



**PUC - SP**

# **ANÁLISE DE CONGLOMERADOS E OS INDICADORES DE GOVERANÇA MUNDIAL**

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## 1. Introdução

O presente trabalho tem como objetivo analisar e comparar diferentes tamanhos de amostras com relação a sua população. Para isso utilizaremos o WGI (Worldwide Governance Indicators) que envolve 212 países. Estes países serão considerados como a população do universo e a partir desta população serão sorteadas amostras aleatórias com os tamanhos de 60 e 30 países, para cada uma das variáveis apresentadas pelo índice.

## 2. As variáveis e os indivíduos

Os indicadores de governança mundial 2009 - Worldwide Governance Indicators (WGI) – apresenta relatórios sobre 212 países e territórios no período de 1996-2008 ((indivíduos), por seis dimensões de governação (variáveis):

- a) Voz e Responsabilização
- b) Estabilidade Política e Ausência de Violência
- c) Eficácia do Governo
- d) Qualidade Regulatória
- e) Estado de Direito
- f) Controle da Corrupção

## 3. Tabela

**Link para tabela completa:**

<http://info.worldbank.org/governance/wgi/pdf/wgidataset.xls>

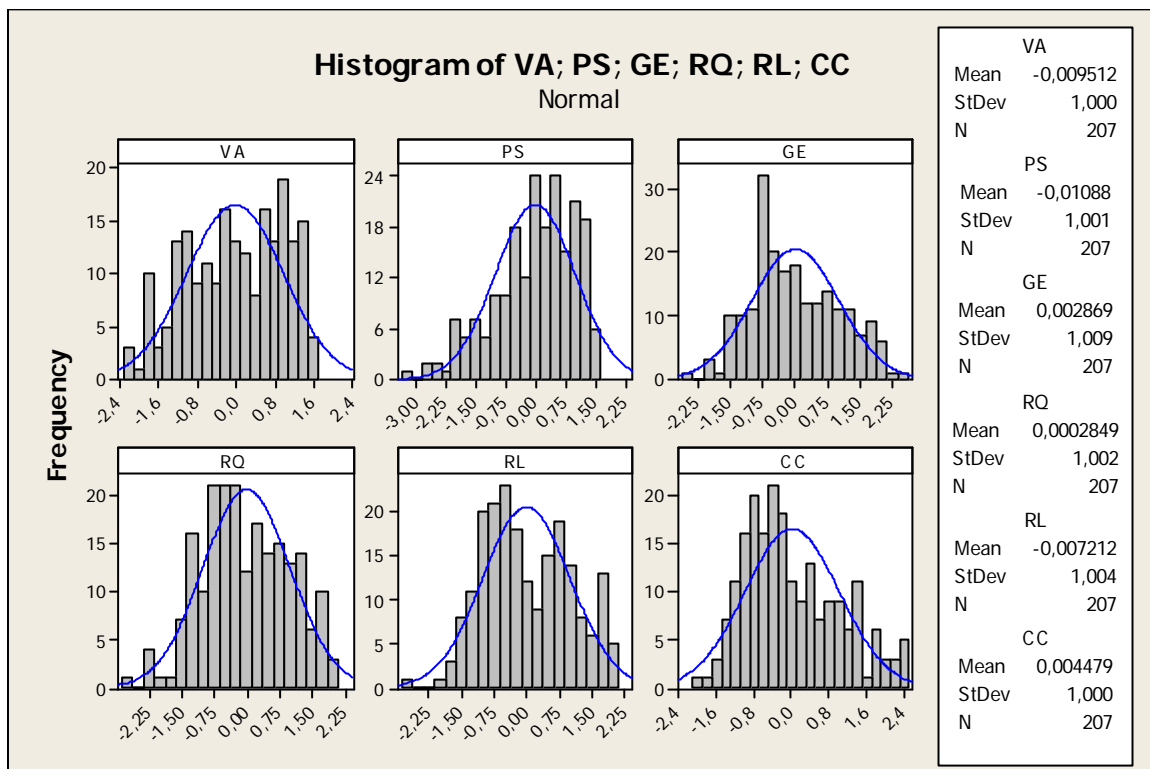
## 4. PESQUISA POR AMOSTRAGEM

A pesquisa por amostragem foi feita em duas amostras, uma de 60 indivíduos, ou países e a outra com 30 indivíduos.

### 4.1 Sumário

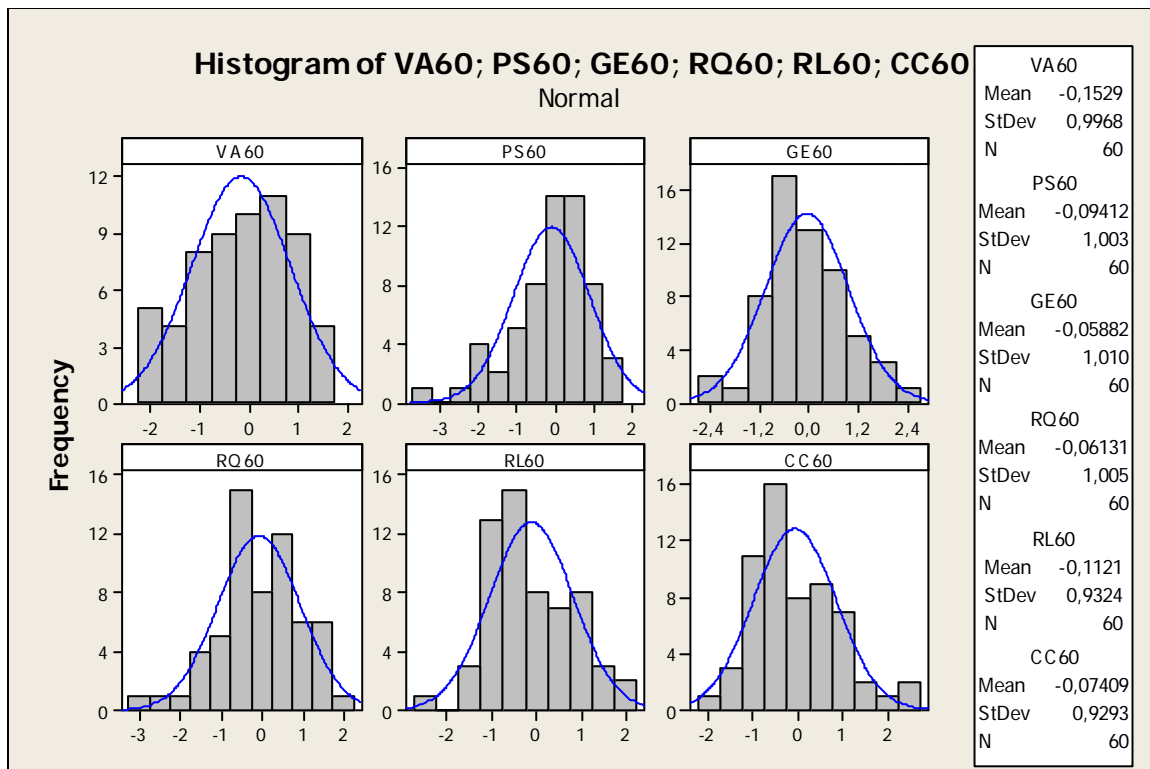
## 4. PESQUISA POR AMOSTRAGEM – COMPONENTE PRINCIPAL

### 4.2.1 Sumário População



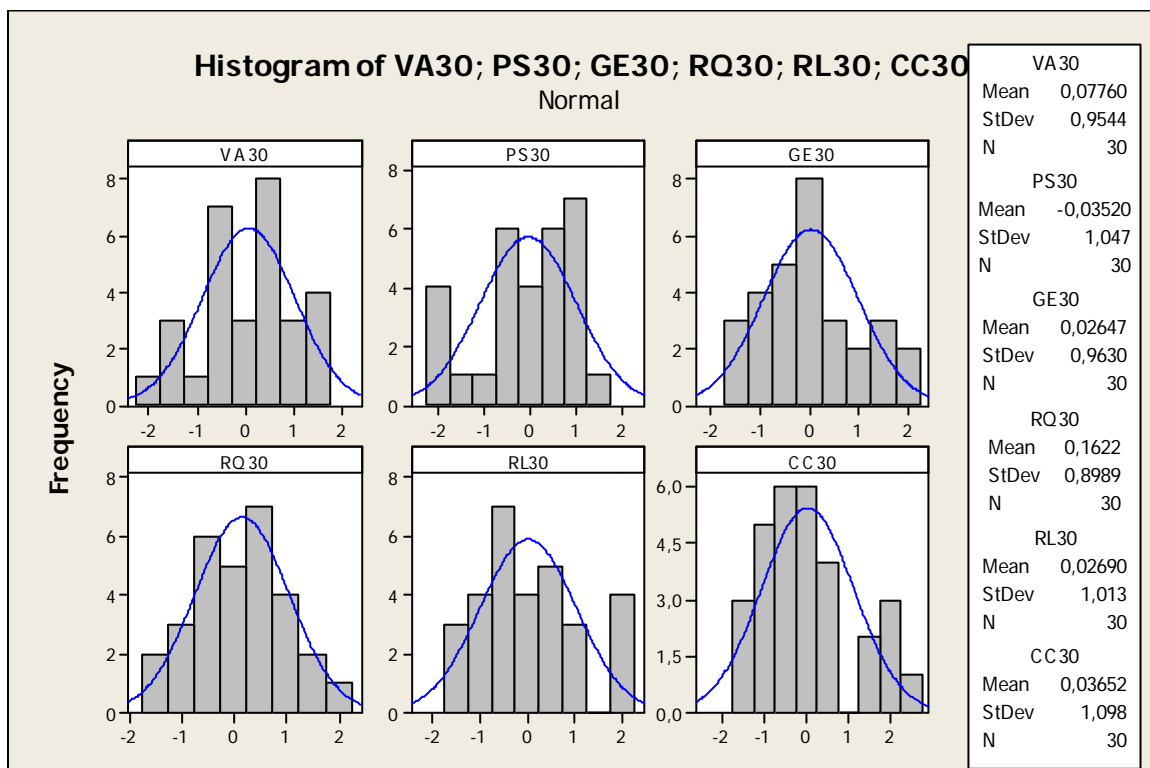
O histograma para a população apresenta uma curva próxima a normal.

### 4.2.2 Sumário para amostra 60



Como as curvas para a amostra de 60 são similares a da população é viável a utilização desta para efeito de análise.

#### 4.2.3 Sumário para amostra 30



Na amostra de 30 existe similaridade a amostra de 60 e da população. Tende a ser mais vantajoso para um trabalho uma análise menor, devido ao custo ser menor e ser mais rapido de analisar, no entanto o pesquisador precisa ter cuidado para não estar com uma amostra tendenciosa.

## 5. ANÁLISE DE DADOS

### 5.1 Para amostra de 60 indivíduos

#### Cluster Analysis of Observations: VA60; PS60; GE60; RQ60; RL60; CC60

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	98,5261	0,15472	33	47	33
2	58	97,7469	0,23652	38	60	38
3	57	97,1154	0,30282	28	43	28
4	56	96,6980	0,34663	38	57	38
5	55	96,3081	0,38757	19	38	19
6	54	96,2050	0,39839	1	19	1
7	53	95,9984	0,42008	13	15	13
8	52	95,9121	0,42913	6	33	6
9	51	95,7479	0,44637	24	30	24
10	50	95,6474	0,45693	12	36	12
11	49	95,5203	0,47026	44	51	44
12	48	95,3824	0,48474	1	3	1
13	47	95,1841	0,50556	12	49	12
14	46	95,0501	0,51962	6	28	6
15	45	94,8012	0,54575	8	56	8
16	44	94,7569	0,55041	1	8	1
17	43	94,7220	0,55407	13	35	13
18	42	94,7115	0,55517	18	21	18
19	41	94,6716	0,55936	12	50	12
20	40	94,2936	0,59905	6	16	6
21	39	94,1598	0,61309	12	53	12
22	38	94,0217	0,62759	42	54	42
23	37	94,0086	0,62896	1	5	1
24	36	93,8774	0,64273	6	29	6
25	35	93,8263	0,64810	11	13	11
26	34	93,7420	0,65695	34	59	34
27	33	93,6885	0,66256	10	32	10
28	32	93,6062	0,67120	2	11	2
29	31	93,3811	0,69483	2	20	2
30	30	93,3605	0,69699	18	26	18
31	29	93,2565	0,70791	7	34	7
32	28	93,1721	0,71678	2	55	2
33	27	93,0064	0,73417	2	10	2
34	26	92,8115	0,75463	1	46	1
35	25	92,4966	0,78769	4	24	4
36	24	92,4725	0,79022	2	18	2
37	23	92,3366	0,80449	12	52	12
38	22	92,2413	0,81449	12	25	12
39	21	92,0745	0,83200	2	6	2
40	20	91,9625	0,84376	7	12	7
41	19	91,5549	0,88655	1	7	1
42	18	91,4601	0,89650	1	2	1
43	17	90,9261	0,95255	1	48	1
44	16	90,6765	0,97875	1	44	1
45	15	90,1518	1,03384	1	37	1
46	14	89,8905	1,06127	1	27	1
47	13	89,8077	1,06997	1	45	1
48	12	89,3974	1,11304	9	41	9
49	11	89,3070	1,12252	17	42	17
50	10	89,2292	1,13069	9	17	9
51	9	88,8268	1,17293	1	39	1
52	8	88,6354	1,19302	1	9	1

53	7	88,1527	1,24370	1	31	1	52
54	6	87,5584	1,30609	1	40	1	53
55	5	86,5583	1,41107	1	4	1	56
56	4	84,9066	1,58446	1	14	1	57
57	3	81,7639	1,91438	1	22	1	58
58	2	81,0131	1,99320	1	58	1	59
59	1	79,6483	2,13648	1	23	1	60

Final Partition

Number of clusters: 20

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	10	2,9935	0,50598	1,02898
Cluster2	19	22,4309	1,02636	1,93631
Cluster3	3	0,5490	0,41558	0,54737
Cluster4	10	6,5132	0,77722	1,08969
Cluster5	1	0,0000	0,00000	0,00000
Cluster6	1	0,0000	0,00000	0,00000
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
Cluster13	1	0,0000	0,00000	0,00000
Cluster14	1	0,0000	0,00000	0,00000
Cluster15	1	0,0000	0,00000	0,00000
Cluster16	2	0,1969	0,31379	0,31379
Cluster17	2	0,1106	0,23513	0,23513
Cluster18	1	0,0000	0,00000	0,00000
Cluster19	1	0,0000	0,00000	0,00000
Cluster20	1	0,0000	0,00000	0,00000

Cluster Centroids

Variable	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6
VA60	-0,027169	0,774515	-0,915851	-0,77100	-2,06436	-1,47529
PS60	-0,150497	0,486465	0,988169	-1,12144	0,23457	-2,33916
GE60	-0,479990	0,507568	0,796725	-0,89867	-1,15859	-1,89313
RQ60	-0,300183	0,605866	0,690508	-0,68770	-2,02605	-1,42684
RL60	-0,401888	0,422883	0,707158	-0,99272	-1,29867	-1,68305
CC60	-0,450432	0,371535	0,923958	-0,89919	-1,34476	-1,30702

Variable	Cluster7	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12
VA60	-1,85204	0,69447	-1,84791	-0,43768	-1,72357	0,18748
PS60	0,03846	-1,39319	-3,27694	-2,04358	-0,31701	0,11822
GE60	-0,50713	1,29713	-2,51076	-0,29255	0,23662	-0,78937
RQ60	-1,58751	1,19694	-2,76935	-0,28145	-0,21665	-1,31055
RL60	-0,85143	0,88234	-2,68567	-0,00955	-0,33314	-0,77978
CC60	-0,06435	0,87410	-1,90470	-0,14652	-0,43795	-0,40873

Variable	Cluster13	Cluster14	Cluster15	Cluster16	Cluster17	Cluster18
VA60	-1,48188	-0,713581	-2,21489	-1,74622	1,45027	-0,55749
PS60	-1,05524	-0,320346	0,35350	0,46524	1,19813	-1,18767
GE60	-0,74822	0,273770	-2,12067	-0,97571	1,94251	0,10977
RQ60	-1,62523	0,339980	-2,27709	-1,08455	1,62230	0,26074
RL60	-0,79597	0,489467	-1,05553	-0,82583	1,83601	-0,03053
CC60	-0,70621	0,406639	-1,73760	-0,79578	2,18625	-0,38436

	Grand centroid		
Variable	Cluster19	Cluster20	centroid

VA60	1,32346	-0,40657	-0,152920
PS60	1,39778	1,32880	-0,094118
GE60	1,86153	2,53125	-0,058823
RQ60	1,34670	1,91783	-0,061314
RL60	1,46685	1,72862	-0,112092
CC60	1,25571	2,34453	-0,074091

Distances Between Cluster Centroids

	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
Cluster1	0,00000	2,04951	2,79584	1,54011	3,05640	3,53960	2,31840
Cluster2	2,04951	0,00000	1,89362	3,49906	4,87187	5,49487	3,84108
Cluster3	2,79584	1,89362	0,00000	3,93175	4,71809	5,81317	3,47473
Cluster4	1,54011	3,49906	3,93175	0,00000	2,37959	2,03888	2,04790
Cluster5	3,05640	4,87187	4,71809	2,37959	0,00000	2,83177	1,59365
Cluster6	3,53960	5,49487	5,81317	2,03888	2,83177	0,00000	3,15874
Cluster7	2,31840	3,84108	3,47473	2,04790	1,59365	3,15874	0,00000
Cluster8	3,29670	2,23068	2,96716	4,15395	6,02986	5,83123	4,84041
Cluster9	5,53544	7,50913	7,84108	4,07617	4,12259	2,13648	4,81191
Cluster10	2,00849	3,12305	3,63469	1,73983	3,83762	3,03070	2,96693
Cluster11	1,85226	2,97704	2,53566	1,92692	2,71946	3,56773	1,72727
Cluster12	1,17447	2,80894	3,53287	1,77234	2,62260	3,41440	2,10858
Cluster13	2,23230	4,08291	4,14273	1,21955	1,72986	2,03632	1,34454
Cluster14	1,73409	1,73101	1,56987	2,64156	4,00589	4,48658	2,78742
Cluster15	3,70462	5,55045	5,44051	2,99776	1,11304	3,02512	2,48019
Cluster16	2,11996	3,78603	3,54441	1,91587	1,26461	3,14533	1,09614
Cluster17	5,05236	3,05702	3,26976	6,42218	7,64870	8,34670	6,39071
Cluster18	1,47027	2,37303	2,78840	1,77689	3,69623	3,55105	2,78427
Cluster19	4,33813	2,32067	2,72651	5,76054	6,90923	7,75095	5,76790
Cluster20	5,35446	3,67678	2,81988	6,52817	7,47597	8,38638	6,14271

	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12	Cluster13
Cluster1	3,29670	5,5354	2,00849	1,85226	1,17447	2,23230
Cluster2	2,23068	7,5091	3,12305	2,97704	2,80894	4,08291
Cluster3	2,96716	7,8411	3,63469	2,53566	3,53287	4,14273
Cluster4	4,15395	4,0762	1,73983	1,92692	1,77234	1,21955
Cluster5	6,02986	4,1226	3,83762	2,71946	2,62260	1,72986
Cluster6	5,83123	2,1365	3,03070	3,56773	3,41440	2,03632
Cluster7	4,84041	4,8119	2,96693	1,72727	2,10858	1,34454
Cluster8	0,00000	7,7908	2,87309	3,65060	4,19413	4,72366
Cluster9	7,79078	0,0000	4,98727	5,52510	5,16057	3,80695
Cluster10	2,87309	4,9873	0,00000	2,26018	2,65181	2,23881
Cluster11	3,65060	5,5251	2,26018	0,00000	2,50822	1,96050
Cluster12	4,19413	5,1606	2,65181	2,50822	0,00000	2,08645
Cluster13	4,72366	3,8069	2,23881	1,96050	2,08645	0,00000
Cluster14	2,29959	6,5478	2,07546	1,64964	2,67107	2,98792
Cluster15	6,77067	4,0490	4,45586	3,56429	3,22106	2,44162
Cluster16	5,04857	4,8885	3,19467	1,79058	2,02419	1,65370
Cluster17	3,24265	10,3539	5,61611	5,50021	5,69226	6,83778
Cluster18	2,51257	5,6071	1,12240	1,56723	2,46976	2,41962
Cluster19	3,00223	9,7571	5,13629	4,83919	4,98334	6,20483
Cluster20	3,68002	10,4031	5,78024	5,12421	6,09425	6,76969

	Cluster14	Cluster15	Cluster16	Cluster17	Cluster18	Cluster19
Cluster1	1,73409	3,70462	2,11996	5,0524	1,47027	4,33813
Cluster2	1,73101	5,55045	3,78603	3,0570	2,37303	2,32067
Cluster3	1,56987	5,44051	3,54441	3,2698	2,78840	2,72651
Cluster4	2,64156	2,99776	1,91587	6,4222	1,77689	5,76054
Cluster5	4,00589	1,11304	1,26461	7,6487	3,69623	6,90923
Cluster6	4,48658	3,02512	3,14533	8,3467	3,55105	7,75095
Cluster7	2,78742	2,48019	1,09614	6,3907	2,78427	5,76790
Cluster8	2,29959	6,77067	5,04857	3,2427	2,51257	3,00223
Cluster9	6,54778	4,04902	4,88855	10,3539	5,60714	9,75710
Cluster10	2,07546	4,45586	3,19467	5,6161	1,12240	5,13629
Cluster11	1,64964	3,56429	1,79058	5,5002	1,56723	4,83919
Cluster12	2,67107	3,22106	2,02419	5,6923	2,46976	4,98334
Cluster13	2,98792	2,44162	1,65370	6,8378	2,41962	6,20483
Cluster14	0,00000	4,71966	2,90685	4,0493	1,30609	3,50887
Cluster15	4,71966	0,00000	1,97611	8,3438	4,40676	7,61069

Cluster16	2,90685	1,97611	0,00000	6,5250	2,81691	5,80676
Cluster17	4,04935	8,34380	6,52499	0,0000	5,00279	1,06800
Cluster18	1,30609	4,40676	2,81691	5,0028	0,00000	4,40482
Cluster19	3,50887	7,61069	5,80676	1,0680	4,40482	0,00000
Cluster20	3,96115	8,23858	6,34351	1,9838	5,05038	2,24199

	Cluster20
Cluster1	5,3545
Cluster2	3,6768
Cluster3	2,8199
Cluster4	6,5282
Cluster5	7,4760
Cluster6	8,3864
Cluster7	6,1427
Cluster8	3,6800
Cluster9	10,4031
Cluster10	5,7802
Cluster11	5,1242
Cluster12	6,0943
Cluster13	6,7697
Cluster14	3,9611
Cluster15	8,2386
Cluster16	6,3435
Cluster17	1,9838
Cluster18	5,0504
Cluster19	2,2420

Pode-se atentar, na tabela acima, que há similaridade entre muitas observações. Desta forma, para melhor observação, utilizamos 20 clusters. Destaca-se em amarelo.

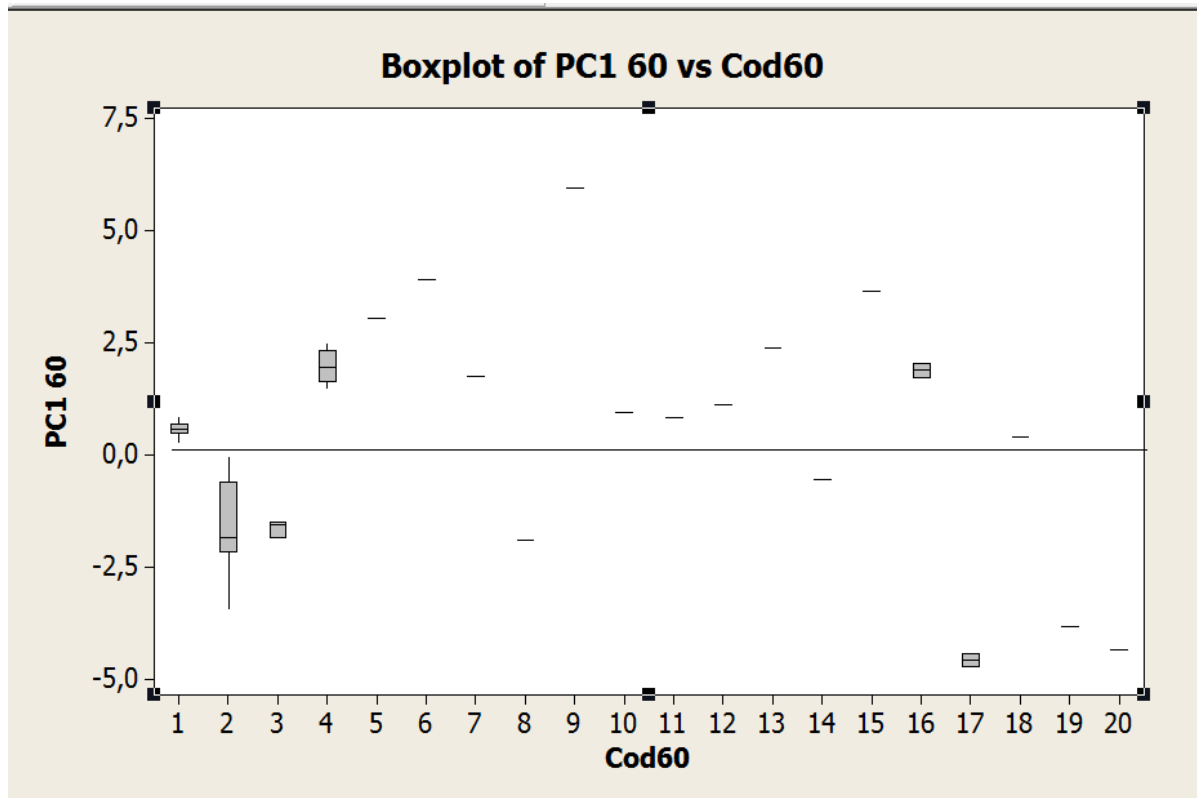
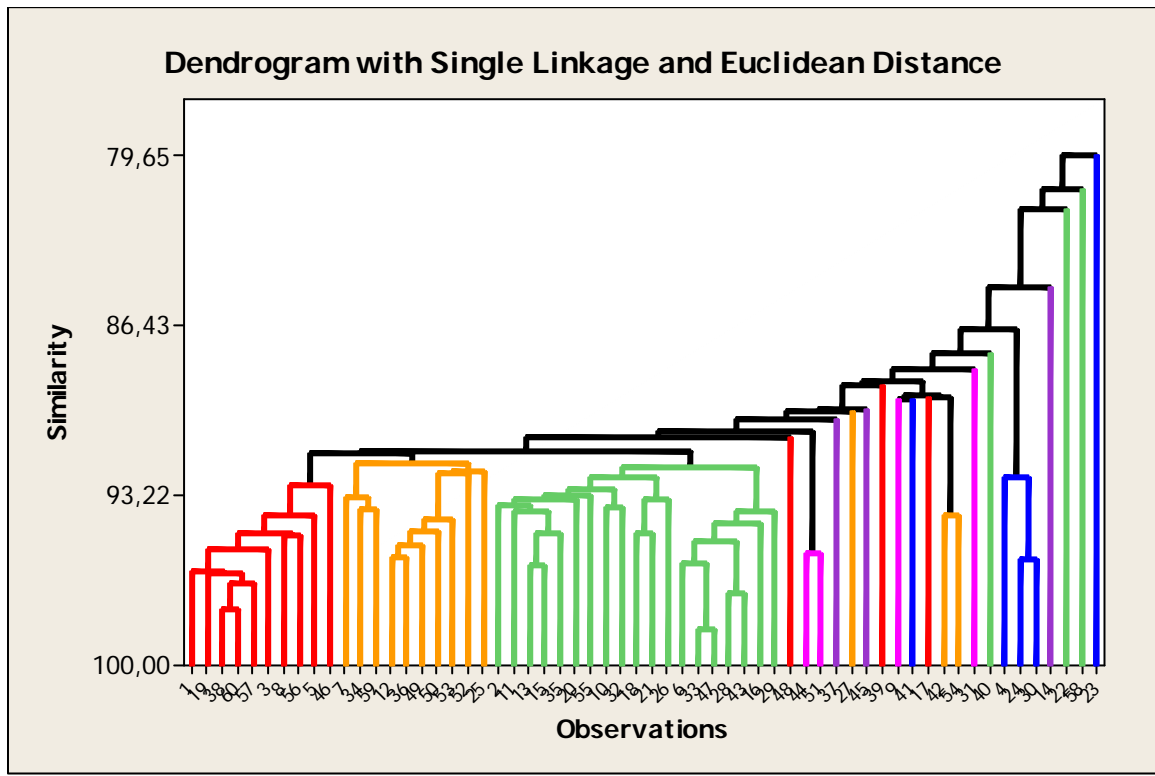
O centróide é o meio de um cluster e pode ser usado como uma medida de localização. Para um determinado cluster a distancia média do centróide é a média das distâncias entre as observações e o centróide. Observa-se a tabela abaixo:

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	10	2,9935	0,50598	1,02898
Cluster2	19	22,4309	1,02636	1,93631
Cluster3	3	0,5490	0,41558	0,54737
Cluster4	10	6,5132	0,77722	1,08969
Cluster5	1	0,0000	0,00000	0,00000
Cluster6	1	0,0000	0,00000	0,00000
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
Cluster13	1	0,0000	0,00000	0,00000
Cluster14	1	0,0000	0,00000	0,00000
Cluster15	1	0,0000	0,00000	0,00000
Cluster16	2	0,1969	0,31379	0,31379
Cluster17	2	0,1106	0,23513	0,23513
Cluster18	1	0,0000	0,00000	0,00000
Cluster19	1	0,0000	0,00000	0,00000
Cluster20	1	0,0000	0,00000	0,00000

No Dendograma abaixo podemos visualizar a disposição dos países e verificar o nível de similaridade entre os países desta região

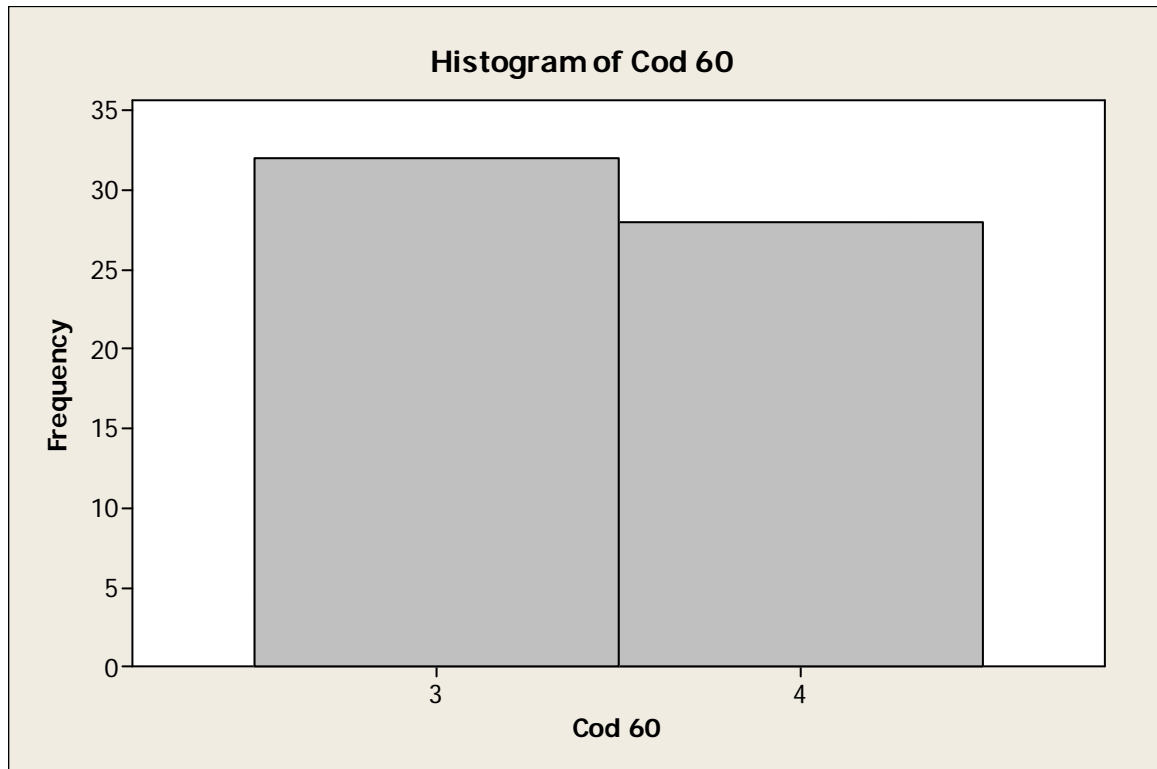


### 5.1.2 Dendrograma



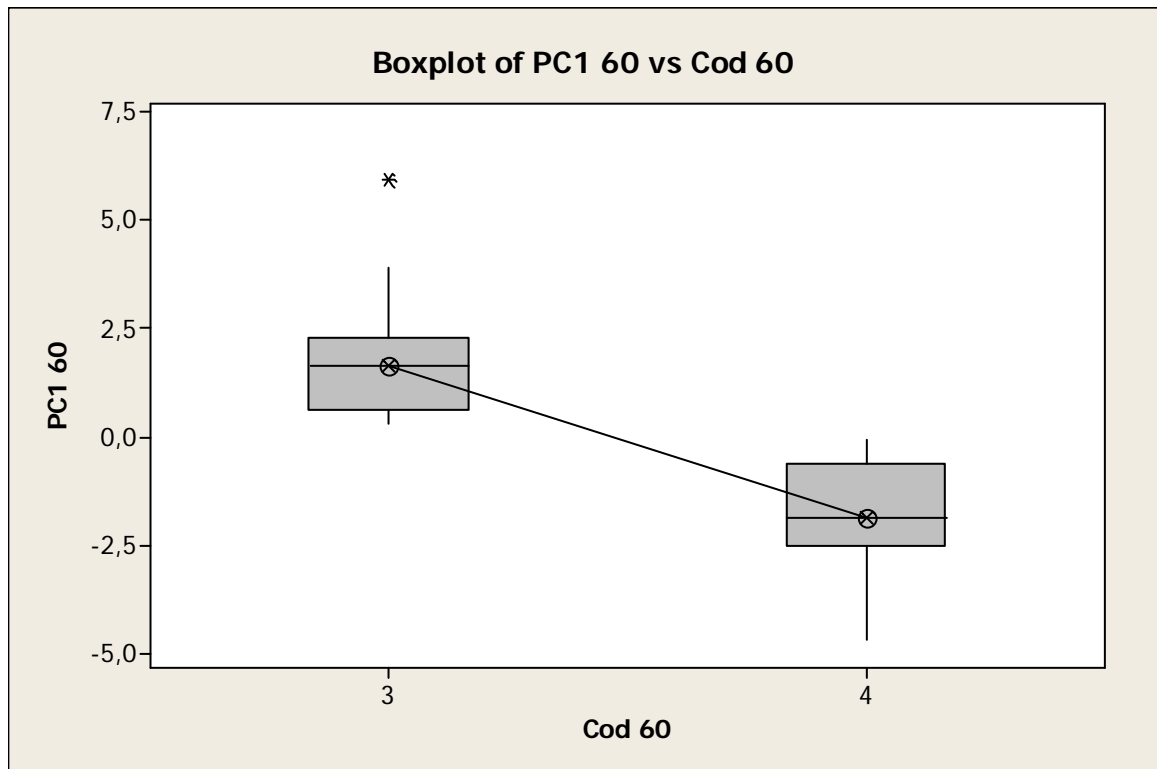
Para uma melhor análise iremos agrupar em dois clusters conforme histograma abaixo.

### 5.1.3 Histograma

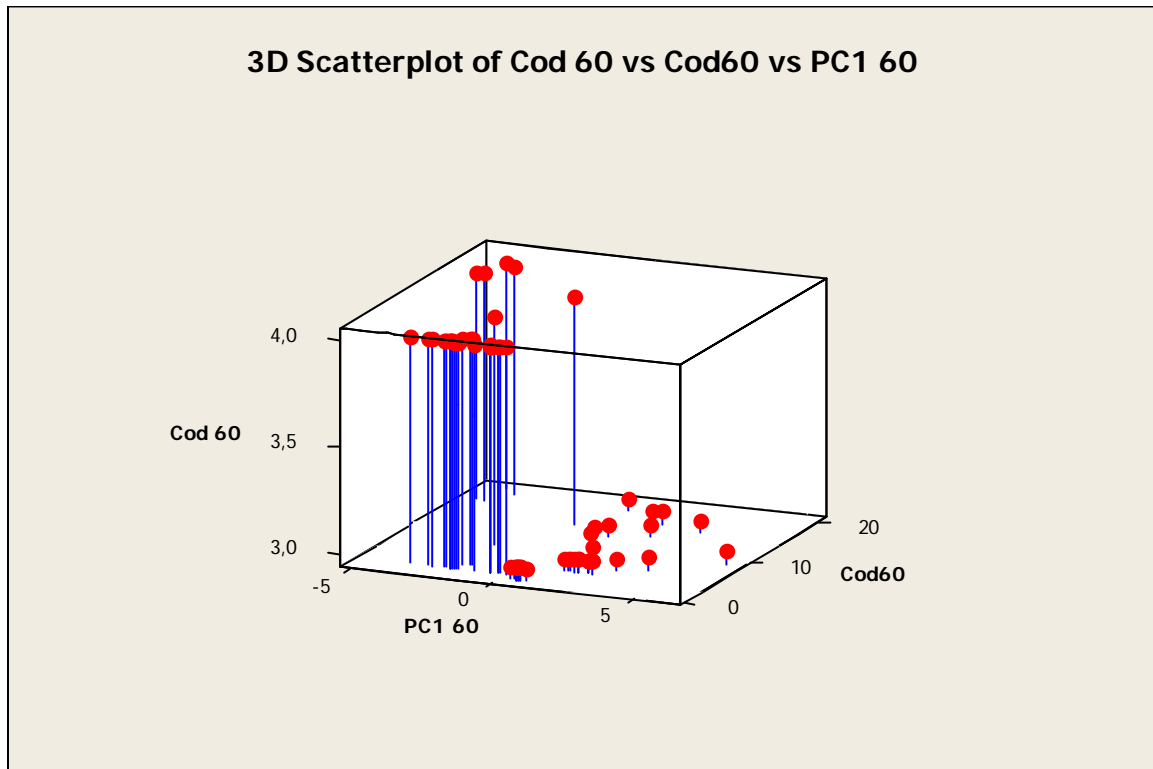


Temos desta forma dois grupos, sendo que o 3 apresenta maior número de amostras.

### 5.1.4 Box plot



### 5.1.5 Gráfico 3D



## 5.2 Para amostra de 30 indivíduos

### 5.2.1 Cluster Analysis of Observations: VA30; PS30; GE30; RQ30; RL30; CC30

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	97,1888	0,22280	5	17	5
2	28	96,8994	0,24574	19	25	19
3	27	95,9042	0,32461	8	27	8
4	26	95,6586	0,34408	3	23	3
5	25	94,5813	0,42946	18	20	18
6	24	92,9723	0,55698	12	29	12
7	23	92,7377	0,57557	15	19	15
8	22	91,5786	0,66744	8	28	8
9	21	91,4492	0,67770	4	13	4
10	20	91,2421	0,69411	18	30	18
11	19	91,2003	0,69742	7	8	7
12	18	90,6532	0,74078	10	15	10
13	17	90,5578	0,74834	2	18	2
14	16	89,7123	0,81535	3	26	3
15	15	88,5903	0,90428	1	7	1
16	14	88,3926	0,91995	3	6	3
17	13	87,9433	0,95555	1	2	1
18	12	87,8700	0,96137	1	22	1
19	11	87,7910	0,96763	1	21	1
20	10	86,8264	1,04407	1	3	1

21	9	86,6095	1,06127	4	11	4	3
22	8	86,2110	1,09285	1	12	1	17
23	7	84,4578	1,23180	1	9	1	18
24	6	84,4310	1,23392	1	4	1	21
25	5	83,2004	1,33146	16	24	16	2
26	4	82,6896	1,37194	1	14	1	22
27	3	81,5548	1,46188	1	5	1	24
28	2	79,3550	1,63623	1	16	1	26
29	1	76,2170	1,88493	1	10	1	30

Final Partition

Number of clusters: 20

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	1	0,000000	0,000000	0,000000
Cluster2	1	0,000000	0,000000	0,000000
Cluster3	2	0,059196	0,172040	0,172040
Cluster4	2	0,229638	0,338849	0,338849
Cluster5	2	0,024820	0,111399	0,111399
Cluster6	1	0,000000	0,000000	0,000000
Cluster7	1	0,000000	0,000000	0,000000
Cluster8	3	0,465740	0,365227	0,524756
Cluster9	1	0,000000	0,000000	0,000000
Cluster10	1	0,000000	0,000000	0,000000
Cluster11	1	0,000000	0,000000	0,000000
Cluster12	2	0,155116	0,278492	0,278492
Cluster13	1	0,000000	0,000000	0,000000
Cluster14	3	0,264440	0,285919	0,395175
Cluster15	1	0,000000	0,000000	0,000000
Cluster16	3	0,425542	0,368499	0,471399
Cluster17	1	0,000000	0,000000	0,000000
Cluster18	1	0,000000	0,000000	0,000000
Cluster19	1	0,000000	0,000000	0,000000
Cluster20	1	0,000000	0,000000	0,000000

Cluster Centroids

Variable	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6
VA30	0,251358	-0,330612	0,87374	-0,59399	-1,38613	0,58576
PS30	0,594638	-0,107733	0,82570	-1,81493	-1,91850	0,40766
GE30	0,009265	-0,667024	0,70023	-0,69428	-1,43350	1,25876
RQ30	-0,048389	-0,319908	1,14107	-0,42827	-1,20482	0,72968
RL30	-0,088430	-0,371482	0,54721	-0,74774	-1,58713	0,79081
CC30	-0,283515	-0,359331	0,30654	-0,75353	-1,40330	0,44773

Variable	Cluster7	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12
VA30	0,161925	0,596923	0,63111	1,44910	-0,43768	0,56275
PS30	-0,311018	0,076524	1,10518	1,22125	-2,04358	1,02302
GE30	-0,135557	0,118380	-0,06533	1,58013	-0,29255	0,57823
RQ30	0,211090	0,580267	-0,43207	1,11944	-0,28145	0,72966
RL30	-0,318811	-0,272305	0,73702	1,91022	-0,00955	0,92988
CC30	-0,110388	-0,286149	0,24405	2,31903	-0,14652	1,32090

Variable	Cluster13	Cluster14	Cluster15	Cluster16	Cluster17	Cluster18
VA30	-0,529079	1,48519	-1,74677	-0,359538	-0,22151	-0,660008
PS30	0,452022	1,17081	-0,55925	-0,477987	-0,83217	0,005214
GE30	0,114139	1,81159	-0,66828	-0,782952	-0,97383	-0,065820
RQ30	0,035562	1,70877	-1,17267	-0,199367	-1,13727	0,318150
RL30	0,701996	1,79387	-0,53934	-0,797061	-1,22948	-0,361117
CC30	0,497500	2,08144	-1,07246	-0,764712	-0,79279	-0,544531

Variable	Cluster19	Cluster20	Grand centroid
VA30	-1,88979	0,983599	0,077595
PS30	-0,08566	0,558660	-0,035204
GE30	-1,43424	0,392058	0,026470
RQ30	-1,37400	0,473150	0,162187
RL30	-1,31408	0,441267	0,026899
CC30	-1,62071	0,484609	0,036521

Distances Between Cluster Centroids

	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
Cluster1	0,00000	1,20373	1,75647	2,79562	3,98950	1,90294	0,99978
Cluster2	1,20373	0,00000	2,75916	1,81475	2,88638	2,81388	0,95555
Cluster3	1,75647	2,75916	0,00000	4,04169	5,49296	0,90452	2,07027
Cluster4	2,79562	1,81475	4,04169	0,00000	1,70717	3,91115	2,03758
Cluster5	3,98950	2,88638	5,49296	1,70717	0,00000	5,41949	3,45690
Cluster6	1,90294	2,81388	0,90452	3,91115	5,41949	0,00000	2,10996
Cluster7	0,99978	0,95555	2,07027	2,03758	3,45690	2,10996	0,00000
Cluster8	0,91038	1,52861	1,52112	2,66794	4,06008	1,76107	0,75713
Cluster9	1,23180	2,08891	1,79938	3,69096	4,87815	1,90679	1,97097
Cluster10	4,05297	4,94316	2,67771	6,12098	7,64643	2,53324	4,31787
Cluster11	2,75778	2,01915	3,67110	1,08308	2,67167	3,38802	1,93015
Cluster12	2,19561	3,04067	1,22277	4,41246	5,83066	1,27439	2,51527
Cluster13	1,37194	1,72505	1,93225	3,11107	4,37502	1,74561	1,60139
Cluster14	4,16249	5,08301	2,59900	6,21135	7,77062	2,51609	4,38734
Cluster15	2,80585	1,86368	4,36961	1,89883	1,94204	4,21761	2,62250
Cluster16	1,70524	0,71508	3,18933	1,38029	2,36540	3,27124	1,24268
Cluster17	2,44395	1,49096	4,03814	1,38528	1,80359	4,03476	2,05776
Cluster18	1,20850	0,96137	2,41640	2,11247	3,26474	2,43912	0,99105
Cluster19	3,48978	2,57115	5,15052	2,68032	1,93995	5,17286	3,42506
Cluster20	1,35152	2,30100	0,81695	3,61416	5,05755	1,05905	1,64629

	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12	Cluster13
Cluster1	0,91038	1,23180	4,05297	2,75778	2,19561	1,37194
Cluster2	1,52861	2,08891	4,94316	2,01915	3,04067	1,72505
Cluster3	1,52112	1,79938	2,67771	3,67110	1,22277	1,93225
Cluster4	2,66794	3,69096	6,12098	1,08308	4,41246	3,11107
Cluster5	4,06008	4,87815	7,64643	2,67167	5,83066	4,37502
Cluster6	1,76107	1,90679	2,53324	3,38802	1,27439	1,74561
Cluster7	0,75713	1,97097	4,31787	1,93015	2,51527	1,60139
Cluster8	0,00000	1,84871	4,00180	2,56226	2,27127	1,80803
Cluster9	1,84871	0,00000	3,38810	3,44111	1,72396	1,44534
Cluster10	4,00180	3,38810	0,00000	5,42706	1,98443	3,55058
Cluster11	2,56226	3,44111	5,42706	0,00000	3,90146	2,72458
Cluster12	2,27127	1,72396	1,98443	3,90146	0,00000	1,71617
Cluster13	1,80803	1,44534	3,55058	2,72458	1,71617	0,00000
Cluster14	4,00019	3,65140	0,68900	5,53482	2,16274	3,73577
Cluster15	3,20598	3,56356	6,41836	2,44753	4,57131	2,92969
Cluster16	1,77396	2,72543	5,50644	1,92529	3,62652	2,36516
Cluster17	2,60984	3,27798	6,17771	2,14865	4,36826	3,11422
Cluster18	1,32750	2,29511	4,75786	2,22259	2,87433	1,59532
Cluster19	3,91231	4,26832	7,35374	3,50916	5,42292	3,88283
Cluster20	1,25364	1,26368	2,82982	3,22976	1,19638	1,62371

	Cluster14	Cluster15	Cluster16	Cluster17	Cluster18	Cluster19
Cluster1	4,16249	2,80585	1,70524	2,44395	1,20850	3,48978
Cluster2	5,08301	1,86368	0,71508	1,49096	0,96137	2,57115
Cluster3	2,59900	4,36961	3,18933	4,03814	2,41640	5,15052
Cluster4	6,21135	1,89883	1,38029	1,38528	2,11247	2,68032
Cluster5	7,77062	1,94204	2,36540	1,80359	3,26474	1,93995
Cluster6	2,51609	4,21761	3,27124	4,03476	2,43912	5,17286
Cluster7	4,38734	2,62250	1,24268	2,05776	0,99105	3,42506
Cluster8	4,00019	3,20598	1,77396	2,60984	1,32750	3,91231
Cluster9	3,65140	3,56356	2,72543	3,27798	2,29511	4,26832
Cluster10	0,68900	6,41836	5,50644	6,17771	4,75786	7,35374
Cluster11	5,53482	2,44753	1,92529	2,14865	2,22259	3,50916
Cluster12	2,16274	4,57131	3,62652	4,36826	2,87433	5,42292
Cluster13	3,73577	2,92969	2,36516	3,11422	1,59532	3,88283

Cluster14	0,00000	6,57890	5,59533	6,33917	4,79152	7,50822
Cluster15	6,57890	0,00000	1,74717	1,74643	2,09657	1,33146
Cluster16	5,59533	1,74717	0,00000	1,11730	1,15948	2,30208
Cluster17	6,33917	1,74643	1,11730	0,00000	2,15683	2,07390
Cluster18	4,79152	2,09657	1,15948	2,15683	0,00000	2,88494
Cluster19	7,50822	1,33146	2,30208	2,07390	2,88494	0,00000
Cluster20	2,92362	3,99045	2,79389	3,50270	2,22359	4,78878
Cluster20						
Cluster1	1,35152					
Cluster2	2,30100					
Cluster3	0,81695					
Cluster4	3,61416					
Cluster5	5,05755					
Cluster6	1,05905					
Cluster7	1,64629					
Cluster8	1,25364					
Cluster9	1,26368					
Cluster10	2,82982					
Cluster11	3,22976					
Cluster12	1,19638					
Cluster13	1,62371					
Cluster14	2,92362					
Cluster15	3,99045					
Cluster16	2,79389					
Cluster17	3,50270					
Cluster18	2,22359					
Cluster19	4,78878					
Cluster20	0,00000					

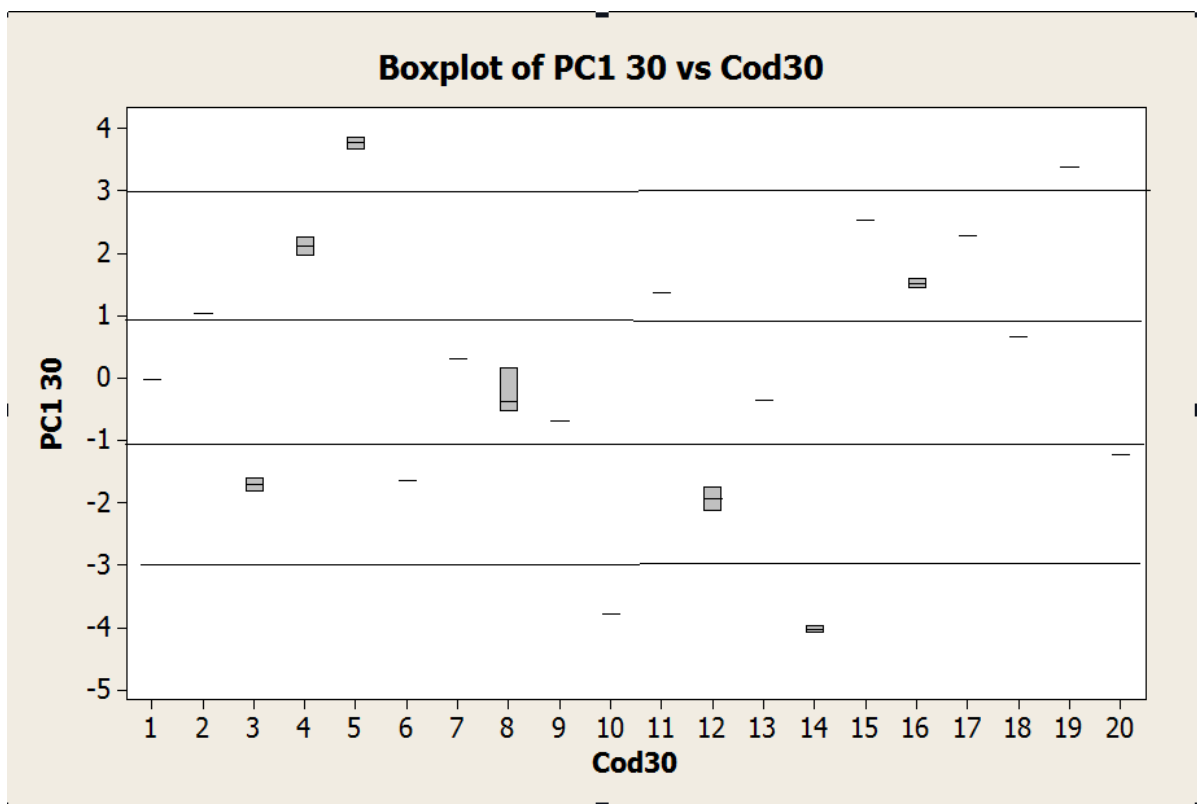
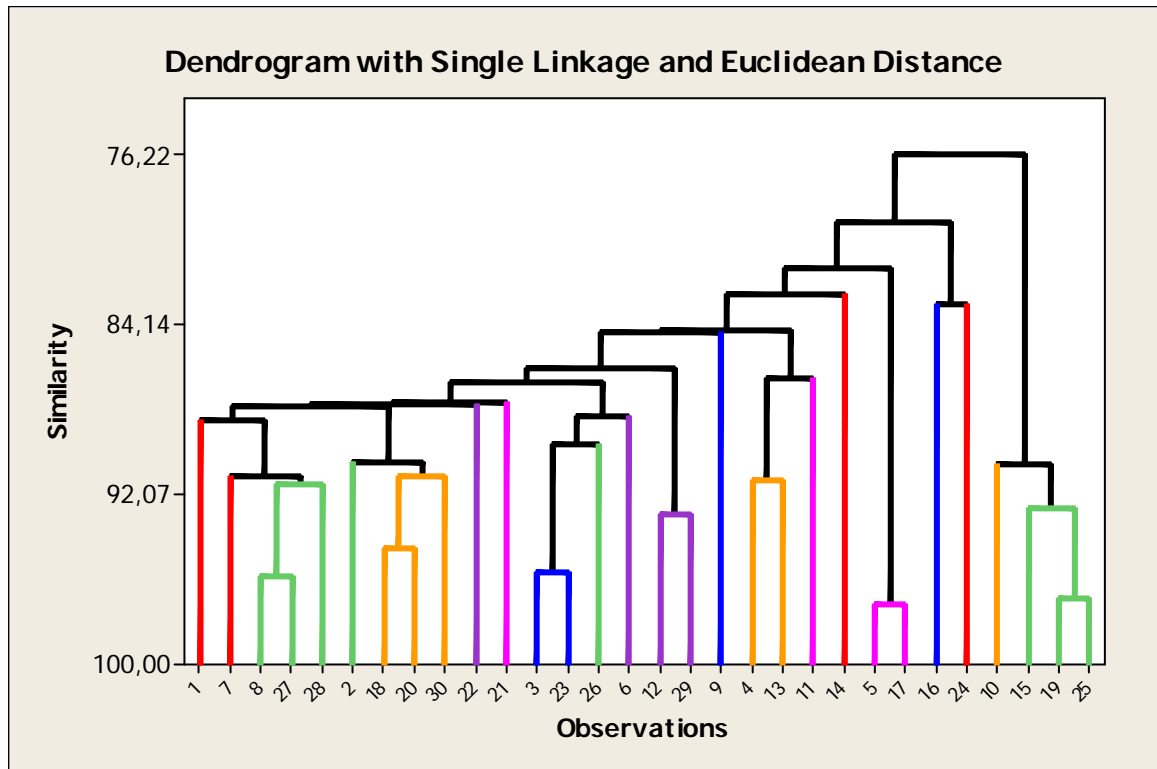
Pode-se atentar, na tabela acima, que há similaridade entre muitas observações. Desta forma, para melhor observação, utilizamos 20 clusters. Destaca-se em amarelo.

O centróide é o meio de um cluster e pode ser usado como uma medida de localização. Para um determinado cluster a distancia média do centróide é a média das distâncias entre as observações e o centróide. Observa-se a tabela abaixo:

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	1	0,000000	0,000000	0,000000
Cluster2	1	0,000000	0,000000	0,000000
Cluster3	2	0,059196	0,172040	0,172040
Cluster4	2	0,229638	0,338849	0,338849
Cluster5	2	0,024820	0,111399	0,111399
Cluster6	1	0,000000	0,000000	0,000000
Cluster7	1	0,000000	0,000000	0,000000
Cluster8	3	0,465740	0,365227	0,524756
Cluster9	1	0,000000	0,000000	0,000000
Cluster10	1	0,000000	0,000000	0,000000
Cluster11	1	0,000000	0,000000	0,000000
Cluster12	2	0,155116	0,278492	0,278492
Cluster13	1	0,000000	0,000000	0,000000
Cluster14	3	0,264440	0,285919	0,395175
Cluster15	1	0,000000	0,000000	0,000000
Cluster16	3	0,425542	0,368499	0,471399
Cluster17	1	0,000000	0,000000	0,000000
Cluster18	1	0,000000	0,000000	0,000000
Cluster19	1	0,000000	0,000000	0,000000
Cluster20	1	0,000000	0,000000	0,000000

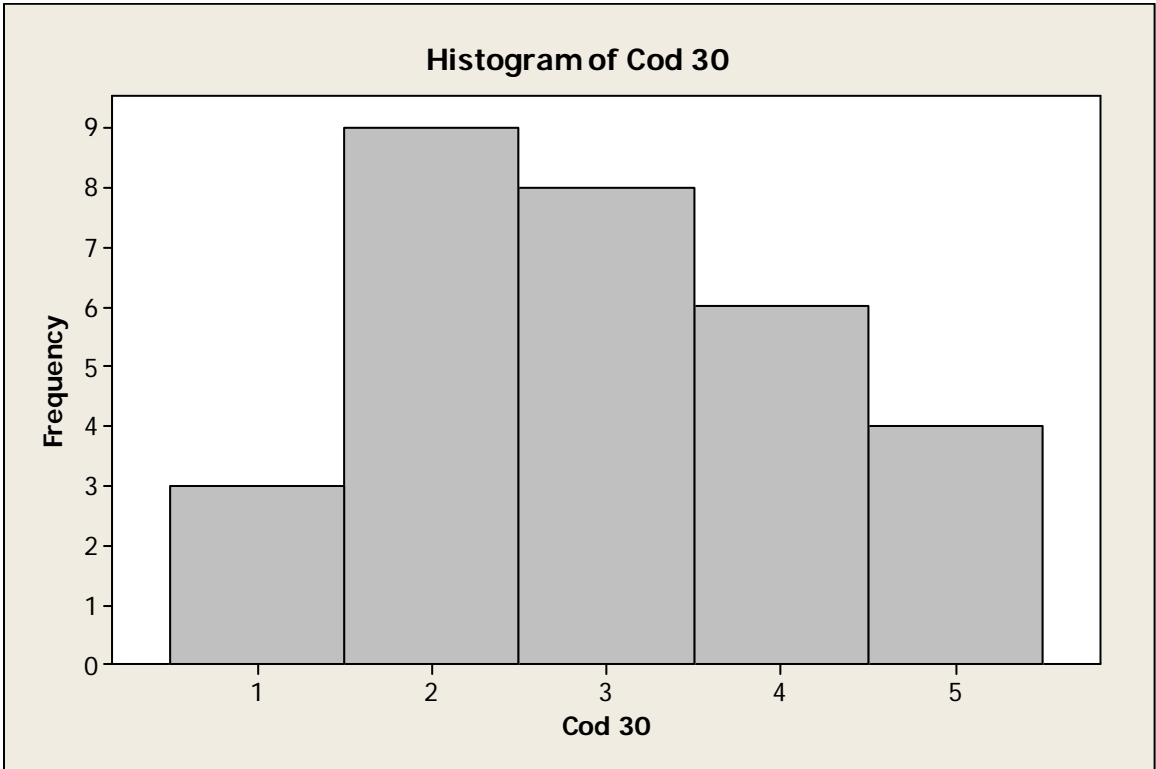
No Dendograma abaixo podemos visualizar a disposição dos países e verificar o nível de similaridade entre os países desta região

## 5.2.2 Dendograma



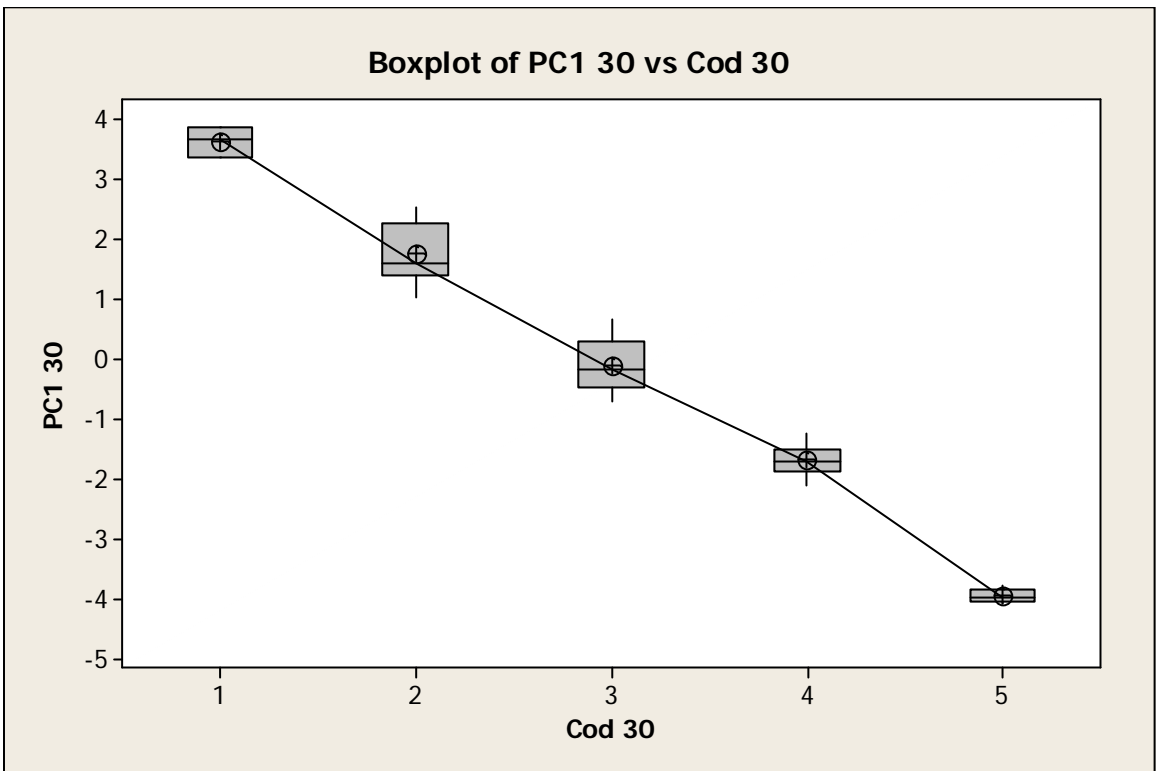
Para melhor análise iremos agrupar em 5 clusters conforme histograma abaixo:

### 5.2.3 Histograma



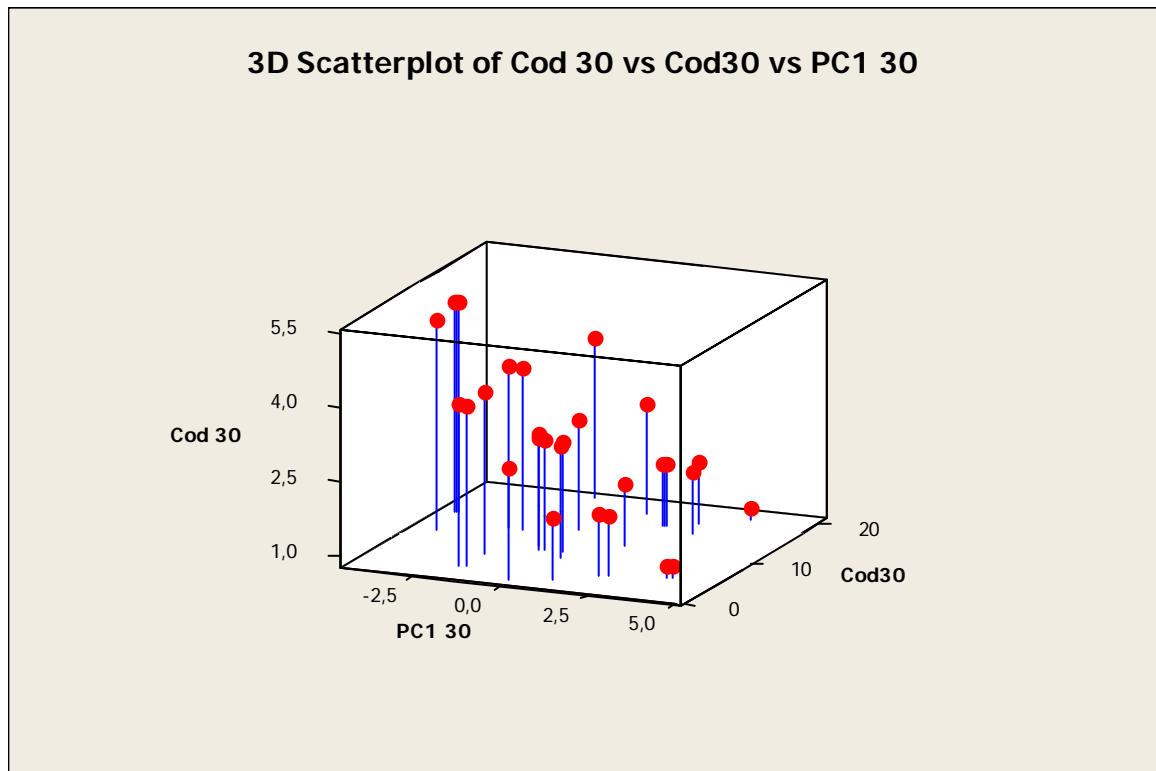
O histograma mostra 3 grandes grupos (2, 3 e 4 respectivamente).

### 5.2.4 Box plot





### 5.2.5 Gráfico 3D



## 6. CONCLUSÕES

Para melhor análise a amostra de 30 apresenta 5 grupos, já que as amostras estão mais distantes uma das outras conforme centroíde demonstrado acima. Desta forma obtemos um histograma e um boxplot que apresenta mais detalhes.