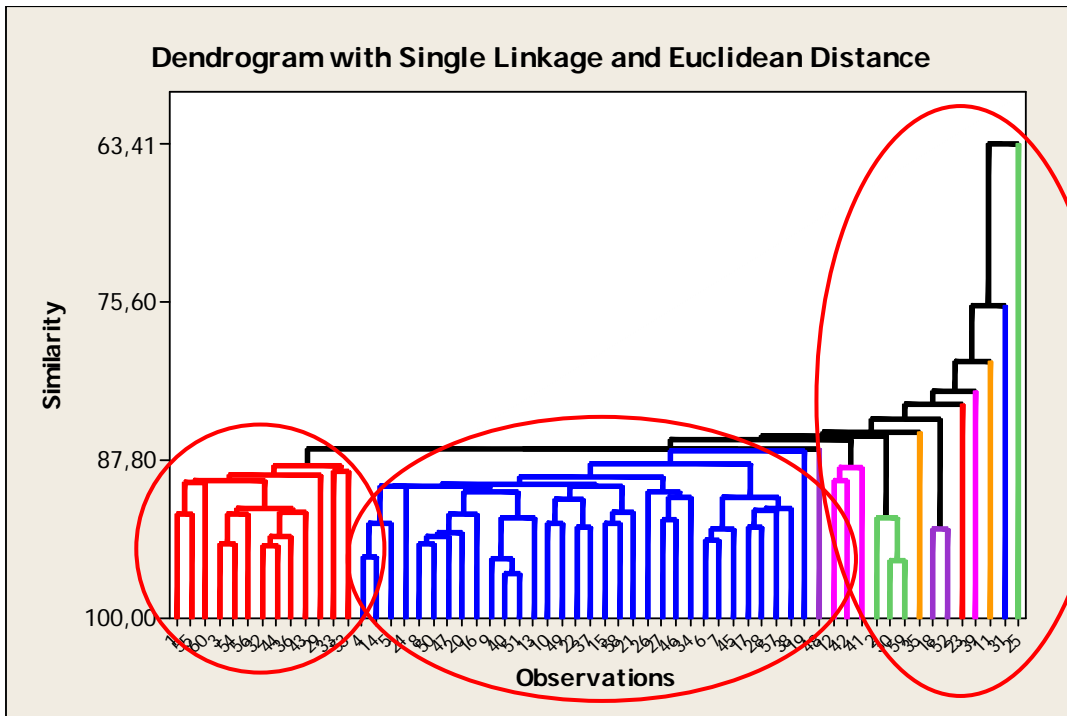
Variable	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12	Grand centroid
LOGAA60	6,25648	4,95596	4,96190	5,02297	6,31673	5,04737
LOGMA60	6,38986	3,13640	2,69897	2,84510	4,69267	4,47775
LOGPU60	8,48419	7,57504	6,96186	6,29405	6,93465	6,93051
LOGPR60	8,88423	8,04827	6,90785	6,12339	6,81314	6,84083

Distances Between Cluster Centroids

	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6
Cluster7						
Cluster1	0,00000	0,94224	1,22240	1,63086	1,67462	0,94794
1,78129						
Cluster2	0,94224	0,00000	2,10260	2,17814	2,43353	1,78879
2,06586						
Cluster3	1,22240	2,10260	0,00000	1,39420	1,12406	1,04849
1,84437						
Cluster4	1,63086	2,17814	1,39420	0,00000	2,49086	1,97615
2,86200						
Cluster5	1,67462	2,43353	1,12406	2,49086	0,00000	1,26349
1,26163						
Cluster6	0,94794	1,78879	1,04849	1,97615	1,26349	0,00000
1,95020						
Cluster7	1,78129	2,06586	1,84437	2,86200	1,26163	1,95020
0,00000						
Cluster8	3,94376	4,41128	3,32969	4,52021	2,53657	3,68392
2,42750						
Cluster9	1,62333	1,67416	2,35839	3,17670	1,89599	1,83593
1,53036						
Cluster10	1,11599	0,83191	2,25901	2,42936	2,46443	1,81482
2,25978						
Cluster11	1,24734	1,02674	2,27095	1,86238	2,89654	1,99273
2,86773						
Cluster12	1,55651	1,86134	1,41601	1,85300	1,80074	1,94828
1,47724						
	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12	
Cluster1	3,94376	1,62333	1,11599	1,24734	1,55651	
Cluster2	4,41128	1,67416	0,83191	1,02674	1,86134	

Cluster3	3,32969	2,35839	2,25901	2,27095	1,41601
Cluster4	4,52021	3,17670	2,42936	1,86238	1,85300
Cluster5	2,53657	1,89599	2,46443	2,89654	1,80074
Cluster6	3,68392	1,83593	1,81482	1,99273	1,94828
Cluster7	2,42750	1,53036	2,25978	2,86773	1,47724
Cluster8	0,00000	3,71506	4,63920	5,14838	3,09428
Cluster9	3,71506	0,00000	1,36672	2,33140	2,49184
Cluster10	4,63920	1,36672	0,00000	1,04232	2,41249
Cluster11	5,14838	2,33140	1,04232	0,00000	2,44407
Cluster12	3,09428	2,49184	2,41249	2,44407	0,00000

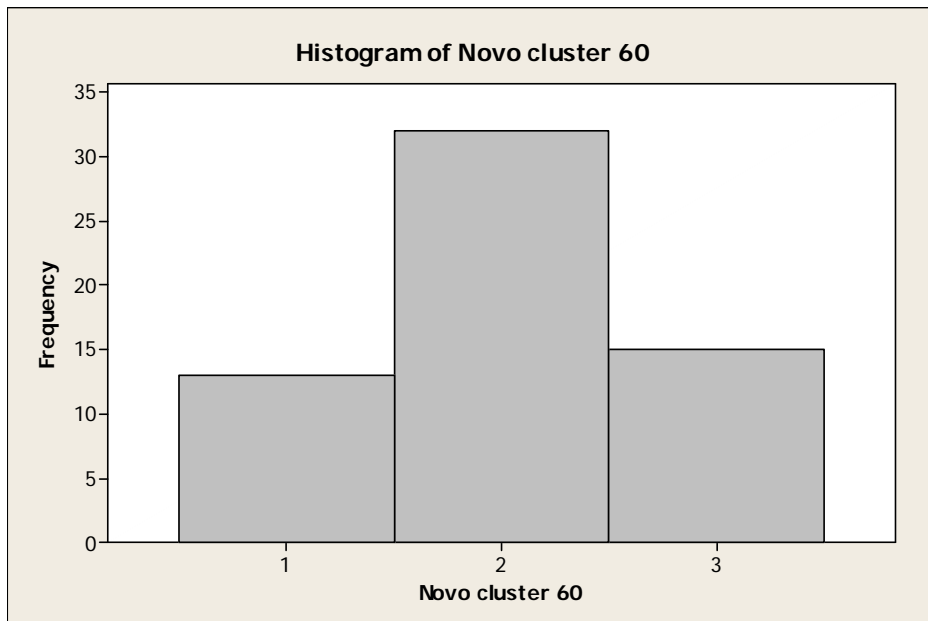
### 8.2.1 Dendograma para 60



Podemos notar que o número de cluster igual a 12 distribui de forma adequada a amostra de 60 indivíduos.

Observamos claramente a existência de 2 grupos nitidamente separado dos demais.

### 8.2.2 Histograma para 60



Podemos notar claramente nesse dendograma que a maioria absoluta dos países estão concentrados em um único cluster.

### 8.3 Análise de conglomerados para 30 indivíduos

## Cluster Analysis of Observations: LOGAA30; LOGMA30; LOGPU30; LOGPR30

Euclidean Distance, Single Linkage  
Amalgamation Steps

Step	Number of clusters	Similarity level	Distance level	Clusters joined	New cluster	Number of obs. in new cluster
1	29	95,2051	0,24420	4 14	4	2
2	28	93,9515	0,30805	6 7	6	2
3	27	92,8670	0,36328	17 28	17	2
4	26	92,6150	0,37611	4 5	4	3
5	25	92,1387	0,40037	9 13	9	2
6	24	91,9311	0,41094	16 20	16	2
7	23	91,6844	0,42351	15 21	15	2
8	22	90,5988	0,47880	6 17	6	4
9	21	90,2742	0,49533	2 30	2	2
10	20	90,1562	0,50134	9 16	9	4
11	19	89,7815	0,52042	8 9	8	5
12	18	89,6553	0,52685	4 24	4	4
13	17	89,6354	0,52786	4 8	4	9
14	16	89,5131	0,53409	10 15	10	3
15	15	88,9440	0,56308	4 27	4	10
16	14	87,0870	0,65765	1 3	1	2
17	13	86,9545	0,66440	10 22	10	4
18	12	86,8740	0,66850	1 29	1	3
19	11	86,7937	0,67259	1 10	1	7
20	10	85,9594	0,71508	4 26	4	11
21	9	85,8188	0,72224	4 19	4	12
22	8	85,4607	0,74048	4 6	4	16
23	7	85,4519	0,74092	1 4	1	23
24	6	84,6203	0,78328	1 12	1	24
25	5	83,3767	0,84661	1 18	1	25
26	4	83,2891	0,85108	1 23	1	26
27	3	83,2536	0,85288	1 2	1	28
28	2	79,2567	1,05644	1 11	1	29
29	1	59,7083	2,05203	1 25	1	30

Final Partition

Number of clusters: 10

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	7	2,87576	0,609015	0,87415
Cluster2	2	0,12268	0,247666	0,24767
Cluster3	11	6,30799	0,676443	1,47311
Cluster4	4	0,61265	0,372545	0,49380
Cluster5	1	0,00000	0,000000	0,00000
Cluster6	1	0,00000	0,000000	0,00000
Cluster7	1	0,00000	0,000000	0,00000
Cluster8	1	0,00000	0,000000	0,00000
Cluster9	1	0,00000	0,000000	0,00000
Cluster10	1	0,00000	0,000000	0,00000

Cluster Centroids

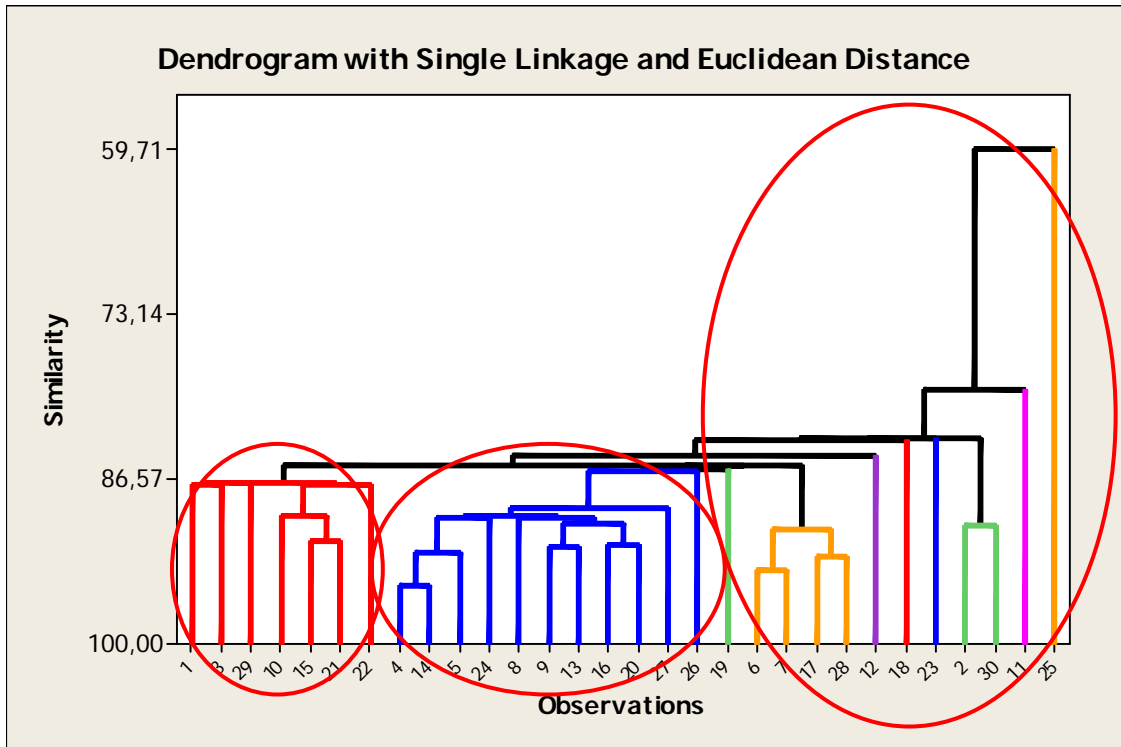
Variable	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
LOGAA30	4,38503	5,62598	4,93000	5,52189	5,17092	4,53551	4,37238
LOGMA30	3,93117	2,94555	4,97025	5,77256	4,55907	4,97104	4,28024

LOGPU30	6,51790	6,56281	6,95301	7,51072	6,48237	7,50524	6,47248
LOGPR30	6,34593	6,90310	6,72982	7,17858	5,43535	7,63422	7,21409
Variable	Cluster8	Cluster9	Cluster10	Grand centroid			
LOGAA30	5,33055	5,87127	6,25648	4,99340			
LOGMA30	4,69020	4,33114	6,38986	4,67979			
LOGPU30	7,37458	7,78942	8,48419	6,97951			
LOGPR30	6,34402	7,87262	8,88423	6,81182			

Distances Between Cluster Centroids

	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6
Cluster7						
Cluster1	0,00000	1,68043	1,30896	2,52234	1,35731	1,93352
0,93690						
Cluster2	1,68043	0,00000	2,18313	2,99620	2,22963	2,59122
1,85951						
Cluster3	1,30896	2,18313	0,00000	1,22738	1,45748	1,13071
1,11915						
Cluster4	2,52234	2,99620	1,22738	0,00000	2,38581	1,35019
2,15119						
Cluster5	1,35731	2,22963	1,45748	2,38581	0,00000	2,54061
1,96963						
Cluster6	1,93352	2,59122	1,13071	1,35019	2,54061	0,00000
1,32171						
Cluster7	0,93690	1,85951	1,11915	2,15119	1,96963	1,32171
0,00000						
Cluster8	1,48460	2,02549	0,75196	1,38677	1,29011	1,54682
1,63003						
Cluster9	2,51325	2,10347	1,81659	1,66105	2,86200	1,52687
2,10173						
Cluster10	4,45610	4,45840	3,28038	2,18577	4,52021	2,73782
3,85184						
	Cluster8	Cluster9	Cluster10			
Cluster1	1,48460	2,51325	4,45610			
Cluster2	2,02549	2,10347	4,45840			
Cluster3	0,75196	1,81659	3,28038			
Cluster4	1,38677	1,66105	2,18577			
Cluster5	1,29011	2,86200	4,52021			
Cluster6	1,54682	1,52687	2,73782			
Cluster7	1,63003	2,10173	3,85184			
Cluster8	0,00000	1,71172	3,38085			
Cluster9	1,71172	0,00000	2,42750			
Cluster10	3,38085	2,42750	0,00000			

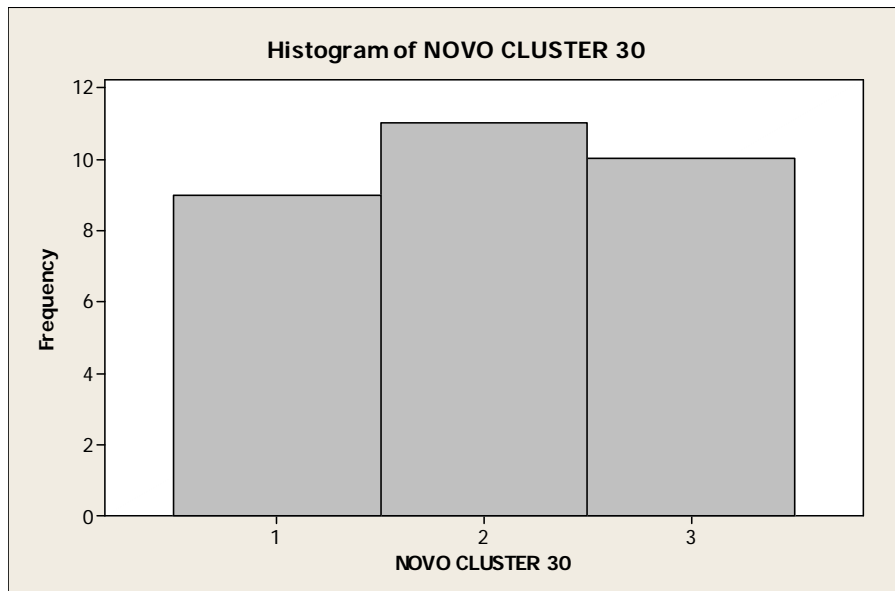
**8.3.1 Dendograma**



Podemos notar que o número de cluster igual a 10 distribui de forma adequada a amostra de 60 indivíduos.

Observamos claramente a existência de 2 grupos nitidamente separado do terceiro.

### 8.3.2 Histograma



Podemos notar claramente nesse dendrograma que a maioria absoluta dos países estão concentrados em um único cluster.

## 9. Análise discriminante

## 9.1 Análise discriminante para população

### Discriminant Analysis: NOVO CLUSTER versus LOG AA; LOG MA; ...

Linear Method for Response: NOVO CLUSTER

Predictors: LOG AA; LOG MA; LOG PU; LOG PR

Group	1	2	3
Count	62	18	41

Summary of classification

Put into Group	True Group		
	1	2	3
1	37	0	11
2	6	14	10
3	19	4	20
Total N	62	18	41
N correct	37	14	20
Proportion	0,597	0,778	0,488

N = 121

N Correct = 71

**Proportion Correct = 0,587**

Squared Distance Between Groups

	1	2	3
1	0,00000	2,36005	0,27397
2	2,36005	0,00000	2,20369
3	0,27397	2,20369	0,00000

Linear Discriminant Function for Groups

	1	2	3
Constant	-67,509	-80,825	-70,510
LOG AA	-0,920	0,942	-0,560
LOG MA	-1,855	-1,341	-1,931
LOG PU	17,850	18,971	17,159
LOG PR	4,215	3,218	5,145

**Análise:**

## 9.2 Análise discriminante para 60

## Discriminant Analysis: NOVO CLUSTER 60 versus LOGAA60; LOGMA60; ...

Linear Method for Response: NOVO CLUSTER 60

Predictors: LOGAA60; LOGMA60; LOGPU60; LOGPR60

Group	1	2	3
Count	13	32	15

Summary of classification

Put into Group	True Group		
	1	2	3
1	10	1	7
2	1	28	1
3	2	3	7
Total N	13	32	15
N correct	10	28	7
Proportion	0,769	0,875	0,467

N = 60

N Correct = 45

**Proportion Correct = 0,750**

Squared Distance Between Groups

	1	2	3
1	0,00000	5,20655	0,59409
2	5,20655	0,00000	5,04486
3	0,59409	5,04486	0,00000

Linear Discriminant Function for Groups

	1	2	3
Constant	-105,11	-106,92	-115,84
LOGAA60	-1,22	-2,62	-1,68
LOGMA60	-6,93	-3,98	-6,93
LOGPU60	30,54	33,70	31,99
LOGPR60	5,56	1,75	5,99

**Análise:**



## Discriminant Analysis: NOVO CLUSTER 30 versus LOGAA30; LOGMA30; ...

Linear Method for Response: NOVO CLUSTER 30

Predictors: LOGAA30; LOGMA30; LOGPU30; LOGPR30

Group	1	2	3
Count	9	11	10

Summary of classification

Put into Group	True Group		
	1	2	3
1	9	0	1
2	0	8	1
3	0	3	8
Total N	9	11	10
N correct	9	8	8
Proportion	1,000	0,727	0,800

N = 30

N Correct = 25

**Proportion Correct = 0,833**

Squared Distance Between Groups

	1	2	3
1	0,0000	5,8058	10,2104
2	5,8058	0,0000	1,4304
3	10,2104	1,4304	0,0000

Linear Discriminant Function for Groups

	1	2	3
Constant	-142,40	-164,52	-186,57
LOGAA30	-1,60	-0,15	0,20
LOGMA30	-0,45	3,98	4,11
LOGPU30	51,56	51,54	54,72
LOGPR30	-6,59	-7,19	-7,65

**Análise:**

## 10.1 Regressão logística para população

### Ordinal Logistic Regression: NOVO CLUSTER versus LOG AA; LOG MA; ...

Link Function: Logit

#### Response Information

Variable	Value	Count
NOVO CLUSTER	1	62
	2	18
	3	41
	Total	121

#### Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI	
						Lower	Upper
Const(1)	3,70068	2,06628	1,79	0,073			
Const(2)	4,36041	2,07706	2,10	0,036			
LOG AA	-0,481193	0,357326	-1,35	0,178	0,62	0,31	1,25
LOG MA	0,0113198	0,272844	0,04	0,967	1,01	0,59	1,73
LOG PU	0,646372	0,640293	1,01	0,313	1,91	0,54	6,69
LOG PR	-0,845271	0,474699	-1,78	0,075	0,43	0,17	1,09

Log-Likelihood = -115,908

Test that all slopes are zero: G = 8,435, DF = 4, **P-Value = 0,077**

#### Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	245,482	236	0,322
Deviance	231,815	236	0,565

#### Measures of Association:

(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures
<b>Concordant</b>	<b>2797</b>	<b>63,6</b>	Somers' D 0,28
Discordant	1571	35,7	Goodman-Kruskal Gamma 0,28
Ties	28	0,6	Kendall's Tau-a 0,17
Total	4396	100,0	

#### Análise:

## 10.2 Regressão logística para 60

## Ordinal Logistic Regression: NOVO CLUSTER versus LOGAA60; LOGMA60; ...

Link Function: Logit

### Response Information

Variable	Value	Count
NOVO CLUSTER 60	1	13
	2	32
	3	15
	Total	60

### Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI	
						Lower	Upper
Const(1)	6,28957	3,75582	1,67	0,094			
Const(2)	8,81581	3,85214	2,29	0,022			
LOGAA60	0,476245	0,521459	0,91	0,361	1,61	0,58	4,47
LOGMA60	0,0715993	0,369868	0,19	0,847	1,07	0,52	2,22
LOGPU60	-0,902256	1,00227	-0,90	0,368	0,41	0,06	2,89
LOGPR60	-0,600692	0,688039	-0,87	0,383	0,55	0,14	2,11

Log-Likelihood = -58,429

Test that all slopes are zero: G = 4,726, DF = 4, **P-Value = 0,317**

### Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	126,082	114	0,207
Deviance	116,858	114	0,408

### Measures of Association:

(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures
<b>Concordant</b>	<b>638</b>	<b>58,5</b>	Somers' D 0,18
Discordant	440	40,3	Goodman-Kruskal Gamma 0,18
Ties	13	1,2	Kendall's Tau-a 0,11
Total	1091	100,0	

### Análise:

## Ordinal Logistic Regression: NOVO CLUSTER versus LOGAA30; LOGMA30; ...

Link Function: Logit

### Response Information

Variable	Value	Count
NOVO CLUSTER 30	1	9
	2	11
	3	10
	Total	30

### Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI	
						Lower	Upper
Const(1)	33,2878	10,2200	3,26	0,001			
Const(2)	36,8049	10,8786	3,38	0,001			
LOGAA30	-0,920561	1,02008	-0,90	0,367	0,40	0,05	2,94
LOGMA30	-2,39932	1,00372	-2,39	0,017	0,09	0,01	0,65
LOGPU30	-3,47975	2,08524	-1,67	0,095	0,03	0,00	1,84
LOGPR30	0,728785	1,20639	0,60	0,546	2,07	0,19	22,05

Log-Likelihood = -17,060

Test that all slopes are zero: G = 31,596, DF = 4, **P-Value = 0,000**

### Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	214,207	54	0,000
Deviance	34,120	54	0,984

### Measures of Association:

(Between the Response Variable and Predicted Probabilities)

Pairs	Number	Percent	Summary Measures
<b>Concordant</b>	<b>275</b>	<b>92,0</b>	Somers' D 0,84
Discordant	24	8,0	Goodman-Kruskal Gamma 0,84
Ties	0	0,0	Kendall's Tau-a 0,58
Total	299	100,0	

### Análise:

## 11. Conclusões finais

Com o aumento do número de indivíduos nas amostras obviamente obtemos uma maior representatividade, porém não podemos nos esquecer que quanto maior o número da amostra maior é também o custo da pesquisa, assim nesse caso, podemos concluir que para as variáveis apresentadas, o número de amostras de 30 representa de maneira satisfatória a população, sendo a melhor relação custo x benefício, pois apenas com o primeiro componente tivemos uma representação acima de 85% do índice.

Notamos que curiosamente, para a amostra de 30 indivíduos foi possível criar dois grupos distintos já para a amostra de 60 indivíduos apenas 2 grupos foram suficientes para demonstrar as diferenças dentro da amostra.

### Resultados

	Análise discriminante	Regressão logística
<b>População</b>	<b>58,7%</b>	<b>63,6%</b>
<b>Amostra de 60</b>	<b>75%</b>	<b>58,5%</b>
<b>Amostra de 30</b>	<b>83,3%</b>	<b>92%</b>